SPECIFICATIONS

PROJECT:	**CLEARVIEW LIBRARY** **269 REGINA STREET** **STAYNER, ONTARIO**
OWNER:	**TOWNSHIP OF CLEARVIEW**
CONSULTANT:	**LEBEL & BOULIANE** **1259 DUNDAS STREET WEST** **TORONTO, ON M6J 1X6** **TEL: 416-500-5927**
CONSULTANT'S PROJECT NUMBER:	**17-001**
DATE:	**DECEMBER 2017**

SUBCONSULTANTS

STRUCTURAL:
MECHAN ICAL:
ELECTRICAL:

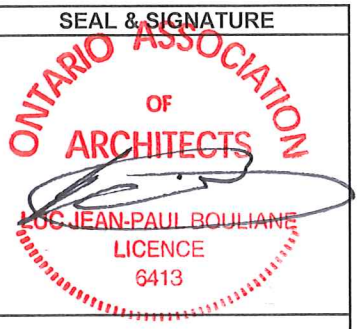
R.J. BURNSIDE AND ASSOC. LTD.
3 RONELL CRESCENT
COLLINGWOOD, ON L9Y 4J6

TEL: 705-446-0515

LANDSCAPING:

ENVISION TATHAM INC.
115 SANFORD FLEMING DRIVE SUITE 200
COLLINGWOOD, ON L96 5A6

TEL: 705-664-2059

CATEGORY	SEAL & SIGNATURE
ARCHITECTURAL This seal governs all Documents and Sections of these Specifications, except for 00 31 00 – Available Project Information and all Sections and Divisions listed below.	
STRUCTURAL This seal governs: Section 03 10 00 – Concrete Forming and Accessories 03 30 00.09 – Cast-in-Place concrete (Short Form) 04 05 19 – Masonry Anchorage and Reinforcing 04 22 00 – Concrete Unit Masonry 05 12 33 – Structural Steel for Buildings 05 21 00 – Steel Joist Framing 05 31 00 – Steel Decking	
MECHANICAL This seal governs: Division 21 to 23	
ELECTRICAL This seal governs: Division 26	
CIVIL This seal governs: Division 32	

END

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DOCUMENT 00 21 13 - INSTRUCTIONS TO BIDDERS

1. COMPLIANCE

.1 In submitting a bid, the bidder agrees to all of the following requirements.

.2 Failure to comply with the requirements of these Instructions to Bidders may cause a bid to be declared non-compliant and such bid may be rejected.

2. BID DOCUMENTS

.1 The following documents form the basis of this bid and shall be considered by bidders:

.1 Instructions to Bidders (Section 00 21 13)
.2 Bid Form (00 41 13) and Supplementary Bid Forms (00 43 22, 00 43 23 and 00 43 36)
.3 Agreement, Definitions and General Conditions (00 52 00)
.4 Supplementary Conditions (00 73 00)
.5 Specifications (as listed in Table of Contents)
.6 Drawings (as per List of Drawings)
.7 Addenda issued during bidding period.

.2 Check bid documents for completeness upon receipt. Inform Consultant immediately should any documents be missing or incomplete.

3. SITE CONDITIONS

.1 The site of the Work is located at 269 Regina Street, Stayner, Ontario.

.2 A soil investigation has been arranged for this site and a report is included hereinafter. Refer to Document 00 31 00.

.3 A designated substances survey has been carried by R. J. Burnside for this site and a report is included hereinafter. Refer to document 00 31 00.

.4 Before submitting a bid, examine the site and existing premises to fully ascertain existing conditions, circumstances and limitations affecting the Work. No allowances will be made for additional costs arising out of failure to investigate existing conditions.

.5 **A MANDATORY pre-bid site visit with Consultants present has been arranged for December 18, 2017, 11:30 a.m. Site visit is mandatory for all bidders. Bids from bidders who have not attended will not be accepted.**

4. PERFORMANCE SECURITY

.1 Each bid shall be accompanied by a bid bond in the amount of 10% of the bid price, payable to the Owner, as evidence of good faith that, if awarded the Contract, the bidder will execute and enter into a formal agreement within the time required and to give the specified security to secure the performance of the terms and conditions of the Contract. Bids not accompanied by the required bid security may be declared informal.

.2 Each bid shall be accompanied by an agreement to bond from a surety company licensed to operate in Ontario, committing to provide the bonds required.

5. CLARIFICATIONS

.1 Neither the Owner nor the Consultant will be responsible for oral instructions.

.2 Report to Consultant all discrepancies, omissions, errors, departures from building by-laws or good practice, and points considered to be ambiguous or of dubious intent, so that the Consultant may, if he

considers it necessary, issue instructions by addendum to all bidders prior to the bid closing date.

.3 Addenda issued during bidding period shall become part of the bid documents and their receipt shall be acknowledged in the space provided on the Bid Form.

.4 Direct questions arising during the bidding period in writing only to:

Lebel & Bouliane
1259 Dundas Street West
Toronto, Ontario M6J 1X6

Attention: Luc Bouliane

E-mail: Luc@ARCH-LB.com

6. SUBSTITUTIONS

.1 Bidders shall note that this is a base bid Specification. Products specified or shown on Drawings by brand name or catalogue number and/or by the name of the manufacturer or supplier shall form the basis of the bid.

.2 Bidders may propose substitutions for products under the following conditions:

.1 Base bid price on products specified and/or shown on Drawings.

.2 List proposed substitutions under "Bidder's Alternatives" in the appropriate space designated for that purpose on the Bid Form Appendix C, showing the product name and stating the difference in price, if any, should the proposed substitution be accepted.

.3 Owner reserves the right to accept or reject any or all of the proposed substitutions.

.3 Consultant will not review substitution requests during bidding period.

7. VALUE ADDED TAX

.1 The Harmonized Sales Tax (HST) shall not be included in Stipulated Bid Price.

8. BIDDER QUALIFICATIONS

.1 Each bid shall be accompanied by completed CCDC 11-2016 Document.

.2 Provide all the information required so as to adequately demonstrate bidder's capacity, skill and experience.

.3 Owner will review and evaluate all the data provided, including the references, to determine whether or not the bidder is qualified to construct this project.

.4 The Owner shall have the exclusive and unfettered right to determine each bidder's suitability and such determination shall be final.

9. BID SUBMISSION

.1 Submit bid on Bid Form (00 41 13) and Supplementary Bid Forms (00 43 22, 00 43 23 and 00 43 36), together with a bid bond and an agreement to bond to:

Jennifer Le Chapelle, CEO Clearview Library
Clearview Township
217 Gideon Street, Stayner, ON LOM 1S0

before **1:00 p.m. local time, January 25, 2018**, in an opaque envelope marked "BID FOR CLEARVIEW LIBRARY, 269 REGINA STREET, STAYNER, ONTARIO", and with bidder's name clearly shown.

.2 Fill in all blank spaces on Bid Form and Appendices in ink, or typewritten, providing the information requested therein and ensure that all forms are signed by an authorized person or persons. Incorporated companies must affix their corporate seal under the signature of their proper officers.

.3 Information provided by bidders on Bid Form and Bid Form Appendices may be amended, if required, provided corrections are initialled by person authorized by bidder.

.4 Bids that are unsigned, improperly signed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations (except as indicated above), or irregularities of any kind at Owner's sole discretion may be regarded as non-compliant and subject to rejection.

.5 Bid price shall be provided in written and numeric form. In case of discrepancy the written form shall govern.

.6 Oral bids, telephone bids or facsimile submissions will not be accepted.

10. LIST OF SUBCONTRACTORS

.1 Provide names of subcontractors listed on Supplementary Bid Form (00 43 36).

.2 Ensure that all firms selected and named have experience in subtrade work described, and where required have submitted their subtrade prices, in strict accordance with bid documents and will execute work with competence and in required time frame.

.3 Do not show "Own Forces" except where intent is to employ Contractor's own qualified on-staff personnel to perform such work. Do not show "Own Estimate" except where proper distribution of tender documents has resulted in no subtrade bid submissions in that particular category.

.4 Do not indicate "TBD" (to be decided) or "TBA" (to be announced) or equivalent notation, and do not indicate multiple choice of subcontractor names for any subtrade category. One subcontractor's name only shall be indicated for each subtrade category.

.5 No names, either of subcontractors or "Own Forces" may be changed after submission of Bid Form Appendix 'A', unless written approval is received from Owner. Such approval will only be considered upon submission of Contractor letter requesting change with full explanation or reason for change and accompanied by letter from named subcontractor agreeing to withdraw with no consequence to Owner.

11. BID OPENING AND ACCEPTANCE

.1 Bids not received by the time stated for their submission will not be considered and will be returned unopened.

.2 Incomplete or conditional bids may be rejected.

.3 Lowest or any bid may not necessarily be accepted.

.4 Bids shall be irrevocable and open to acceptance by Owner for a period of 60 days from date stated for their submission.

.5 The Owner reserves the right to adjust the bid prices submitted, in accordance with information provided by bidders on Bid Form Appendix 'C', not including Bidders Alternatives, for the purpose of and prior to determining the low bidder.

.6 Owner reserves the right, at its sole discretion, to accept or reject any bid without reasons, including without limitation, the lowest priced bid and further reserves the right, at its sole discretion, to accept the bid that it deems the most advantageous, notwithstanding any custom, usage, or agreement in the industry or trade, or any other policy or practice. The successful bidder, if any, will be selected by the Owner based on any number of criteria that it, in its sole discretion, considers relevant, including without limitation (and not listed in order of importance), any combination of: price, product options, schedule, proposed subcontractors, and any other factor that the Owner deems relevant in its absolute discretion. The submission of bids does not obligate the Owner to accept any bid or to proceed further with this tender, or with the Project.

.7 Owner further reserves the right, in its sole discretion, to cancel this tender if the bids submitted exceed its internal budget for the work, or shout it not receive any satisfactory bids, or should it receive an insufficient number of bids, or for any other reasons in its absolute discretion.

.8 If the Owner does not receive any satisfactory bids, it may, at its sole discretion, either: revise the scope of work identified in the bid documents and invite one or more of the bidders to resubmit revised quotations; or enter into negotiations for the whole or any part of the work with any bidder, or with more than one bidder, concurrently. The Owner is not required to offer any revised scope of work or negotiations to any bidder, and shall incur no obligation or liability to any bidder in the exercise of this right.

.9 Each bidder acknowledges and agrees that neither the Owner, the Consutlant, nor their representatives or agents shall have any liability or obligation to any bidder whose bid is not accepted. Without limiting the generality of the foregoing, neither the Owner, the Consutlant, and their representatives or agents, shall be liable to any bidder for any claim, action, cost, loss, damage, or liability whatsoever and howsoever arising from this tender. Each bidder further acknowledges and agrees to bear full and sole responsibility for all costs related to the preparation of its bid and participation in this tender process. The Owner, the Consultant, and their representatives or agents shall not be liable to any bidder in contract, tort, restitution, or any other legal basis for recovery, for any claim , action, loss, damage, costs, or liability whatsoever arising from the preparation and submission of any bid, or any negotiations with the Owner after the submittal of bids, or any act or omission by the Owner, the Consutlant, or their representatives or agents, including the rejection or of any or all bids, or the selection of any bidder for the Project work.

12. BID ANALYSIS

.1 Within three working days of notifications by the Consultant, and prior to award of Contract, the low bidder or bidders shall submit a trade by trade breakdown of the bid price for analysis by Consultant.

.2 Submit additional information promptly if requested by Consultant.

.3 Requests for information shall not be construed as acceptance of a bid.

13. PRELIMINARY CONSTRUCTION SCHEDULE

.1 Within three working days of notification by Consultant the low bidder or bidders, prior to the execution of a Contract, shall submit a preliminary construction schedule.

.2 Schedule may be in bar chart format. Include all major subtrades and show project milestones such as start and completion of major project components.

14. BONDS AND INSURANCE

.1 Within three working days of notification by Owner, the successful bidder shall submit to the Consultant a certified true copy of the required insurance policies, the required performance and labour and material payment bonds and other documentation required, prior to the formal execution of the Contract.

15. MUNICIPAL FREEDOM OF INFORMATION AND PROECTION OF PRIVACTY ACT (MFIPPA)

.1 The bidder acknowledges and agrees the Owner is subject Municipal Freedom of Information and Protection of Privacy Act (MFIPPA). The bidder further expressly acknowledges and agrees that, upon the acceptance of a successful bid and conclusion of the tender process (including execution and delivery of a definite agreement between Owner and the successful bidder), the bid submitted shall not be considered confidential for the purposes of Section 10 of MFIPPA, and in the event of an access request or at the discretion of Owner shall be subject to release in its entirety without redaction.

END

DOCUMENT 00 31 00 - AVAILABLE PROJECT INFORMATION

1. GEOTECHNICAL DATA

.1 A soil investigation has been carried out by Peto MacCallum Ltd. Consulting Engineers, who have issued the following report:

.1 "Geotechnical Investigation, Proposed Library Addition to Stayner Community Centre, Stayner, ON for Township of Clearview" (Jan. 2017).

.2 Report is hereby offered in good faith for general information and guidance. The Consultant assumes no responsibility for completeness and accuracy of report.

.3 Contractor shall not be entitled to extra payment and/or performance time for work which is required and which is reasonably inferable in report as being necessary.

.4 In case of discrepancies between recommendations contained in report and requirements of Contract Documents, the latter shall govern. Advise Consultant in writing of any discrepancies discovered.

2. DESIGNATED SUBSTANCES

.1 Designated substances testing has been carried out by R.J. Burnside & Associates Ltd. who have issued the following report:

.1 Designated Substances Survey, Stayner Community Centre 269 Regina Street, Stayner, ON, Township of Clearview" Ref. No. 30003988.0002; dated October 2017.

.2 Report is hereby offered in good faith for general information and guidance. The Consultant assumes no responsibility for completeness and accuracy of report.

END

DOCUMENT 00 41 13 - BID FORM

CLEARVIEW LIBRARY
STAYNER, ONTARIO

NAME OF BIDDER _____

ADDRESS _____

_____ **TELEPHONE:** _____

E-MAIL: _____

BID PRICE

I / We, the undersigned, having carefully examined the bid documents for this project, having visited and investigated the Site, and examined all conditions, circumstances and limitations affecting the Work, offer to enter into a Contract with the Owner for this Project and to perform the Work required by the bid documents for the stipulated price of:

_____

_____ DOLLARS ($_____)

Bid price is in Canadian funds, not including HST. Price is free of escalation clauses.

ADDENDA

I / We the undersigned have received, examined and incorporated addenda No. _____ to No. _____ inclusive.

BID SECURITY

Attached to this bid is a bid bond issued by _____ in the amount of 10% of the bid price stated hereinbefore. I/We the undersigned agree that if I/we default in executing a Contract or providing the required performance security in accordance with the terms of the bid documents, the Owner shall have sustained liquidated damages in the amount equal to the difference between the amount of this bid and the amount for which the Owner legally contracts with another party to perform the Work, of the latter amount be in excess of the former up to maximum of 10% of my/our bid price and such amount shall become the property of the Owner.

AGREEMENT TO BOND

Attached to this bid is a separate agreement to bond for this Project, issued by _____ _____, undertaking to provide the bonds required by the bid documents.

DECLARATIONS

I / We the undersigned declare that:

(a) I / We agree to reach Substantial Performance within _____ weeks from award of Contract and complete all work of the Contract on within _____weeks from Substantial Performance;

(b) no person, firm or corporation other than the undersigned has any interest in this bid or in the proposed Contract for which this bid is made;

(c) this bid is open to acceptance for a period of 60 days from date stated for its submission.

Date _____

Signature _____

Name and Title _____ Seal

Signature _____

Name and Title _____

Incorporated bidders shall affix their company seal, together with the signature(s) of the authorized signing official(s).

END

CLEARVIEW LIBRARY
STAYNER, ONTARIO

NAME OF BIDDER _____

I / We, the undersigned agree that Owner may use the following unit prices for additional work, and that all unit prices, unless specifically indicated, are all inclusive for complete work, in place, supplied and installed in accordance with applicable contract requirements and that unit prices listed include all overhead and profit mark-up. Equipment rates include operator and float costs; labour rates include labour burden. I / We agree that the credits for deleted work shall be no less than 80% of the prices listed hereunder. I / We, the undersigned agree that the Owner shall have the right to negotiate the cost of additional work instead of using the unit prices listed hereunder. Prices listed hereunder do not include HST.

ITEM OF WORK	EXTRA	UNIT OF MEASURE
1 EXCAVATION & BACKFILLING		
.1 MACHINE EXCAVATION, including removal from site:		
.1 to depth of 2 m	$.....	/ m³
.2 in excess of 2 m	$.....	/ m³
.2 HAND EXCAVATION, including removal from site:		
.1 to depth of 1.2 m	$.....	/ m³
.2 in excess of 1.2 m	$.....	/ m³
.3 TRENCHING, including removal from site:		
.1 to depth of 3 m	$.....	/ m³
.2 in excess of 3 m	$.....	/ m³
.4 GRANULAR BACKFILL (Granular "B") in place compacted:		
.1 by hand	$.....	/ m³
.2 by machine	$.....	/ m³
2 CONCRETE		
.1 Concrete formwork, including stripping:	$.....	/ m²
.2 Concrete, including finishing and curing:		
.1 Footings	$.....	/ m³
.2 Foundation walls, piers and other formed concrete below grade	$.....	/ m³
.3 Concrete slabs on grade	$.....	/ m³
.4 Architecturally exposed concrete	$.....	/ m³
.3 Concrete reinforcing steel, including detailing:	$.....	/ kg
3 MASONRY		
.1 Normal weight units type H/15/A/M, including mortar and core grouting 1 cell per linear m:		

.1 140 mm thick block $...../ m²

.2 190 mm thick block $...../ m²

.3 240 mm thick block $..... / m²

.2 Masonry reinforcing bar reinforcement, including detailing and placement: $...../kg

4 STRUCTURAL STEEL

.1 Welding of existing open web steel joists beyond the amount of reinforcing shown on drawings. Price based on a standard 6 mm fillet or groove field weld x 40 mm long, completed while other welding work is in progress; exclude additional scaffolding, but include cleaning and prime painting of weld.

$...../ each

.2 Structural steel members, including detailing:

.1 Columns, rolled shapes:

.1 Up to 30 kg/m: $...../ kg
.2 Over 30 kg/m up to 60 kg/m: $...../ kg
.3 Over 60 kg/m up to 110 kg/m: $...../ kg
.4 Over 110 kg/m: $...../ kg

.2 Columns, HSS shapes:

.1 Up to 30 kg/m: $...../ kg
.2 Over 30 kg/m: $...../ kg

.3 Beams, channels, angles and rolled shapes:

.1 Up to 30 kg/m: $...../ kg
.2 Over 30 kg/m: $...../ kg

.3 Hourly labour rates, including payroll burden:

.1 Additional engineering of steel connections or repairs: $...../ hr

.2 Additional steel detailing: $...../ hr

.3 Shop labour: $...../ hr

.4 Field erection of steel: $...../ hr

.5 Field welding: $...../ hr

5 STEEL DECK INCLUDING DETAILING

.1 38 mm deep: $...../ kg

.2 76 mm deep: $...../ kg

DATE _____

NAME _____

SIGNATURE _____

CLEARVIEW LIBRARY
STAYNER, ONTARIO

NAME OF BIDDER _____

I/We, the undersigned have inserted below all itemized and alternative prices requested. I/We agree that

.1 all prices submitted take into consideration and allow for changes and adjustments in other work as may be necessary to provide a finished and functional result, unless specifically indicated otherwise,

.2 alternative prices are for changes in the Work as stated in the description of each alternative price,

.3 itemized prices are break-out prices for work which is included in bid price and which are required by Owner for administrative and funding allocation purposes, and there is no intention to delete the work covered by them,

.4 the Owner reserves the right to reject the alternative prices provided by Bidder and instead negotiate any changes that may be required,

.5 and that the Owner reserves the right to accept or reject any of the prices proposed hereunder.

.6 prices listed hereunder do not include HST.

ALTERNATIVE PRICES for work which may be required in lieu of work included in the bid documents:

		Deduct from bid price	**Add to bid price**
.1	Replace W2 and R2 from Emetco 300 Series Metal Siding to Kalzip TM65/400	$_____	$_____
.2	Replace W1 and S1 from Cedar to Cement Panels (See Specification Sections)	$_____	$_____
.3	Replace arena metal cladding from VicWest 150-4 to Emetco 300 Series	$_____	$_____
.4	Replace arena metal cladding from VicWest 150-4 to Kalzip TM65/400	$_____	$_____
.5	In lieu of repairing and reinforcing two joists to support new wall between them (Option 1, included in base bid), design and provide a new 914 mm deep OWSJ in line w ith the wall and reinforce adjacent joists for wall support (Option 2) (Refer to Drawings S102).	$_____	$_____

ALTERNATIVE PRICES for work which may be deleted

		Deduct from bid price
.1	Scope 1BS from window and door replacement on Community Centre indicated on 1/A1.2 as 1Bs	$_____
.2	Scope 10 and 10B on 1/A2.1, including work associated with recessed slab, drain, and floor grille at entry. At 2 locations.	$_____
.3	Scope 4 and 5 on 1/A2.1 for work associated with electric radiant heat.	$_____
.4	Scope 17S on 1/A1.0 and flooring in Vestibule 108 shown on A2.3.	$_____
.5	Scope of T5 mosaic tile wall mural shown on 2/A8.0	$_____
.6	Scope for display unit M112 in Atrium 112	$_____

.7 Scope shown on mechanical requiring all work associated with humidifier and all associated components. $_____

.8 Scope to supply and install Water Filling Station. $_____

.9 Scope for drains shown at 2 entries shown as 10 and 10B on 1/As.1. $_____

ITEMIZED PRICES

Deduct from bid price

.1 Metal cladding for recladding Arena on south and east side – see elevations $_____

.2 Movable Partition: panel folding door on 1/A2.2 and associated work to install the panel door. $_____

BIDDER'S ALTERNATIVES

I/We the undersigned propose the following alternatives:

Product Specified	Proposed Substitution	Deduct from Bid Price
1 _____		$_____
2 _____		$_____
3 _____		$_____
4 _____		$_____
5 _____		$_____
6 _____		$_____

(Add extra pages if necessary)

Date _____

Signature _____

Name and Title _____

END

CLEARVIEW LIBRARY
STAYNER, ONTARIO

NAME OF BIDDER _____

I/We, the undersigned propose that the following Subcontractors and/or suppliers will be used to perform work of this Contract, and I/we confirm that all have been investigated to confirm their reliability and competence to carry out the Work in accordance with the Contract Documents; and I/we agree that no changes from this list may be made without the express written approval of the Owner.

Extra costs to the Contract will not be considered for a Subcontractor/supplier substitution, regardless of the reason, except where a substitution is requested by the Owner.

Item of Work ____ **Subcontractor**_____

Concrete Formwork_____

Polished Concrete Floors_____

Masonry_____

Lightweight Steel Framing_____

Structural Steel_____

Open Web Steel Joists_____

Steel Deck_____

Cabinetwork_____

Wood Cladding_____

Metal Cladding_____

Roofing_____

AluminumWindows/Curtainwall_____

Gypsum Board/Acoustical Ceilings_____

Resilient Flooring/Carpet _____

Painting_____

Mechanical _____

Electrical _____

Landscaping_____

Date _____

Signature _____

Name and Title _____

END

LANDSCAPE UNIT RATES

No.	Item	Unit	Qty	Unit Cost	Item Cost
1.0	**Site Works**				
1.1	Hydroseeding - Lawn	m2	126		
1.2	Hydroseeding - Low Meadow	m2	450		
1.3	Hydroseeding - Tall Meadow	m2	581		
1.4	Sod	m2	14		
1.5	Imported Topsoil (150mm)	m2	1,155		
1.6	Riverstone Splash Strip	m2	108		
				Subtotal Site Works	
2.0	**Walkways**				
2.1	Concrete Paving - Walkways	m2	213		
2.2	Concrete Paving - Picnic Area (Provisional)	m2	102		
2.3	Tactile Walking Surface Indicators	ea.	5		
				Subtotal Walkways	
3.0	**Planting**				
3.1	Deciduous Trees (Provisional)				
	Acer saccharum (50mm cal., W.B., Specimen)	ea.	2		
	Sugar Maple				
	Celtis occidentalis (50mm cal., W.B., Specimen)	ea.	1		
	Hackberry				
	Quercus macrocarpa (50mm cal., W.B., Specimen)	ea.	1		
	Bur Oak				
3.2	Perennials & Ornamental Grasses (Provisional)				
	Calamagrostis acutiflora 'Karl Foerster' (1 gal.)	ea.	76		
	Karl Foerster Feather Reed Grass				
3.3	Mulched Planting Bed (Provisional)	m2	43		
				Subtotal Planting	
4.0	**Site Furnishings**				
4.1	Standard Picnic Table - Surface Mount (Provisional)	ea.	1		
4.2	ADA Picnic Table - Surface Mount (Provisional)	ea.	1		
4.3	Bench (Provisional)	ea.	1		
4.4	Bike Rack (Provisional)	ea.	2		
4.5	Trash Receptacle (Provisional)	ea.	2		
4.6	Flag Pole (Provisional)	ea.	2		
				Subtotal Site Furnishings	
				TOTAL	

LANDSCAPE UNIT RATES

No.	Item	Unit	Qty	Unit Cost	Item Cost
A	**Alernate Pricing**				
A.1	Granular Picnic Area	m2	102		
A.2	Standard Picnic Table - Direct Bury	ea.	1		
A.3	ADA Picnic Table - Direct Bury	ea.	1		

SECTION 00 52 00 - AGREEMENT, DEFINITIONS AND GENERAL CONDITIONS

AGREEMENT

The executed Agreement Between Owner and Contractor of the Standard Construction Documents CCDC 2-2008, except as amended by Supplementary Conditions governs the Work of this Contract.

DEFINITIONS

The Definitions of the Standard Construction Document CCDC 2-2008 as amended by Supplementary Conditions apply to all Contract Documents.

GENERAL CONDITIONS

The General Conditions of the Stipulated Price Contract of the Standard Construction Document CCDC 2-2008, except as amended by Supplementary Conditions, govern the Work of this Contract.

END

SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS

GENERAL

The General Conditions of the Stipulated Price Contract of the Standard Construction Document CCDC 2-2008 are hereby amended as follows:

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

GC 1.1 CONTRACT DOCUMENTS

Add new subparagraph 1.1.7.5:

1.1.7.5 In case of discrepancies, noted materials and annotations shall take precedence over graphic indications in the Contract Documents.

GC 2.2 ROLE OF THE CONSULTANT

Delete paragraph 2.2.4. in its entirety.

Add the word “schedules” after the word “techniques” in paragraph 2.2.6.

Add to the end of the second sentence of paragraph 2.2.6: “or to adhere to the construction schedule.”

Add at the end of paragraph 2.2.9: “The Owner and the Contractor shall waive any claims against the Consultant arising out of the making of such interpretations and findings in accordance with paragraphs 2.2.7., 2.2.8. and 2.2.9”.

Add new sentence to end of paragraph 2.2.11 “The Consultant’s obligation to make findings on a large claim or large number of claims is subject to the terms and conditions of the Owner/Consultant agreement.”

add to paragraph 2.2.13:

> “If in the opinion of the Contractor a Supplemental Instruction involves an adjustment in the Contract Price or Contract Time, Contractor shall within 7 working days of receipt of Supplemental Instruction advise the Consultant in writing accordingly. Failure to provide written notification within time stipulated shall imply acceptance of Supplemental Instruction by Contractor.”

Delete the comma after the word “submittals” and add the words “which are provided” before the words “in accordance” in paragraph 2.2.14.

GC 2.3 REVIEW AND INSPECTION OF THE WORK

add new paragraph 2.3.8:

2.3.8 The Consultant will conduct periodic reviews of the Work in progress, to determine general conformance with the requirements of the Contract Documents. Such reviews, or lack thereof, shall not give rise to any claims by the Contractor in connection with construction safety at the Place of the Work, responsibility for which belongs exclusively to the Contractor.

GC 2.4 DEFECTIVE WORK

Add new subparagraphs 2.4.1.1 and 2.4.1.2:

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

2.4.1.2 The Contractor shall prioritize the correction of any defective work which, in the sole discretion of the Owner, adversely affects the day to day operation of the Owner.

GC 3.1 CONTROL OF THE WORK

Add the word “schedules” after the word “techniques” in paragraph 3.1.2.

Add new paragraph 3.1.3:

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

GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

change paragraph 3.2.2.2 to read:

.2 assume responsibility for compliance with health and safety legislation at the Place of the Work, as it applies to such work.

GC 3.4 DOCUMENT REVIEW

change paragraph 3.4.1 to read:

3.4.1 The Contractor shall review the Contract Documents and shall report promptly to the Consultant any error, inconsistency or omission the Contractor may discover. Such review by the Contractor shall comply with the standard of care described in paragraph 3.14.1 of the Contract. Except for its obligation to make such review and report the result, the Contractor does not assume any responsibility to the Owner or the Consultant for the accuracy of the Contract Documents. The Contractor shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the Contract Documents, which the Contractor could not reasonably have discovered. If the Contractor does discover any error, inconsistency or omission in the Contract Documents, the Contractor shall not proceed with the work affected until the Contractor has received corrected or missing information from the Consultant.

GC 3.5 CONSTRUCTION SCHEDULE

add new paragraph:

.4 Commence Work immediately upon award of Contract and provide sufficient labour for the steady progress of the Work including overtime work, if required to meet the scheduled date of completion.

GC 3.8 LABOUR AND PRODUCTS

add new paragraphs 3.8.4, 3.8.5 and 3.8.6:

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

3.8.5 The foreperson of each trade engaged on the work must be able to speak and understand the English language well enough to comprehend and carry out all instructions issued and to work in complete coordination with other trades.

3.8.6 The hours of work, the working conditions and the rates of wages shall be in accordance with the local conditions and requirements and the Contractor shall not pay less than the minimum wages established by customary standards in the locality of the site for the same or a similar class of work. Information necessary to confirm compliance with these requirements shall be provided by the Contractor to the Owner on request.

GC 3.10 SHOP DRAWINGS

Delete the last sentence in paragraph 3.10.9

Delete the words “so as to cause no delay in the performance of the Work” in paragraph 3.10.12.

add new paragraph 3.10.13:

3.10.13 Reviewed shop drawings shall not authorize changes in Contract Price and/or Contract Time.

Add new General Condition

GC 3.14 PERFORMANCE BY CONTRACTOR

3.14.1 In performing its services and obligations under the Contract, the Contractor shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The Contractor acknowledges and agrees that throughout the Contract, the Contractor’s obligations, duties and responsibilities shall be interpreted in accordance with this standard. The Contractor shall exercise the same standard of due care and diligence in respect of any Products, personnel, or procedures which it may recommend to the Owner.

3.14.2 The Contractor further represents, covenants and warrants to the Owner that:

.1 The personnel it assigns to the Project are appropriately experienced;

.2 It has a sufficient staff of qualified and competent personnel to replace its designated supervisor and project manager, subject to the Owner’s approval, in the event of death, incapacity, removal or resignation.

GC 4.1 CASH ALLOWANCES

Delete paragraph 4.1.4 in its entirety and substitute new paragraph 4.1.4:

4.1.4 Where the actual cost of the Work under any cash allowance exceeds the amount of the allowance, any unexpended amounts from other cash allowances shall be reallocated, at the Consultant’s direction, to cover the shortfall, and, in that case, there shall be no additional amount added to the Contract Price for overhead and profit. Only where the actual cost of the Work under all cash allowances exceeds the total amount of all cash allowances shall the Contractor be compensated for the excess incurred and substantiated, plus an amount for overhead and profit on the excess only, as set out in the Contract Documents.

Delete paragraph 4.1.5 in its entirety and substitute new paragraph 4.1.5:

4.1.5 The net amount of any unexpended cash allowances, after providing for any reallocations as contemplated in paragraph 4.1.4, shall be deducted from the Contract Price by Change Order without any adjustment for the Contractor’s overhead and profit on such amount.

GC 5.2 APPLICATION FOR PROGRESS PAYMENT

paragraph 5.2.2, first line: change "dated the last day" to read "dated as of the last day"

change paragraph 5.2.7 to read:

5.2.7 Claims for Products fabricated but not delivered to the Place of the Work will not be considered. Claims for Products delivered to the Place of the Work but not yet incorporated into the work, provided such Products are Project specific and cannot readily be used elsewhere, may be considered for payment on an individual basis and shall be supported by such evidence as the Consultant may reasonably require, to establish the value and delivery of the Products.

add new paragraphs:

5.2.8 The Contractor shall submit, with each application for payment after the first, a statutory declaration in a form satisfactory to the Owner, verifying that all payments due to Subcontractors, for wages and salaries, for work done and products furnished in connection with the Work to the end of the month immediately preceding that covered by the current application have been made.

5.2.9 The Contractor shall submit with each application a current Certificate of Clearance from the Workplace Safety and Insurance Board.

GC 5.6 PROGRESSIVE RELEASE OF HOLDBACK

paragraph 5.6.1: add to first line, after "where legislation permits":

"and where the Owner has agreed in writing to such separate, partial certification for holdback release for a Subcontractor or supplier,"

add new paragraph 5.7.5:

5.7.5 There shall be no certification of progress payments by the Consultant after Substantial Performance until Final Payment. The Owner reserves the right to contract out uncompleted deficiencies if same have not been completed within a reasonable amount of time, as determined by the Consultant, without prejudice to any other right or remedy and without affecting warranty period.

GC 5.8 WITHHOLDING OF PAYMENT

add new paragraphs 5.8.2 and 5.8.3:

5.8.2 In addition to any rights the Owner has pursuant to the Construction Lien Act, if a lien is registered or an action commenced against the Owner, the Owner shall have the right to withhold from any money otherwise due to the Contractor, the full amount claimed in the lien action plus an additional sum sufficient to satisfy all of the Owner's expenses relating to such lien actions, including legal and consulting costs. These funds held back shall be released to the Contractor upon the full discharge of all liens and dismissal of all actions against the Owner.

GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

add new paragraphs:

6.1.3 If any change in the Work results in either a deletion of a part of the Work or the removal of a part of the Work in circumstances where the Owner determines, in its discretion, that the removed scope should be performed by the Owner's own forces or by a different contractor, the Contractor shall not be entitled to any compensation for loss of profit or other consequential loss as a result of the deletion or removal.

6.1.4 If any change or deviation in, or omission from the Work is made by which the amount of Work to be performed is decreased, or if the whole or a portion of the Work is dispensed with, no compensation is claimable by the Contractor for any loss of anticipated profits in respect thereof.

C 6.2 CHANGE ORDER

add new paragraphs 6.2.3 and 6.2.4:

6.2.3 Allowance for overhead and profit shall be limited to ten percent (10%) for Contractor's work, or where work is subcontracted, for Subcontractor's work. The Contractor shall be entitled to five percent (5%) of a Subcontractor's total cost. Overhead and profit may not be charged on credits to the Contract. Where a change involves both extras and credits, overhead and profit shall apply only to the net extra of the change,

if any.

6.2.4 The costs for the following items shall be considered to be included in the allowance for overhead and profit:

.1 Contractor's head office expenses, including estimating and accounting services.
.2 Wages of project managers, superintendents, assistants, watchpersons and administrative personnel.
.3 Temporary site office including costs for telephone, facsimile machine and internet equipment.
.4 Small tools.
.5 Insurance and bonding premiums.
.6 Construction safety program.
.7 Shop and record drawings and interference drawings.
.8 Clean up and disposal of waste materials.

GC 6.3 CHANGE DIRECTIVE

change paragraph 6.3.4 to read:

6.3.4 The Contractor shall present in a form acceptable to the Consultant an amount of adjustment to the Contract Price, if any, and an adjustment in the Contract Time, if any, for the changes covered by a change directive. The procedures of evaluation including applicable overhead and profit mark-up provisions shall be as described under 6.2 CHANGE ORDER.

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

Add new paragraph 6.4.5:

6.4.5 The Contractor confirms that, prior to bidding the Project, it carefully investigated the Place of the Work and applied to that investigation the degree of care and skill described in paragraph 3.14.1, given the amount of time provided between the issue of the bid documents and the actual closing of bids, the degree of access provided to the Contractor prior to submission of bid, and the sufficiency and completeness of the information provided by the Owner. The Contractor is not entitled to compensation or to an extension of the Contract Time for conditions which could reasonably have been ascertained by the Contractor by such careful investigation undertaken prior to the submission of the bid.

GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

add new paragraph 9.2.10:

9.2.10 For the purposes of this General Condition the term toxic and hazardous substances shall be taken to mean and shall be limited to only designated substances as currently defined by applicable statutory and regulatory requirements.

GC 9.4 CONSTRUCTION SAFETY

add new paragraph 9.4.2:

9.4.2 The Contractor shall assume the role of the "Constructor" as defined by applicable legislation.

GC 10.1 TAXES AND DUTIES

add new paragraph 10.1.3:

10.1.3 The Contractor shall, at the request of the Owner, assist, join in, or at Owner's expense, make application on

behalf of the Owner for any exemption, recovery or refund. Provide the Owner with copies, or where required originals of records, invoices, purchase orders or other documentation as may be necessary to support such application.

GC 10.2 LAWS, NOTICES, PERMITS AND FEES

Change paragraphs 10.2.2 to read:

10.2.2 The Contractor shall apply and the Owner shall pay for the building permit. The Owner shall obtain and pay for development approvals, permanent easements, rights of servitude, and all other necessary approvals and permits, except for the permits and fees referred to in paragraph 10.2.3 or for which the Contract Documents specify as the responsibility of the Contractor. The Contractor shall pay construction damage deposits levied by the municipality in connection with the issuances of the building permit.

Delete from the first line of paragraph 10.2.5 the word, “The” and substitute the words: “Subject to paragraph 3.14.1, the”.

GC 11.1 INSURANCE

add new paragraph 11.1.9:

11.1.9 Insurance shall not be terminated until the Owner has been notified in writing of this intention by the insured and agrees to such termination.

add new paragraph 11.1.10:

11.1.10 The Owner shall provide, maintain and pay for property and boiler and machinery insurance for the existing building as required by G11.1.1.4 and shall promptly provide the Owner with confirmation of coverage and if requested, a certified true copy of the policies, certified by an authorized representative of the insurer, together with copies of any amending endorsement applicable to the Work.

GC 11.2 CONTRACT SECURITY

Add new paragraphs:

11.2.3 If requested by the Owner the Contractor, after receiving written notification form the Owner within 7 calendar days of such notification, and prior to the signing of the Contract, shall provide a performance bond and a labour and materials payment bond, each in the amount of 50% of the Contract price issued by a duly incorporated and nationally recognized surety company approved by the Owner, guaranteeing the faithful performance of the Contract in accordance with the Contract Documents including the requirements for warranties provided for the GC 12.3 WARRANTY, and the payment of all obligations incurred in the event of the Contractor’s default, including, but limited to the following:

.1 The payment of all legal, accounting, architectural, engineering and other consultant’s expenses incurred by the Owner in determining the extent of Work executed an any additional work required as a result of the interruption of the Work, and its completion.

.2 The payment of additional expenses to the Owner in the form of security guard services, light, heat, power, and other relate dc costs, payable over the period between the default of the Contract and commencement of the Work under the terms of this Article.

11.2.4 Without limiting the foregoing in any way, the bonds shall indemnify and hold harmless the Owner for and against any and all costs and expenses (including legal and Consultant services and court costs) arising out of or as a consequence of any default of the Contractor under this Contract.

11.2.5 The form of such bonds shall be in accordance with the latest edition of the CCDC approved bond forms, modified as may be necessary to incorporate the requirements stated herein.

11.2.6 The contractor shall be responsible for notifying the surety company of any changes made to the Contract during the course of construction.

GC 12.1 INDEMNIFICATION

Add “and the Consultant” after the words “hold harmless the other” in paragraph 12.1.1.

GC 12.3 WARRANTY

Delete from the first line of paragraph 12.3.2 the word, “The” and add the words: “Subject to paragraph 3.14.1, the”.

Add to paragraph 12.3.3: “The warranty period shall recommence for corrected work.”

Add new paragraph 12.3.7:

12.3.7 The Contractor shall commence to correct any defect within five working days after receiving a notice from the Owner or the Consultant, and complete the work as expeditiously as possible, except that in case the defect would prevent maintaining security or keep basic systems essential to the ongoing business of the Owner, operational as designed, all necessary corrections and/or installations of temporary replacements shall be carried out immediately as an emergency service. Should the Contractor fail to provide this emergency service within 24 hours of a request made the Owner is authorized, regardless of GC 3.1, to carry out all necessary repairs or replacements at the Contractor’s expense.

END

SECTION 01 19 00 - GENERAL REQUIREMENTS

1.1 GENERAL REQUIREMENTS

.1 Division 1 requirements apply to all Sections of Work.

1.2 SUMMARY OF WORK

.1 Provide all items, articles, materials, services and incidentals, whether or not expressly specified or shown, to make finished work complete and fully operational, consistent with the intent of the Contract Documents.

.2 Provide all work indicated in Contract Documents, regardless whether located within or outside Owner's property lines.

.3 The following work is not included in this Contract:

.1 Point to point internet provider to the building.

.2 Security installation (See E104).

.3 Telecommunication Cable supply and install (See 104).

.4 AV work in Community Hall.

.5 Furniture.

.6 Shelving.

.7 Work identified N.I.C.

1.3 PRODUCTS SUPPLIED BY OWNER

.1 The following products will be supplied only by the Owner for incorporation into work of this Contract:

.1 Products designated accordingly.

.2 Owner will provide manufacturer's installation instructions for each product, if available.

.3 Contractor's duties:

.1 Unload and handle at site. Pay demurrage charges if unloading is delayed.

.2 Promptly inspect delivered products, and give written report to Consultant on condition of all items received.

.3 Store and protect products until required for installation.

.4 Install, connect and finish products as required.

.5 Remove packaging material from site and clean products.

1.4 DIVISION OF WORK

.1 Work specified in the Specification has been divided into technical Sections for the purpose of ready reference. Division of work among Subcontractors and suppliers is solely the Contractor's responsibility and Consultant assumes no responsibility to act as an arbiter to establish subcontract limits between Sections or Divisions of work.

1.5 METRIC PROJECT

.1 This project is based on The International System of Units (SI). Measurements 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 All metric units specified shall be taken to be the minimum acceptable unless otherwise noted.

.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.

.4 Where a material or product cannot be obtained in the metric size specified, request clarification from Consultant.

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

1.6 SAFETY AND SECURITY

.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.

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

.3 Maintain fire protection for work. Store paints and volatile substances in a separate and controlled location and inspect frequently. Inspect temporary wiring, drop cords, extension cables for defective insulation or connections frequently. Remove combustible wastes frequently. Prohibit smoking in areas where volatile and flammable substances are used.

.4 Do not cut, bore or sleeve through any loadbearing member, new or existing without Consultant's written authorization, unless specifically indicated on Drawings.

1.7 USE OF SITE

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

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

.3 Where encroachment beyond property limits is necessary make arrangement with respective property owners.

END

SECTION 01 21 00 - ALLOWANCES

1.1 GENERAL

.1 Comply with GC 4.1 CASH ALLOWANCES.

.2 Cash allowances are designated for additional work and services deemed to be necessary by Owner, from time to time, throughout the execution of the Work. Where a cash allowance refers to an item or category of work already included in Contract Documents, it shall be assumed to cover work or services in addition to that indicated, unless specifically indicated otherwise.

.3 Contractor may be required from time to time to assist in tendering of certain items of work covered by allowance, as directed by Consultant.

1.2 AUTHORIZATION

.1 Expenditures from allowances included in the Contract require authorization in writing from the Consultant.

.2 Work covered by allowances shall be performed for such amounts and by such persons as directed by the Consultant.

1.3 CASH ALLOWANCES

.1 Cash allowances include supply and installation unless specifically indicated otherwise.

.2 Supply only allowances shall include:

.1 Net cost of products
.2 Delivery to site
.3 Applicable taxes and duties (not including HST)

.3 Supply and install allowances shall include:

.1 Net cost of products
.2 Delivery to site
.3 Unloading, storing, handling of products on site
.4 Installation, finishing and commissioning of products
.5 Applicable taxes and duties (not including HST)

.4 Inspection and testing allowances shall include:

.1 Net costs of inspection/testing services
.2 Applicable taxes (not including HST)

.5 Other costs related to work covered by allowances are not covered by the allowance but shall be included separately in Contract.

.6 Include in the Contract a cash allowance in the amount of $45,000.00 (Forty Five Thousand Dollars) to cover the following:

.1 Independent inspection and testing.
.2 Signage.

END

SECTION 01 31 00 - PROJECT COORDINATION

1.1 PRE-CONSTRUCTION MEETING

.1 Immediately prior to construction, upon notification attend at location of Owner's choice, pre--construction meeting, along with authoritative representatives of certain key subcontractors as specifically indicated in the conference notice.

.2 Purpose of meeting is as follows:

.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 Consultant’s inspection requirements.

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

.3 The Consultant shall organize and chair the pre-construction meeting. Consultant shall record minutes of pre-construction meeting and distribute a copy to each participant within ten days of meeting.

1.2 SITE MEETINGS

.1 Prior to the commencement of the Work, the Contractor together with the Consultant shall mutually agree to a sequence for holding bi-weekly site meetings.

.2 Contractor shall chair site meetings. Ensure that persons, whose presence is required, are present and that relative information is available to allow meetings to be conducted efficiently.

.3 Once a month or more often if directed by Consultant include review with Consultant and Owner of construction schedule and application for progress payment, during or immediately following site meeting.

.4 Record minutes of each meeting and promptly distribute copies to be received by all participants not later than seven days after meeting has been held. Distribute minutes of meetings to all Subconsultants, whether in attendance or not.

1.3 SUPERVISION

.1 Employ an experienced and qualified supervisor who shall be in complete charge of the work from commencement to final completion of the Work and who shall be present at the site whenever work is being carried out. A working foreperson will not be acceptable. The supervisor shall not be changed after commencement of work without the Consultant's approval.

.2 Supervise, direct, manage and control the work of all forces carrying out the work, including subcontractors and suppliers. Carry out daily inspections to ensure compliance with the Contract Documents and the maintenance of quality standards. Ensure that the supervisory staff includes personnel competent in supervising all Sections of Work required.

.3 Arrange for sufficient number of qualified assistants to the supervisor as required for the proper and efficient execution of the Work.

1.4 DOCUMENTS ON SITE

.1 Contractor's field office shall at all times contain a complete set of Contract Documents (Drawings and

Specifications) with all addenda, site instructions, change orders, reviewed shop drawings and samples, colour schedule, paint materials schedules, hardware list, progress reports and meeting minutes.

.2 Keep building permit documents in field office for duration of work.

1.5 INTERFERENCE AND COORDINATION DRAWINGS

.1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the spaces provided.

.2 Prepare drawings to indicate coordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.

.3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.

.4 Submit copies of interference drawings to Consultant for review and approval.

1.6 SLEEVING AND INSERT SETTING DRAWINGS

.1 Prepare sleeving drawings for work of Divisions 21 to 28, showing size and location of all penetrations through load bearing elements. Submit sleeving drawings to Consultant for review not less than 15 days prior to construction of affected elements.

.2 Prepare insert setting drawings for work to be cast into concrete and/or mortared into masonry elements. Submit insert setting drawings to Consultant for review not less than 15 days prior to construction of affected elements.

END

SECTION 01 32 00 - PROJECT PROGRESS DOCUMENTATION

1.1 CONSTRUCTION SCHEDULE

.1 Within 21 days of Contract award, submit in format acceptable to Consultant, minimum four copies of Contractor's critical path construction schedule, using suitable computer scheduling software, such as “MS Project” or “Primavera”.

.2 Schedule proposed by the 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 range of weather conditions, as documented by official weather records.

.4 Float belongs to Project.

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

.4 Schedule shall show:

.1 Commencement and completion dates of Contract.

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

.3 Commencement and completion dates of each trade. Major trades shall be further broken down as directed by Consultant; generally follow Specification format.

.4 Order and delivery dates for major or critical equipment.

.5 Critical dates for shop drawing/sample submissions.

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

.5 Submit copy of schedule showing actual progress, to Consultant once a month, concurrently with application for payment. 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.

.6 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.

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

1.2 CASH FLOW CHART

.1 Within 21 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.

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

1.3 PROGRESS RECORD

.1 Maintain on site, permanent written record of progress of work. Record shall be open to inspection by Consultant at all times and copy shall be furnished to Consultant upon request.

.2 This record shall show weather conditions, dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to erection and removal of forms, pouring of concrete, installation of roofing and other critical or major components as well as number of employees of various trades and type and quantity of equipment employed daily, shall be noted.

.3 Display a copy of the construction schedule in the site office from start of construction to completion. Superimpose actual progress of work on schedule at least once each week.

1.4 AS-BUILT DRAWINGS

.1 Obtain and keep on site at all times a complete and separate set of black line white prints.

.2 Note clearly, neatly, accurately and promptly as the work progresses location of services, piping, conduits, ductwork embedded in concrete/masonry, concealed in ceilings, walls and furring and underground services below building and outside of building, where such services are not in locations shown on drawings.

.3 Accurate location, depth, position, size and type of concealed and underground services, both inside and outside shall be included as part of these as-built drawings.

.4 As-built drawings shall be available for review at each site meeting.

.5 Refer to Section 01770 for requirements on submission of as-built drawings.

1.5 PRODUCT DELIVERY CONTROL

.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.

.2 Provide equipment delivery schedule, coordinated with construction and submittals' schedule, showing delivery dates for major and/or critical equipment.

.3 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.

1.6 PRODUCT DELIVERY CONTROL

.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.

.2 Provide equipment delivery schedule, coordinated with construction and submittals' schedule, showing delivery dates for major and/or critical equipment.

.3 The Contractor shall contact the Consultant immediately upon receipt of information indicating that any material, 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 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.

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

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

END

SECTION 01 33 00 - SUBMITTALS

1. GENERAL

.1 Unless specified or directed otherwise, make all submissions to the Consultant at the Consultant's office.

.2 Make all submissions required by the Contract Documents with reasonable promptness and in orderly sequence so as to cause no delay in the work.

2. RELATED REQUIREMENTS

.1 Make the following submissions in accordance with requirements specified elsewhere:

.1	Applications for payment:	General Conditions
.2	Insurance certificates:	General Conditions
.3	Bonds:	General Conditions
.4	Construction schedule:	Section 01 32 00
.5	Cash flow chart:	Section 01 32 00
.6	Progress photographs:	Section 01 32 00
.7	Equipment delivery schedule:	Section 01 32 00
.8	Purchase order documentation:	Section 01 32 00
.9	Waste audit and reduction plans:	Section 01 41 00
.10	Maintenance and operations data:	Section 01 77 00
.11	Record drawings:	Section 01 77 00
.12	Maintenance materials:	Section 01 77 00

3. SCHEDULE OF VALUES

.1 Submit schedule of values in accordance with requirements of CCDC 5B PART 5.

.2 Follow specifications table of contents as basis for degree of breakdown required. Show breakdown for different construction phases/stages if required by Consultant.

.3 Break down cost for large items of work as directed by Consultant.

.4 Provide additional cost breakdown information if requested by Consultant.

4. SCHEDULE OF SUBMITTALS

.1 Within 15 days of submission of construction schedule submit a schedule of submittals for shop drawings, samples, lists of materials and other documentation requiring Consultant's review.

.2 For each item requiring submission and review show anticipated date of submission and critical date for return of reviewed submission.

.3 Design sequence of submissions to reflect requirements of construction schedule.

.4 Allow up to 15 days for Consultant's review for each submission. Stagger submissions as much as possible to permit adequate review time for each item submitted. If several submissions are made at the same time or within a short time of each other, indicate order of priority in which submissions should be reviewed.

.5 Include sufficient time to permit corrections and resubmission, if necessary, without affecting construction schedule.

5. PRODUCT DATA

.1 Submit product data sheets, required by Contract Documents, and others as may be reasonably required by Consultant.

.2 Submit product data sheets in digital or printed hardcopy form and in accordance with the following requirements:

.1 Show detailed comprehensive information on products to be used.

.2 Clearly identify product/model number on data sheets containing multiple products.

.3 Supplement manufacturer's/distributor's standard schematics, diagrams, brochures, data sheets, catalogue sheets, charts and other descriptive data as required to give a clear understanding of the properties of the product and how product is to be incorporated into project.

6. SHOP DRAWINGS

.1 Submit shop drawings required by Contract Documents, in accordance with requirements of GC 3.10SHOP DRAWINGS.

.2 Prepare shop drawings in metric measurements only. Shop drawings containing imperial measurements will be rejected.

.3 Unless otherwise directed by the Consultant, submit a digital file or the following number of prints for each shop drawing required:

.1 Architectural shop drawings: 2 prints
.2 Structural, mechanical, electrical shop drawings: 3 prints

.4 After review Consultant shall return an annotated digital file or a marked-up print to the Construction Manager. Construction Manager shall obtain and distribute the necessary number of copies for each shop drawing.

.5 Provide shop drawings bearing seal and signature of professional engineer licensed to practise in Ontario where required. Shop drawings submitted without required seal and signature will be rejected and returned to Construction Manager without review.

.6 Shop drawings which require the approval of a legally constituted authority having jurisdiction shall be submitted by Construction Manager to such authority for approval. Such shop drawings shall receive final approval of authority having jurisdiction before Consultant's final review.

.7 No work requiring a shop drawing submission shall be commenced until the submission has received Consultant's final review. Do not use any shop drawing, erection drawing or setting drawing which does not bear the stamp and signature of the Consultant.

.8 The Consultant's review is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Consultant approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Construction Manager submitting same, and this review shall not relieve the Construction Manager of his responsibility for meeting the requirements of the Contract Documents. The Construction Manager is responsible for dimensions to be confirmed and correlated at the job 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.

7. SAMPLES

.1 Submit samples required by Contract Documents and as directed by the Consultant.

.2 Unless indicated otherwise submit samples in duplicate.

.3 Where colour selection is required submit manufacturer's full colour range for specified product line.

.4 Submit samples with identifying labels bearing material or component description, manufacturer's name and brand name, Construction Manager's name, project name, location in which material or component is to be used, and date.

.5 Prepay any shipping charges involved for delivering samples to destination point and returning to point of origin if required.

.6 No work requiring a sample submission shall be commenced until the submission has received Consultant's final review.

END

1.1 OPERATIONAL LIMITATIONS

.1 Contractor's access to and use of site is limited to assigned work, staging and storage areas and so as to permit continued use of existing facilities with the least amount of inconvenience and disturbance possible.

.2 At all times restrict access, parking, material deliveries, execution of work, operations and procedures to agreed locations and times and do not deviate from agreed procedures without prior approval by Owner.

.3 Maintain continuous and safe access to existing building exits and entrances.

.4 Periodically review proposed construction operations with the Owner and Consultant and co-operate as required to ensure that the Owner's interests and requirements are not unduly compromised.

.5 Do not execute work adjacent and/or above occupied areas except where it can be demonstrated that adequate protective devices are in place.

.6 Take special care when operating delivery and construction vehicles near and on Owner’s property; reduce speed when driving on or near Owner’s property. Provide flagperson at points where construction traffic crosses public access routes.

.7 Prevent disruption of existing life safety systems in unassigned areas including fire detection and alarm systems, fire protection systems, exits, emergency lighting. Comply with “Guidelines for Maintaining Fire Safety During Construction in Existing Buildings” issued by the Office of the Fire Marshal, dated January 2003. Coordinate with Owner and municipal fire department ot maintain fire safety within existing facility.

.8 Erect dustproof, minimum 1 hour fire rated partitions in interior locations, to separate work areas unassigned areas, as follows:

.1 Steel framed gypsum board partitions as specified in Section 09 21 16.

.2 Sound insulation at all locations.

.3 Minimum 0.1 mm thick polyethylene dust barrier at “construction” side, between studs and gypsum board, taped at joints and terminations.

.9 Provide temporary fencing around Contractor’s assigned work, storage and staging area in accordance with requirements specified in Section 01 50 00. Maintain temporary fence throughout construction period. Modify construction fence as required to suit exit arrangements from existing building. Upon completion of the work or when directed by Consultant dismantle and remove temporary fence.

.10 Work within unassigned building, areas may only be carried out at times and in manner approved by Owner. Give Owner minimum 72 hours’ notice and obtain approval prior to proceeding.

.1 Workers are not permitted inside unassigned building areas except by prior arrangement with the approval of the Owner.

.2 Where work is permitted to be carried out within unassigned spaces take the following action upon completion of each authorized work period:

.1 Restore disturbed surfaces by patching, covering, painting, finishing as directed by Consutlant.

.2 Remove construction materials, equipment and tools.

1.2 SCHEDULING AND PHASING

.1 Comply with the following scheduling and phasing requirements:

.1 Anticipated start of work on site: March 1, 2018.

.2 Substantial Performance: on or before July 1, 2019.

1.3 ALTERATIONS, MATERIALS AND WORKMANSHIP

.1 Cut, alter, relocate, modify existing work as required to accommodate new work.

.2 Materials used in patching, making good and refinishing of existing construction and/or components shall be of a standard equal to that specified for new construction and if not specified, equal to or exceeding that of original existing work.

.3 Quality of workmanship employed in alterations work shall be equal to that specified for new work if not specified, equal to or exceeding original existing work.

.4 Existing materials and equipment which are to be used in new work shall be repaired and refinished as necessary or additional new materials and components required shall be provided to facilitate reinstallation of such existing materials and equipment.

.5 As part of the work of this Section, remove and relocate, or temporarily remove and reinstall, existing materials and equipment as required to complete work of the Contract.

.6 Make good by restoring to original condition, existing construction, equipment, materials, finishes, features, not scheduled for alterations but damaged or disturbed due to work of this Contract.

.7 Prepare existing surfaces scheduled to receive new finish by grinding, filling, overcoating, washing, etching, shot blasting or other chemical or mechanical means, as required to ensure satisfactory installation of new finish.

.8 Unless otherwise detailed finish new surfaces flush with existing surfaces. Make junctions between existing and new work, or at replaced or remedial work visually undetectable. Make surfaces adjacent to one another of the same material, unit sizes, colour, and texture. If this is impossible, make a proposal of intended method of making good for approval, before proceeding.

.9 Where existing work, penetrating floors and/or roofs, has been removed, patch floors and/or ceilings to match existing construction.

1.4 CUTTING NEW OPENINGS

.1 Prior to cutting any new openings into/through existing reinforced concrete elements, conduct radar survey, or other type of non-destructive survey, of areas to be cut, to locate presence of reinforcing steel, conduits and other embedded items. Make adjustment in locations to be cut, to avoid embedded items. Surveys employing X-ray technique may only be carried out when affected areas are unoccupied.

.2 Provide minimum 48 hours' notice prior to scanning.

1.5 EXISTING SERVICES

.1 Ensure that existing active services (including but not limited to hot and cold water, drainage, power, heating, ventilation, cooling, life safety and security systems) required for unassigned areas are not damaged or interrupted.

.2 Should existing services be accidentally disrupted, make complete restoration immediately and ensure adequate protection to avoid future disruption.

.3 Schedule required disruptions of services to unassigned areas as directed by Owner. Notify the Owner minimum 48 hours prior to executing any work which would disrupt services to occupied areas and obtain permission to proceed. Restore systems to their proper operating condition at the

end of each interruption.

1.6 DESIGNATED SUBSTANCES

.1 Designated substances (as defined by Bill 208 of the Occupational Health and Safety Act), except those disclosed by Owner prior to Bid Submission are not known to exist in assigned work areas. Refer to Document 00 31 00 – Existing Conditions. Owner will arrange and separately pay for removal of asbestos containing materials in Contractor's work areas, prior to start of work by Contractor.

.2 If, in the execution of the Work, any designated substances or PCB containing materials other than those previously identified, are encountered, cease work in area affected and inform Consultant immediately. Do not proceed with work in areas affected until receiving instructions from Consultant.

1.7 PROTECTION

.1 Keep area of work safe and secure at all times, denying access to unauthorized personnel.

.2 Protect existing work from damage. Make good any damage caused.

.3 Ensure that no part of the existing structure is overloaded due to work executed under this Contract.

.4 Take special measures when moving heavy loads or equipment. Protect floors, jambs and soffits of openings used as passageways or through which materials are moved. Use rubber tired conveyances only when moving materials and equipment inside building. Provide suitable coverings as required to protect existing work.

.5 Provide adequate guards, barricades and other temporary protection to prevent injury to persons.

.6 Protect building interiors from damage by weather, when executing work which affects integrity of exterior walls and roofs. Schedule activities during dry periods and/or provide temporary weatherproof closures to protect openings made in exterior walls and roof. At no cost to the Owner, replace interior finishes damaged by weather as a result of the Work of this Contract.

.7 Provide temporary fire resistant closures at existing building openings exposed to construction areas.

.8 Prevent spread of dust and noxious fumes, odours to unassigned areas. Comply with Owner's requirements governing noise and dust control.

1.8 TEMPORARY ACCESS

.1 Provide temporary granular access road to and around building to maintain equipment access to construction areas at all times. Upon completion of work, when no longer required, remove temporary access road.

.2 Provide minimum 400 mm thick, 50 mm crushed limestone working mat as required to permit work being carried out under all site and weather conditions. Remove working mat when no longer required.

.3 Place filter fabric below access road and working mat.

1.9 TEMPORARY USE OF EXISTING FACILITIES

.1 Existing facilities such as water and electrical power may be utilized by Contractor for temporary use; make arrangement with the Owner and follow Owner's directions with regard to such use.

.2 Provide power cords, hoses and other devices as required to convey power/water from points where it is available to points where it is required.

1.10 EXISTING CONDITIONS

.1 Prior to start of work on site carry out a photographic precondition survey of existing buildings, structures, surfaces, finishes, features in all areas affected by this project.

.2 Provide a copy of survey to Owner and Consultant.

.3 Contractor shall be responsible for and make good any damage caused to existing buildings, structures, surfaces, finishes, features except that which is clearly documented to have existed prior to start of work.

END

Ministry of Public Safety and Security

Office of the
Fire Marshal

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North York ON M2M 4J1
Telephone: (416) 325-3100
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Ministère de la Sûreté et de la Sécurité publique

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Ontario

GUIDELINES FOR MAINTAINING FIRE SAFETY DURING CONSTRUCTION IN EXISTING BUILDINGS

The following typical conditions usually arise during construction and could present serious unsafe conditions in case of a fire emergency.

1. Closing of Exits

All exits, including stairways and exterior doors to the outside, serving the existing building must be maintained. Where an exit is blocked off or deleted due to construction activities, an acceptable alternative exit must be provided. Where it is absolutely necessary for access to be gained through the construction area to an exit, the access must be clearly defined and protected so that it is separated from the construction area by a reasonable smoke tight fire separation equivalent to ¾ hour fire-resistance rating.

2. Intersecting Corridors – Existing Corridors on Occupied Floor Areas Exposed to New Corridors Under Construction

Temporary fire separations of steel studs and gypsum board construction equivalent to ¾-hour fire-resistance rating must be erected. Where access is desired, the opening must be protected by a door of solid core wood or hollow steel construction equipped with self-closing and latching hardware. Should such temporary fire separations cut off or eliminate required access to exits, alternative access must be provided.

3. Fire Department Access

The location of a building addition and the construction activities must not obstruct the access roadways designated for fire department equipment. If it is necessary that existing access be obstructed or deleted, alternative access, acceptable to the fire department, must be pre-planned and provided prior to commencement of construction. Sentence 3.2.5.2. (6) of the Ontario Building Code provides the design criteria for required access routes.

4. Control of Combustible Materials

The stockpiling of construction materials adjacent to the existing building must be carefully controlled. Article 2.4.2.1. of the Fire Code prohibits such storage where the materials create a fire hazard to the existing building or its occupants. Materials stored and equipment used in portion of the building under construction could create a fire hazard; for instance, the storage of excessive amounts of foam plastic insulation or the placement of open flame portable heating appliances. The control of combustibles on a construction site is also regulated under the *Occupational Health and Safety Act*.

5. Exposure of Construction in Progress to Existing Occupied Areas

Existing exterior walls with windows of plain glazing when exposed to construction in progress must be protected by ⅝" gypsum board on suitable framing for the duration of the construction. Other openings in the existing exterior walls such as doors, louvers, etc. must be similarly protected or replaced with doors of solid core wood or hollow steel construction.

6. Openings Created Through Floors or Other Fire Separations

Openings in existing floor assemblies and vertical fire separations necessitated by installation of equipment systems or construction in general must be temporarily sealed with fire barrier materials such as mineral wool or other noncombustible insulation.

7. Modification and Extension to Existing Fire Alarm Systems

Maintaining the fire alarm system in operating condition during the construction of the addition will require careful planning especially when the extension to the fire alarm system is carried out in phases.

A technical representative from the fire alarm manufacturer should be assigned to the project to coordinate the different stages of the extension. Whenever a changeover time occurs, which is an outage time of a least a portion of the fire alarm system, the municipal fire department must be notified of the temporary shutdown and alternative measure must be devised.

8. Shutdown of Fire Protection Systems

Where temporary shutdown of sprinkler systems, standpipe systems or other fire protection systems is necessary due to alterations, repairs or extensions, the appropriate requirements in the Fire Code must be observed. See Article 1.1.1.2., Clause 2.8.2.1.(1)(g), Subsections 6.4.1 and 6.5.2.

9. Fire Safety Plan

Depending on the nature of the construction, it may become necessary to modify the fire emergency procedures required under the Fire Safety Plan, subsection 2,8.2 of the Fire Code. Such changes may be of a temporary nature to accommodate revised exits, modifications to the fire alarm system operation, etc. in which case, the procedures must be returned to the original format at the completion of the project. In some cases, permanent revisions to the emergency procedures are required when the construction is completed.

Materials and closures in the temporary fire separations mentioned in the able are suggested examples only. Other materials acceptable to this Office may, of course, be sued. Should there be questions arising from any of the able situations, this Office sir to be informed and consulted to ensure that minimum life safety will be maintained. We would like to point out that partial occupancy of a building is regulated under Subsection 2.4.3. of the Building Code and comes under the authority of the Municipal Building Department.

January 2003

SECTION 01 41 00 - REGULATORY REQUIREMENTS

1.1 PERMITS, LICENCES, FEES

.1 Comply with requirements of GC 10.2.

.2 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.

.3 Review building permit set with Consultant immediately following receipt of building permit and jointly determine whether or not changes to Contract are required.

.4 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.

.5 Report to the Consultant in writing any condition which would prohibit granting of any permit or approval before work affecting such items is commenced.

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

1.2 BUILDING CODE, BY-LAWS, REGULATIONS

.1 Carry out work in accordance with requirements of the Ontario Building Code, latest issue, including all amendments and revisions.

.2 Comply with requirements, regulations and ordinances of other jurisdictional authorities.

.3 Where it is necessary to carry out work outside property lines, such as sidewalks, paving or concrete curbs, comply with applicable municipal and/or regional requirements.

.4 Promptly submit written notice to Consultant, of observed variance of Contract Documents from requirements of Building Code and authorities having jurisdiction. Assume responsibility for work known to be contrary to such requirements and performed without notifying Consultant.

1.3 CONSTRUCTION SAFETY

.1 Comply with requirements of GC 3.6.

.2 Be governed by pertinent safety requirements of Federal or Provincial Governments and of municipal bodies having authority, particularly the Ontario Construction Safety Act, and regulations of Ontario Ministry of Labour, and work in conjunction with proper safety associations operating under the authority of Workplace Safety and Insurance Act.

.3 Do not, in the performance of the work, in any manner endanger the safety or unlawfully interfere with the convenience of the public.

.4 Notify the Ontario Ministry of Labour of intended work of this Contract as required by the Occupational Health and Safety Act. One copy of the "Notice of Project" shall be handed to Consultant.

1.4 FIRE PROTECTION

.1 Refer to technical Sections of Specifications and Drawings for fire protection requirements.

.2 Test methods used to determine fire hazard classification and fire endurance rating shall be as required by Ontario Building Code.

.3 Upon request, furnish to Consultant with evidence of compliance with project fire protection requirements.

.4 Materials and components used to construct fire rated assemblies and materials requiring fire hazard classification shall be listed and labelled, or otherwise approved, by fire rating authority. Labelled materials and their packaging shall bear fire rating authorities label showing product classification.

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

.6 Materials having a fire hazard classification shall be applied or installed in accordance with fire rating authority`s printed instructions.

.7 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.

.8 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.

.9 Fill and patch voids and gaps around openings and penetrations in and at perimeter of assemblies so as to maintain continuity and to produce a fire resistant smoke tight seal, acceptable to jurisdictional authorities and Consultant.

1.5 HAZARDOUS MATERIALS

.1 Comply with provisions of the Occupational Health and Safety Act as amended to include WHMIS (Workplace Hazardous Materials Information System).

.2 Ensure that Material Safety Data Sheets (MSDS) are available on site prior to first delivery to site of any controlled material or substance.

.3 Maintain on site for duration of Contract a hazardous materials log containing all required MSDS.

.4 Log shall be open for inspection for Owner, Consultant and all personnel on site.

.5 Ensure that workers are instructed in the purpose and content of MSDS.

1.6 WASTE MANAGEMENT

.1 Comply with applicable regulations of federal, provincial and municipal authorities governing waste management.

.2 Prepare and submit waste audit and waste reduction plan in accordance with applicable requirements of regulatory agencies.

.3 Prepare and submit source separation plan in accordance with applicable requirements of regulatory agencies.

END

SECTION 01 42 13 - ABBREVIATIONS AND ACRONYMS

1.1 ABBREVIATIONS AND ACRONYMS

.1 The abbreviations/acronyms listed below, when used in the Contract Documents, shall have the meanings shown.

.2 See Drawing Abbreviations and Room Finish Schedule for additional abbreviations/acronyms.

ABBREVIATION/ ACRONYM	MEANING
AA	ALUMINUM ASSOCIATION
AAMA	ARCHITECTURAL ALUMINUM MANUFACTURERS` ASSOCIATION
AASHO	AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS
ACI	AMERICAN CONCRETE INSTITUTE
AGA	AMERICAN GAS ASSOCIATION
AIA	AMERICAN INSTITUTE OF ARCHITECTS
AIMA	ACOUSTICAL & INSULATING MATERIALS ASSOCIATION
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
AMCA	AIR MOVING AND CONDITIONING ASSOCIATION INC.
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIRCONDITIONING ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWI	ARCHITECTURAL WOODWORK INSTITUTE (USA)
AWMAC	ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA
AWS	AMERICAN WELDING SOCIETY
CCA	CANADIAN CONSTRUCTION ASSOCIATION
CCRC	CANADIAN CODE FOR RESIDENTIAL CONSTRUCTION
CEC	CANADIAN ELECTRICAL CODE
CFUA	CANADIAN FIRE UNDERWRITERS ASSOCIATION
CGA	CANADIAN GAS ASSOCIATION
CGSB	CANADIAN GENERAL STANDARDS BOARD
CIQS	CANADIAN INSTITUTE OF QUANTITY SURVEYORS
CISC	CANADIAN INSTITUTE OF STEEL CONSTRUCTION
CITC	CANADIAN INSTITUTE OF TIMBER CONSTRUCTION
CLA	CANADIAN LUMBERMEN`S ASSOCIATION
CMHC	CANADA MORTGAGE & HOUSING CORPORATION
COFI	COUNCIL OF FOREST INDUSTRIES OF BRITISH COLUMBIA
CPCI	CANADIAN PRESTRESSED CONCRETE INSTITUTE
CRCA	CANADIAN ROOFING CONTRACTORS ASSOCIATION
CSA	CANADIAN STANDARDS ASSOCIATION
CSC	CONSTRUCTION SPECIFICATIONS CANADA
CSI	CONSTRUCTION SPECIFICATIONS INSTITUTE (USA)
CSPI	CORRUGATED STEEL PIPE INSTITUTE
CSSBI	CANADIAN SHEET STEEL BUILDING INSTITUTE
CUA	CANADIAN UNDERWRITERS` ASSOCIATION
CWB	CANADIAN WELDING BUREAU
CWC	CANADIAN WOOD COUNCIL
DND	DEPARTMENT OF NATIONAL DEFENCE, CANADA
FM	FACTORY MUTUAL ENGINEERING CORPORATION
FS	FEDERAL SPECIFICATION (USA)
IES	ILLUMINATING ENGINEERING SOCIETY
IGMAC	INSULATED GLASS MANUFACTURERS ASSOCIATION OF CANADA
LTIC	LAMINATED TIMBER INSTITUTE OF CANADA
MIA	MARBLE INSTITUTE OF AMERICA
MPI	MASTER PAINTERS INSTITUTE
MPMDD	MODIFIED PROCTOR MAXIMUM DRY DENSITY
NAAMM	NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (USA)
NBFU	NATIONAL BOARD OF FIRE UNDERWRITERS
NBC	NATIONAL BUILDING CODE OF CANADA

ABBREVIATION/ ACRONYM	MEANING
NBS	NATIONAL BUREAU OF STANDARDS (USDC)
NEMA	NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NHLA	NATIONAL HARDWOOD LUMBER ASSOCIATION (USA)
NLGA	NATIONAL LUMBER GRADES AUTHORITY
NRC	NATIONAL RESEARCH COUNCIL
OBC	ONTARIO BUILDING CODE
OHSA	OCCUPATIONAL HEALTH AND SAFETY ACT
OPSS	ONTARIO PROVINCIAL STANDARD SPECIFICATIONS
PCA	PORTLAND CEMENT ASSOCIATION
PCI	PRESTRESSED CONCRETE INSTITUTE
RAIC	ROYAL ARCHITECTURAL INSTITUTE OF CANADA
SDI	STEEL DECK INSTITUTE
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SPMDD	STANDARD PROCTOR MAXIMUM DRY DENSITY
SSPC	STEEL STRUCTURES PAINTING COUNCIL
TTMAC	TERRAZZO, TILE & MARBLE ASSOCIATION OF CANADA
ULC	UNDERWRITERS' LABORATORIES OF CANADA
ULI	UNDERWRITERS' LABORATORIES, INC. (USA)
USAS	UNITED STATES OF AMERICA STANDARDS INSTITUTE
WSIB	WORKPLACE SAFETY AND INSURANCE BOARD

END

1.1 INDEPENDENT INSPECTION AND TESTING

.1 Requirements specified herein apply to independent inspection and testing specified under technical Specification Sections, Divisions 2 to 33. Owner will pay separately for independent inspection and testing services.

.2 Requirements specified herein do not apply to the following:

.1 Inspection and testing required by laws, ordinances, rules, regulations and orders of public authorities.

.2 Testing, adjustment and balancing of mechanical and electrical systems and equipment.

.3 Inspection and testing performed exclusively for Contractor`s convenience.

.4 Tests specified in Division 2 to 33 inclusive, to be included in Contract such as mill tests, certificates of compliance and testing to be carried out by Contractor under direction of Consultant.

.3 Failure by independent inspection and testing agency to detect defective work or materials shall not in any way prevent later rejection, when such defect is discovered, nor shall it obligate Consultant for final acceptance.

.4 Independent inspection and testing agency (hereinafter referred to as testing agency) is expected to do the following:

.1 Act on a professional and unprejudiced basis and carry out inspection and testing functions to establish compliance with requirements of Contract Documents.

.2 Check work as it progresses and prepare reports stating results of tests and conditions of work and state in each report whether specimens tested conform to requirements of Contract Documents, specifically noting deviations.

.3 Distribute reports in digital form to the following:

.1 Owner

.2 Consultant

.3 Subconsultants affected

.4 Contractor

.5 Building Department (if so directed)

.5 Testing agency is not authorized to amend or release any requirements of Contract Documents, nor to approve or accept any portion of work.

.6 Contractor shall do the following:

.1 Notify testing agency minimum 48 hours in advance of operations to allow for assignment of personnel and scheduling of tests without causing delay in work.

.2 Provide testing agency with access to work at all times.

.3 Supply material samples for testing.

.4 Supply casual labour and other incidental services required by testing agency.

.5 Provide facilities for site storage of samples.

.6 Make good work disturbed by testing agency.

.7 When initial inspection and testing indicates non-compliance with Contract Documents, any

subsequent reinspection and retesting occasioned by non-compliance shall be performed by same testing agency and cost thereof borne by Contractor.

1.2 MOCK UPS

.1 Where required by Contract Documents construct mock-ups of work on site, in size and at location directed by Consultant.

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

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

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

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

.6 In addition to any mock-ups required by the Contract Documents, arrange for Consultant's site review and approval of the initial portion of the following work categories at locations and to extent directed by Consultant:

.1 Framing

.2 Air barrier

.3 Vapour retarder

.4 Thermal insulation

.5 Wood cladding

.6 Metal cladding

.7 Roofing and metal flashings

.8 Gypsum board

.9 Finish carpentry

.10 Cementitious wood acoustic panels

.11 Floor finishes

.12 Electric lighting.

1.3 TOLERANCES

.1 Unless specific tolerances are required by a Section of the Specifications or a referenced standard, meet the following non-cumulative tolerances for installed work:

.1 "plumb" shall mean within ±3 mm in 3 m of true plumb.

.2 "level" shall mean within ±3 mm in 3 m of true level

.3 "square" shall mean within ±30 seconds of true 90°.

.4 "straight" shall mean within ±3 mm in 3 m under a 3 m straightedge.

1.4 BUILDING ENVELOPE

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

.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.

.3 Provide control joints in exterior building components of design and spacing which will permit expansion and contraction of components without causing distortion, failure of joint seals, undue stress, cracking, bowing or other defects detrimental to appearance and performance. Review design and location of control joints with Consultant prior to start of work and follow directions given by Consultant.

.4 Anchor exterior cladding components to structure in manner suitable to accommodate structural deflection and creep. Design anchorage to withstand expected wind loads, positive and negative, in accordance with applicable regulations.

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

.6 Ensure that air spaces on the outside of vertical air barrier/vapour retarder (walls) are constructed with adequate drainage provisions to the exterior.

.7 Where different wall and roof systems meet, provide photographic record of junctions prior to covering up with subsequent work, except where Constant has reviewed and accepted conditions.

1.5 DRAINAGE

.1 Lay out and construct work to ensure that positive drainage is provided to roof drains, floor drains, site drains and catch basins, as set in their final position, preventing undrained areas and ponding.

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

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

END

SECTION 01 50 00 - TEMPORARY FACILITIES

1.1 GENERAL

.1 Provide all temporary facilities and controls required for the proper execution of the work.

.2 Provide and maintain temporary systems in accordance with applicable regulations and requirements. Arrange for, obtain and pay for any permits required.

.3 Upon completion of the Work or when no longer required remove temporary facilities from site.

1.2 TEMPORARY ELECTRICITY AND LIGHTING

.1 Provide temporary electrical lighting and power system for use by all Sections.

.2 Arrange, obtain and pay for service, including meter, of sufficient size to allow use of required tools and equipment and to ensure adequate lighting levels for the proper execution of work.

.3 Install and maintain temporary electrical systems in accordance the Ontario Electrical Code and regulations of other authorities having jurisdiction.

1.3 TEMPORARY HEATING

.1 Furnish equipment, labour and fuel to provide temporary heat as required for proper execution of work.

.2 Heat enclosed building to minimum 15^{o}C at all times until taken over by Owner. Provide intermittent heating up to 21^{o}C as required for proper execution of work.

.3 Use propane or natural gas heaters of a type where the flame is not exposed. Open flame heaters are not permitted.

.4 Uniformly distribute heat to avoid hot and cold areas and to prevent excessive drying.

1.4 TEMPORARY VENTILATION

.1 Provide minimum 1 air change per hour for enclosed areas receiving architectural finishes.

.2 Prior to commencement of work where hazardous or volatile adhesives, coatings or substances are used, install adequate mechanical ventilation.

.3 Do not allow excessive build-up of moisture inside building.

1.5 TEMPORARY COMMUNICATIONS

.1 Provide site telephone service for duration of contract until completion.

.2 Make provisions on site to send and receive emails at site office until Substantial Performance.

1.6 TEMPORARY WATER

.1 Provide temporary water supply, for use by all Sections.

.2 Water shall be clean and non-staining.

1.7 TEMPORARY SANITARY FACILITIES

.1 Provide temporary male and female toilet facilities, including handwash facilities, for all personnel and visitors on site.

.2 Keep facilities clean and sanitary and provided with required supplies at all times.

.3 Except where temporary sanitary facilities are connected to municipal sewer system, periodically remove wastes from site.

1.8 TEMPORARY FIRST-AID FACILITIES

.1 Provide site equipment and medical facilities necessary to supply first-aid service to injured personnel in accordance with regulations of the Workplace Safety and Insurance Act. Maintain facilities for duration of Contract.

1.9 TEMPORARY FIRE PROTECTION

.1 Provide and maintain in proper working order at least four fire extinguishers on each floor, prominently placed, until completion of work.

.2 Fire extinguishers shall be minimum 9 kg 4A 60BC type.

.3 Remove fire extinguishers from site, upon completion of work or when directed by Consultant.

.4 Where gas welding or cutting is to be done within 3 m or above combustible material, or above space that may be occupied by persons, interpose shields of non-combustible material. Tanks supplying gases for welding or cutting shall be placed at no greater distance from the work than is necessary and shall be securely fastened in an upright position. Such tanks shall be free from exposure to the sun or high temperature.

1.10 TEMPORARY USE OF NEW PERMANENT SERVICE AND EQUIPMENT

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

.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.

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

.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.

1.11 CONSTRUCTION AIDS

.1 Provide temporary stairs, ladders, ramps required for movement and placing of materials, equipment and personnel.

.2 Provide mechanical hoisting equipment and fully qualified operators as required during construction.

.3 Erect required scaffolding independent of walls, arranged to avoid interference with work of other Sections as much as possible.

.4 Provide and maintain required shoring and bracing in accordance with Construction Safety Act and other applicable regulations.

.5 Shoring and all false work over one tier in height shall be designed and shall bear the stamp of a registered professional engineer, having experience in this field.

.6 The use of explosive power tools must be approved in writing by jurisdictional authorities. The use of explosive power tools will not be permitted under any circumstances unless equipped with a device which positively prevents free flight of the stud.

1.12 BARRIERS

.1 Protect public and workers from injury.

.2 Provide and maintain required hoardings, barricades, guardrails, and lights in accordance with applicable regulations.

.3 Provide and maintain relocatable wire mesh fencing (InstaFence or equivalent) around assigned

exterior areas (if any) minimum 1.8 m high.

1.13 TEMPORARY CONTROLS

.1 Provide protective coverings to protect work against damage caused by weather, including but not necessarily limited to rain, snow, ice, wind, frost and excessive heat.

.2 Provide wind breaks and sun shades to allow proper setting and curing of cementitious materials.

.3 Protect built components from freezing until fully cured.

.4 Prevent sprayed materials from contaminating air beyond application area, by providing temporary enclosures.

.5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

.6 Prevent tracking of mud and dirt from site onto paved surfaces. Maintain stabilized vehicle egress point (mud mat), 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 shovelling or sweeping and subsequent washing. Dispose of mud and dirt in a controlled disposal area.

1.14 PEST CONTROL

.1 Provide rodent control and other pest control programs during construction, in accordance with requirements of jurisdictional authorities.

1.15 TEMPORARY DRAINAGE

.1 Comply with applicable requirements of municipality, conservation authority and other regulatory agencies having jurisdiction.

.2 Provide and maintain adequate temporary pumping and drainage systems to keep excavations and structures free of water. Prevent flow of surface water into excavations. Locate sumps away from foundations. Prevent pumped water from carrying soil in suspension in sufficient quantity to cause settlement of adjacent earth. Provide sufficient standby equipment to ensure continuity of pumping systems.

1.16 EROSION AND SEDIMENT CONTROLS

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

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

.3 Determine and conform to sedimentation and erosion control requirements of the conservation authority having jurisdiction. Provide and maintain until completion of work or until directed by Consutlant to be removed, sediment control devices at catch basins, drainage courses and at other locations on site as directed.

.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.

1.17 SIGNS

.1 Except as specified here do not erect any signs unless approved by the Consultant.

.2 Erect signs relating to safety on the work, or mandatory regulation notices.

.3 Prior to commencement of work wherein hazardous or volatile cements, coatings, or substances are used, barricade entire area and post adequate number of "NO SMOKING" signs.

.4 Mount Owner's and Consultants' signs outside construction hoarding at location directed by Consultant.

1.18 FIELD OFFICE AND SHEDS

.1 Maintain, until completion of Contract, for Contractor's use, a temporary office as required for work, large enough to accommodate site administrative activities and site meetings, complete with light, heating and cooling equipment to maintain 21^{o}C, ventilation, table and chairs. Do not store materials, tools, equipment in meeting area; keep clean and tidy.

.2 Provide temporary covers, sheds and platforms of weatherproof construction as may be required for protection and preservation of materials, small tools, equipment which may be susceptible to damage.

END

SECTION 01 60 00 - PRODUCT REQUIREMENTS

1.1 PRODUCT QUALITY

.1 Products supplied for work shall be new and as far as possible and unless otherwise specified, of Canadian manufacture.

.2 Materials used for temporary facilities are not required to be new, provided they are structurally sound and in suitable and safe operating condition.

1.2 STANDARDS AND TERMINOLOGY

.1 Where a standard has been adopted by these Specifications, incorporate minimum requirements of such standard into the work. Where requirements of Specifications are more stringent than those of the standard, follow more stringent requirements.

.2 Reference to standards, specifications, handbooks and manufacturer's catalogues refer to latest edition thereof and all amendments or revisions applicable at bid closing date, unless date suffix is included with document number.

.3 Wherever words "acceptable", "approved", "satisfactory", "selected", "directed", "designated", "permitted", "inspected", "instructed", "required", "submit", or similar words or phrases are used in standards or elsewhere in Contract Documents, it shall be understood, that "by (to) the Consultant" follow, unless context provides otherwise.

.4 Where the word "provide" is used in these Contract Documents, it shall be taken to mean "supply and install" unless specifically noted otherwise.

1.3 CERTIFICATION

.1 Building materials, components and elements specified without the use of trade or proprietary names shall meet requirements specified.

.2 If requested by Consultant, submit evidence of meeting requirements specified. Evidence shall consist of certification based on tests carried out by an independent testing agency.

.3 Certification based on previous tests for same materials, components or elements is acceptable. Certification shall be in form of written test reports prepared by testing agency.

1.4 AVAILABILITY AND SUBSTITUTIONS

.1 Products which are specified by their proprietary names or by part or catalogue number form the basis for Contract. No substitutes for these may be used without Consultant's approval in writing.

.2 Where it is found that specified materials have become unavailable for incorporating into work, notify Consultant immediately of proposed substitution.

.3 Proposed substitution shall be any top quality product considered by Consultant to be of equal quality and value to that specified, and suitable for purpose intended.

.4 Products proposed as substitutions, and which are considered by Consultant to be suitable for purpose intended, but which are in his opinion of lesser value and quality than those specified shall only be accepted as substitution if reasonable credits are allowed for their use.

.5 In order to substantiate equivalency of proposed materials, products or processes, submit samples, printed product descriptions, test data, installation instructions, standards, certification, sample, - guarantee/warranty forms, list of successful projects incorporating such proposals, and similar information requested by Consultant.

.6 Whenever a substitute is proposed, any change to contract price as a result of acceptance of proposed product shall include any adjustments to adjacent structure or space in order to accept minor differences in size or weight between proposed items and corresponding specified items.

.7 Prevent any substitution or request for substitution from delaying construction progress in any way.

.8 Requests for substitution resulting from failure to place orders in time will not be entertained. Be responsible for ordering products in time to ensure their required delivery; bear all costs for failure to comply with these requirements.

1.5 PRODUCT HANDLING AND STORAGE

.1 Suitably pack, crate and protect products during transportation to site to preserve their quality and fitness for the purpose intended.

.2 Store products in original, undamaged condition with manufacturer's labels and seals intact until they are being incorporated into completed work.

.3 Handle and store materials in accordance with manufacturer's and supplier`s recommendations and so as to ensure preservation of their quality, appearance and fitness for work.

.4 Arrange materials so as to facilitate prompt inspection, and remove faulty, damaged or rejected materials immediately from site.

END

SECTION 01 73 00 - EXECUTION REQUIREMENTS

1.1 EXAMINATION

.1 Examine the site, existing premises and surrounding areas and be fully informed as to the conditions and limitations under which the work has to be executed. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to bid closing.

.2 Prior to commencement of work, make careful examination of previously executed work, existing conditions, levels, dimensions and clearances. Promptly advise Consultant of unsatisfactory preparatory work and substrate conditions; commencement of work implies acceptance of conditions.

1.2 PROTECTION

1. Ensure that no damage is caused to existing structures, buildings, foundations, pavement, fences, curbs, grounds, plants, property, utilities, services, finishes during the progress of Work. Repair and make good any damage caused at no extra cost to Owner to the complete satisfaction of the respective property owners and authorities having jurisdiction. Do not proceed with repairs or remedial work without written permission of the Consultant. Only trades specifically capable of performing the work will be allowed to make remedial or repair work.

.2 Keep surfaces to receive finished flooring dry and free from oil and grease. Stockpiling of damp or wet building materials and use of mixing boxes or water buckets without protecting floors from moisture gain by approved means, is prohibited.

.3 Keep municipal roads clean of mud and debris resulting from construction traffic.

.4 Prevent soiling of pavement due to spillage, mixing of material or any other cause. Make good any damage caused.

.5 Protect new work from damage with suitable protective coverings.

.6 Protect work during periods of suspension, regardless of reason for suspension.

1.3 SERVICES AND UTILITY SYSTEMS

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

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

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

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

.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.

.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.

1.4 SLEEVES, SUPPORTS, AND FASTENERS

.1 Unless specified in other Sections, furnish, set and secure inserts, hangers, sleeves, fasteners, adhesives, anchors and other supports and fittings required for proper installation of work.

.2 Use exposed metal fastenings and accessories of same texture, colour and finish as base metal on which they occur.

.3 Select appropriate type of anchoring and fastening devices and in sufficient quantity and in such manner as to provide positive permanent anchorage of unit to be anchored in position. Keep exposed fasteners to a minimum, evenly spaced and neatly laid out.

.4 Fasteners shall be of permanent type. Do not use wood plugs.

.5 Fasteners which cause spalling or cracking of material to which anchorage is being made shall not be used.

.6 Fasteners in contact with preservative pressure treated wood shall be stainless steel unless otherwise approved by Consultant.

1.5 CONCEALMENT

.1 Conceal ductwork, piping, conduit and wiring located in finished areas, in ceiling spaces and furred construction unless specifically noted to be exposed.

.2 If any doubt arises as to means of concealment, or intent of Contract Documents in this connection, request clarification from Consultant before proceeding with portion of work in question.

1.6 CUTTING AND PATCHING

.1 Regardless of which Section of work is responsible for any portion of cutting and patching, in each case tradesmen qualified in work being cut and patched shall be employed to ensure that it is correctly done.

.2 Any cost caused by omission or ill-timed work shall be borne by party responsible therefore.

.3 Do not endanger any work by cutting, digging or otherwise altering, and do not cut nor alter any loadbearing element without written authorization by Consultant. Provide bracing, shoring and temporary supports as required to keep construction safely supported at all times.

.4 Cut holes carefully and not larger than required after they are located by Sections requiring them, using suitable equipment and tools.

.5 Patching and making good work shall be undetectable in finished work.

1.7 WORKMANSHIP

.1 All work shall be carried out in accordance with the best trade practice, by mechanics skilled in the type of work concerned.

.2 Products, materials, systems and equipment shall be applied, installed, connected, erected, used cleaned and conditioned in accordance with the applicable manufacturer's printed directions.

.3 Where specified requirements are in conflict with manufacturer's written directions, follow manufacturer's directions, but inform Consultant in writing prior to proceeding with affected work. Where specified requirements are more stringent than manufacturer's directions, comply with specified requirements.

1.8 LINES AND LEVELS

.1 Verify all elevations, lines, levels and dimensions as indicated and report errors, any conflicts, or inconsistencies to the Consultant before commencing work or as soon as discovered.

.2 Accurately lay out work and establish lines and levels in accordance with requirements of Contract Documents.

.3 Set up, maintain and protect permanent reference points and provide general dimensions and elevations for all Sections of Work.

1.9 DIMENSIONS

.1 Check and verify dimensions wherever referring to work. Dimensions, when pertaining to work of another Section, shall be verified with Section concerned. Details and measurements of work which is to fit or conform with work installed shall be taken at site.

.2 Do not scale Drawings. If there is ambiguity, lack of information or inconsistency, immediately consult Consultant for directions. Be responsible for extra costs involved through the disregarding of this notice.

.3 Walls, partitions and screens shall be considered as extending from floor to underside of structural deck unless specifically indicated otherwise on Drawings.

1.10 LOCATION OF FIXTURES

.1 Location of fixtures, apparatus, equipment, fittings, outlets, conduits, pipes and ducts shown or specified, but not dimensioned, shall be considered approximate.

.2 Request direction from Consultant to establish exact location. Any relocation caused by Contractor's failure to request direction from Consultant shall be done by Contractor at no extra cost. Where job conditions require reasonable changes in indicated locations and arrangements, make changes at no additional cost.

.3 Conserve space and coordinate with work of other Sections to ensure that ducts, pipes, conduits and other items will fit into allocated wall and ceiling spaces, while ensuring adequate space for access and maintenance.

.4 Where ducts, piping and conduits are permitted to be exposed they shall be neatly and uniformly laid out parallel to adjacent building lines and parallel to each other where they run in the same direction. Review exposed installations with Consultant prior to start of work. At no cost to Owner make changes to exposed work as directed by the Consultant where such work is not installed in accordance with Consultant's prior review.

.5 Except where locations are specifically noted on Drawings, install exposed mechanical and electrical fixtures including outlets, switches, thermostats, panels and other items, located on walls, in orderly and neatly laid out manner, lining up with each other and grouped together where possible. Review installation with Consultant prior to start of rough-in work. Relocate at no cost to Owner any work which does not meet this requirement.

END

SECTION 01 74 00 - CLEANING

1.1 GENERAL

.1 Be responsible for cleanliness of assigned work areas to satisfaction of Consultant. Maintain work areas in neat and orderly condition at all times.

.2 Periodically, or when directed by the Consultant, remove from work areas rubbish and waste materials.

.3 Use only cleaning materials recommended by manufacturer of surface to be cleaned.

.4 Use cleaning material only on surfaces recommended by cleaning material manufacturer.

1.2 CLEANING DURING CONSTRUCTION

.1 Remove debris, packaging and waste materials frequently.

.2 Keep dust and dirt to an acceptable level, as directed.

.3 Remove oily rags, waste and other hazardous substances from premises at close of each day, or more often if required.

1.3 FINAL CLEANING

.1 Upon completion of work, or, where work is phased, upon completion of each phase, thoroughly clean all surfaces and components. Provide professional cleaning by a recognized, established cleaning company, to allow Owner to occupy without further cleaning except where specifically indicated otherwise.

.2 Remove stains, dirt and smudges from finished surfaces.

.3 Clean exposed finished surfaces in accordance with respective material manufacturer's recommendations.

.4 Clean mechanical and electrical fixtures and other fittings of labels, wrappings, paper and other foreign material.

.5 Replace heating, ventilation and air conditioning filters if units were operated during construction. Clean inside of ducts, blowers and coils.

.6 Remove from work areas all waste and surplus materials from all areas, including roofs and ceiling spaces.

.7 Remove snow and ice from driveways, parking areas and walks.

.8 Power wash paved surfaces.

1.4 WASTE COLLECTION AND DISPOSAL

.1 All waste materials and debris resulting from the work of this Contract shall belong to the Contractor and shall be removed from the site and legally disposed.

.2 Periodically, or when directed by the Consultant remove waste material and debris.

.3 Separate and salvage materials suitable for recycling from general waste stream and transport to recognized recycling facility.

.4 Burying, burning, selling waste materials on site is prohibited.

.5 Disposal of liquid wastes into waterways, sewers is prohibited.

END

SECTION 01 77 00 - PROJECT CLOSEOUT

1.1 REFERENCE STANDARD

.1 Comply with provisions of OAA / OGCA “A Guide to Project Closeout Procedures” November 2010, except as modified in these Specifications.

1.2 OPERATING AND MAINTENANCE MANUALS

.1 Provide operation and maintenance manuals. Data shall be contained in D-ring binders with soft vinyl covers. Binders shall have clear plastic pocket at back of spine identification containing label "Operation and Maintenance Manual" and project name and volume number, if applicable. Each manual shall contain a title sheet listing project name, date and volume number and names and addresses of Contractors and Subcontractors, Consultant and Subconsultants.

.2 Provide operating and maintenance data, prepared on 8 1/2" X 11" sheets in printed or typewritten form.

.3 Data shall be assembled in systematic order, generally following the specification format. Provide labelled, celluloid covered tabs fastened to hard paper dividers to identify different Sections.

.4 Provide the following material as applicable to work of this Contract:

.1 List of contents. If more than one volume is required, provide a cross-reference contents page at front of each volume.

.2 Complete list of subcontractors and suppliers, showing name, address, telephone/fax numbers, name of contact person and description of work done.

.3 Complete list of products used in the work showing product name, part number or code and manufacturer for each listing; follow specification format.

.4 Copy of finish hardware list, complete with all amendments and revisions.

.5 Schedule of paints and coatings. Include sufficient explanation to fully identify each surface with the applicable paint or coating used. Enclose copy of colour schedule.

.6 Maintenance instructions for all finished surfaces.

.7 Brochures, cuts of all equipment and fixtures.

.8 Operating and maintenance instructions for all equipment.

.9 Valve manual.

.10 Controls schematics.

.11 Extended warranties.

.12 Maintenance contracts.

.13 Other data required elsewhere in Contract Documents or deemed necessary by Consultant.

1.3 EXTENDED WARRANTIES

.1 Submit extended warranties as part of "Operating and Maintenance Manuals".

.2 Arrange extended warranties in systematic order matching Specification format. Include a table of contents listing warranties in same order.

.3 Each warranty must show:

.1 Name and address of Project

.2 Name of Owner
.3 Section Number and Title

.4 All extended warranties must be presented under Contractor's letterhead, seal and signature and must bear similar wording to that specified in Contract Documents.

.5 Submit manufacturers' Product warranties in accordance with GC 12.3.6.

1.4 AS-BUILT DRAWINGS

.1 Prior to final payment submit as-built drawings specified in Section 01 32 00, in pdf format.

.2 Clearly and prominently mark each drawing "AS-BUILT DRAWING prepared by _____ _____(name of Contractor).

1.5 MAINTENANCE MATERIALS

.1 Deliver maintenance materials as required elsewhere in these Specifications. Obtain receipt for delivered materials and submit copy of receipt to Consultant.

.2 Package materials so that they are protected from damage and loss of essential properties.

.3 Label packaged materials for proper identification of contents and project name.

1.6 OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Prior to requesting Substantial Performance, at a time acceptable to Owner and Consultant, but not before operating and maintenance data has been reviewed and accepted by Consultant, instruct designated Owner's representatives in the operation and maintenance of all systems and equipment.

.2 Arrange training sessions for each type of operating system and equipment. Sessions shall be conducted by qualified instructors and shall be of sufficient duration and depth to adequately instruct participants.

.3 Throughout the training sessions make reference to reviewed operation and maintenance manuals to familiarize participants with the data provided.

.4 Prepare an attendance record for each training session, to be signed by each participant upon conclusion of session. Show date and time of session, subject of session and name, title and organization of each participant. Submit a copy of each record to Consultant.

.5 Subcontractor whose work is subject of training session and Contractor shall be represented during training session by qualified personnel.

1.7 INSPECTION AND ACCEPTANCE OF WORK

.1 Prior to requesting Substantial Performance submit the following:

.1 3 copies of operating and maintenance manuals (one complete set of manuals must be submitted for Consultant's review minimum 6 weeks prior to requesting Substantial Performance).

.2 Inspection and acceptance certificates required from regulatory agencies.

.3 Written statement from each subcontractor / supplier verifying that all work provided by them is asbestos-free.

.2 Advise the Consultant in writing, when work has been substantially completed. If Consultant agrees that this stage has been reached, prepare a complete list of deficiencies and submit this list to Consultant.

.3 On receipt of the above deficiency list in a satisfactory form, the Consultant, accompanied by Subconsultants, the Contractor and the Owner, if deemed desirable, will carry out a review of the Project.

.4 Add to the deficiency list, in accordance with Consultant's directions, any additional deficiencies which are identified during inspection and reissue updated deficiency list.

.5 Upon completion, inspection and acceptance of work, Owner will take over and occupy completed work. Refer to Supplementary Conditions for procedures relating to certification of Substantial Performance and release of holdback.

1.8 FINAL SUBMISSION

.1 Prior to claiming Final Payment do the following:

.1 Submit set of as-built drawings.

.2 Submit complete set of reviewed shop drawings, folded to 8 1/2" X 11" size, contained in heavy duty manila envelopes, numbered and labelled. Follow specification format with no more than one Section per envelope.

.3 Submit maintenance materials.

.4 Submit a final accounting of all approved changes to the Contract Price, including adjustments to cash allowances.

1.9 WARRANTY INSPECTION

.1 The Contractor shall organize a warranty inspection to take place two weeks prior to the expiration of the standard one-year warranty. The Consultant, subconsultants, the Contractor, subcontractors and the Owner's representatives shall attend.

END

1.1 COMMISSIONING

.1 The Owner may hire and pay for an independent commissioning agent to carry out commissioning activities required for this Project.

.2 The commissioning agent shall:

.1 Develop a comprehensive commissioning schedule identifying all commissioning activities required.

.2 Set up, oversee and report on all required commissioning activities as further described in Divisions 21 to 28 and other specifications Sections.

.3 The Contractor shall:

.1 Assist in setting up, coordination and scheduling of required commissioning activities.

.2 Provide commissioning agent with a complete set of documents, including site instructions, change order and shop drawings, to allow commissioning agent to establish accurately and completely establish the scope of commissioning activities required.

.3 Provide all materials, equipment services and instrumentation required to complete commissioning process. Provide access to all required areas.

.4 Provide an experienced mechanical/electrical coordinator who shall supervise the commissioning activities.

.5 Ensure coordination and cooperation between different Sections of work to properly implement and complete the commissioning process.

.6 Ensure the building and all systems are ready for testing and that building is safe and clean for equipment operation.

.7 Provide assistance to commissioning agent during performance tests.

END

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes descriptions for demolishing, salvaging, recycling and removing of asphalt paving identified in whole or in part, and for backfilling trenches and excavations resulting from site demolition activities a required by scope of work.

1.2 RELATED REQUIREMENTS

.1 Section 02 41 13– Selective Site Demolition

.2 Section 02 41 99– Demolition for Minor Works

.3 Section 02 61 00.01– Soil Remediation

1.3 PRICE AND PAYMENT

.1 Removal of existing asphalt pavement will be measured in square metres of surface actually removed regardless of depth removed.

.2 Payment under this item will include operations involved in removing, hauling and stockpiling designated pavement.

1.4 REFERENCE STANDARDS

.1 Canada Green Building Council (CaGBC)

.1 LEED® Reference Guide for Building Design and Construction, Version 4.

.2 Department of Justice Canada (Jus)

.1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

.2 Canadian Environmental Protection Act, 1999 (CEPA), c. 33.

.3 U.S. Environmental Protection Agency (EPA) / Office of Water

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.5 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.

.2 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled

.3 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill, prepared in accordance with Section 01 74 19 - Construction Waste Management and Disposal and as follows:

.1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.

.4 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.5 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 21- Construction Waste Management and Disposal.

.6 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 21- Construction Waste Management and Disposal.

1.6 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate requirements for Waste Management and Disposal for materials being re used or recycled in accordance with Section 01 45 16.19:

.1 Divert excess materials from landfill.

.2 Separate materials identified for recycling place in identified areas in accordance with Waste Management Plan.

.3 Label location of salvaged material's storage areas and provide barriers and security devices.

.4 Remove materials that cannot be salvaged for re use or recycling and dispose of in accordance with applicable codes at licensed facilities.

.2 Pre Construction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19– Project Meetings; attended by the Owner, the Contractor and Geotechnical Consultant to discuss the following:

.1 Verify project requirements.

.2 Review site conditions.

.3 Coordination with other Subcontractor’s affected by work of this Section.

.4 Examine existing site conditions adjacent to demolition work, prior to start of Work.

.5 Waste reporting requirements.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Shop Drawings: Submit shop drawings indicating diagrams or details showing sequence of demolition work.

.2 Informational Submittals: Provide the following submittals during the course of the work:

.1 Certificates: Submit copies of certified weigh bills, bills of lading or receipts from authorized disposal sites and re use and recycling facilities for material removed from site on a weekly basis.

.3 Sustainable Design Submittals:

.1 LEED® v4 Submittals: in accordance with Section 01 35 21- LEED® Requirements.

.2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with Section 01 35 21 - LEED Requirements EPA 832/R-92-2005.

.3 Construction Waste Management: Submit project CWM Plan highlighting recycling and salvage requirements in accordance with Section 01 74 21 - Construction Waste Management and Disposal, and as follows:

.1 LEED® Diversion Method: Based on LEED® MR Credit Option 1, Path 1 to divert a minimum of 50% of total waste diversion and three (3) material streams that will be targeted for alternative waste disposal methods Option 2, to generate less than 12.2 kg of construction waste per m2 of building floor area Option 1, Path 2 to generate a minimum of 75% of total waste diversion and four (4) material streams that will be targeted for alternative disposal methods.

1.8 QUALITY ASSURANCE

.1 Regulatory Requirements: ensure Work is performed in compliance with Ontario Provincial Standards and Specifications.

.2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.

1.9 SITE CONDITIONS

.1 Protect existing site features to remain or identified for salvage or re use; make repairs and restore to a similar condition to existing where damage to these items occurs as directed by the Consultant and at no cost to Owner:

.1 Remove and store salvaged materials to prevent contamination.

.2 Store and protect salvaged materials as required for maximum preservation of material.

.3 Handle salvaged materials the same as new materials.

.2 Perform pavement removal work to prevent adverse effects to adjacent watercourses, groundwater and wildlife, and to prevent excess air and noise pollution:

.1 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Authorities Having Jurisdiction.

.3 Protect existing site features and structures, trees, plants and foliage on site and adjacent properties.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Use cold milling, planning or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.

PART 3 EXECUTION

3.1 PREPARATION

.1 Verify extent and location of asphalt identified for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities, preserve active utilities traversing site in operating condition.

.3 Temporary Erosion and Sedimentation Control

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.4 Prior to beginning removal operation, inspect and verify with Consultant areas, depths and lines of asphalt pavement to be removed.

.5 Protection: protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Consultant at no additional cost.

3.2 REMOVAL

.1 Remove existing asphalt pavement to lines and grades as shown on the Contract Drawings.

.2 Demolition of pavements, curbs and gutters:

.1 Square up adjacent surfaces to remain in place by saw cutting or other method acceptable to the Consultant on site.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular materials where they are exposed and identified to remain.

.4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving.

.3 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.

.4 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.5 Suppress dust generated by removal process.

3.3 FINISH TOLERANCES

.1 Finished surfaces in areas where asphalt pavement has been removed to be within +/-5 mm of grade specified but not uniformly high or low.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

.4 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.2 Removed asphalt pavement which is to be recycled in hot mix asphalt concrete under this contract may be stockpiled at designated asphalt plant site.

END OF SECTION

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SECTION 02 41 19 — SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

B. Refer also to the Drawings for general notes and scope of demolition work

1.2 SECTION INCLUDES

A. Methods and procedures for demolition work of existing construction and building elements indicated on Drawings or by provisions of this section

B. Salvage of existing items to be reused or recycled

1.3 RELATED WORKS

A. Disconnecting, removal of mechanical and electrical services. Refer also to Division 22, Division 23, and Division 26 demolition notes by respective Consultants.

B. Safety barriers and temporary closures are specified in SECTION 01 56 00 — TEMPORARY BARRIERS AND ENCLOSURES

C. Installation of new roofing system after removal of existing roof, where applicable. See Section 07 52 00 - MODIFIED BITUMINOUS ROOFING.

D. This section does not cover asbestos or lead abatement procedures.

1. If such materials are suspected to be in existence within the area of the project, the Owner or the Owner's Representative shall provide a Designated Substance Report for review, else secure an appropriate testing agency for verification and recommendation on action.

2. Should material resembling spray or trowel applied asbestos or other designated substances listed as hazardous be encountered during the process of demolition, work shall stop and preventative measures taken.

    a. Notify Owner and Consultant immediately.

    b. Do not proceed until written instructions have been received from Client / Owner, and Consultant.

1.4 DEFINTIIONS

A. *Remove*: detach items from existing construction and dispose of them off-site unless indicated otherwise to be salvaged or reinstalled

B. *Remove and Salvage*: detach items from existing construction, in a manner to prevent damage, and deliver to the Owner ready for reuse or store as noted on the drawings

C. *Remove and Reinstall*: detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. *Existing to Remain*: leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled

E. *Dismantle*: remove by disassembling or detaching an item from a surface, using gentle methods and equipment so as to prevent damage to the items and surface; disposing of items unless otherwise indicated to salvage or reinstall.

1.5 EXAMINATION

A. Visit the site and the existing building so as to fully understand all existing conditions, limitations and circumstances, and extent of work required. No increase in cost or extension of performance time will be considered for conditions, limitations and circumstances which could reasonably be determined prior to submission of bid.

1.6 MATERIAL OWNERSHIP

A. Unless otherwise indicated, all materials, rubbish and debris resulting from demolition work shall become the Contractor's property and shall be removed from site and legally disposed of unless specifically indicated otherwise.

B. Unless otherwise explicitly indicated, historic items, relics, antiques, and similar objects discovered/uncovered during the demolition works shall remain the property of the Owner,

1. Carefully salvage in a manner to prevent damage and promptly return to the Owner.

1.7 REGULATORY REQUIREMENTS

A. Obtain and pay for necessary permits for Work of this Section. Give required notices, and make submissions required by regulatory agencies.

B. Comply with applicable requirements of jurisdictional authorities and CSA S350-M1980 "Code of Practice for Safety in Demolition of Structures".

1.8 PROTECTION

A. Prevent uncontrolled movement, settlement, or damage. Provide shoring and bracing as required.

B. Take steps to positively prevent uncontrolled falling of demolished materials.

C. Ensure that no part of existing structure is over-loaded due to work carried out under this Section.

1. Before proceeding with demolition of load bearing structures, and where required by the authorities having jurisdiction, submit for review by Consultant, underpinning/shoring drawings prepared by a qualified engineer registered in the province or territory of the project.

D. Prevent debris from blocking drainage systems.

E. Insure that debris does not obstruct exits and passageways and install anti-dusting screens or better protection around portions to be demolished and prevent penetration of dust, rain and snow into spaces used, and through the building fresh air intakes.

F. Ensure that temporary guards, hoardings are provided in accordance with applicable safety regulations. Refer to requirements of SECTION 01 56 00 — TEMPORARY BARRIERS AND ENCLOSURES, and SECTION 01 56 39 - TEMPORARY TREE AND PLANT PROTECTION.

G. Supply and maintain temporary dust-tight screens as required.

H. Fully protect the work, the materials and the equipment during any temporary closures of the site for whatever reason.

I. Insure that demolition work involving exterior walls is performed adequately to provide continuous protection against water infiltration at all times.

J. Keep noise, dust and inconvenience to neighbours to a minimum. Schedule delivery and pick up of skids, bins, and other required materials to avoid pick up and drop off times if any school is in proximity to the site. Inform owner and consultant go any complaints from neighbours.

1.9 COORDINATION

A. Coordinate the demolition of all trades including Divisions 21 to 28 as required by the scope of the project.

B. Prior to the commencement of the selective demolition work, provide the following:

1. Descriptions of and anticipated quantities of materials to be salvaged, reused, recycled and/or landfilled

2. Schedule of selective demolition

3. Number and locations of dumpsters

4. Anticipated frequency of tippage

5. The name and address of the hauler and waste facility/ waste receiving organization

    a. Indicate receipt and acceptance of demolished material by a landfill facility authorized to accept such material

PART 2 PRODUCTS

2.1 RESERVED

PART 3 EXECUTION

3.1 PREPARATION

A. Ensure that affected spaces are unoccupied and discontinued in use.

B. Verify that existing services in areas affected by demolition work are disconnected, capped, removed or relocated, prior to start of Work where they interfere with the execution of the Work. Preserve and protect active utilities traversing site in operating condition.

1. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the as-built drawings. Support, shore up and maintain pipes and conduits encountered.

2. Install warning signs on electrical equipment and cables which shall remain live during work for other parts of the building or site.

3. Notify and obtain approval of utility companies before starting demolition.

4. Immediately notify the Owner, the Consultant and the utility company concerned in case of damage to any utility or service, designated to remain in place.

5. Immediately notify the Owner and the Consultant should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

C. Notify Owner before disrupting building services and/or access. Where applicable, refer to requirements of Section 01 35 00 - Special Project Requirements.

D. Obtain written permission from Owner 72 hours before commencing any openings in existing envelope. Do not proceed without written permission of Owner.

E. Provide weather tight safety enclosures if openings in the building envelope shall remain open for construction work.

F. Notify the Consultant should any uncharted utility or service be encountered. Await instructions in writing regarding remedial action

3.2 SALVAGE

A. Prior to start of demolition carefully remove and salvage items designated accordingly (designated “Return to Owner”) and deliver them to location designated by Owner.

B. Refer also to Consultants Drawings for general notes and scope of salvage work.

3.3 DEMOLITION GENERAL

A. Refer to Consultant drawings and Sections 21 to 28 for extents and limits of demolition.

B. Prior to Commencing Demolition:

1. Before commencing work, inspect site with Owner or Owner’s representative and the Consultant, and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

2. Report all defective work and deficiencies in writing to the Consultant, with supporting photos, as described in Section 01 35 00 - Special Project Requirements, item 1.10 - Existing Conditions.

3. Plan and execute each operation in a secure way and with the objective of minimum disturbance, noise, dust and vibration.

C. Demolition:

1. Demolish parts of existing building, including foundations, slabs on grade and underground services as shown and as required to accommodate new work.

2. Demolish work in a safe and systematic manner, from top to bottom.

    a. Do not throw or drop demolished materials from heights. Use chutes, conveyors, or hoisting equipment to lower materials.

3. Demolish masonry and concrete elements in small sections.

4. Obtain Consultants’ approval before demolishing any structural elements for which demolition process has not been outlined in structural documentation.

    a. Retain and protect from damage or trauma structural elements which are required.

    b. Carefully remove and lower, in a controlled manner, structural framing members and other heavy or large objects.

5. Make necessary cuttings, holes and penetrations in the existing walls and roof to provide passageways for mechanical/electrical services or special equipment, or for other reasons.

6. Cut existing membrane, insulation and vapour barriers properly and execute with precision the holes or penetrations through the roof deck or the wall materials.

7. Trim edges of partially demolished building elements to tolerances as defined by the Consultant to suit future use.

8. Demolish in a manner to minimize dusting. Keep dusty materials wetted but prevent flooding or contaminated runoff.

9. At all times leave work in safe condition, so that no part is in danger of uncontrolled toppling or falling.

10. Any damage observed after the commencement of the demolition work will be presumed to be the result of the Work of this Section and shall be repaired at the Contractor's own cost, to the Consultant's satisfaction.

    a. Assume responsibility for any damage caused by the demolition work.

    b. In case of excessive demolition resulting from an error or exceeding limits shown on drawings, make good all parts demolished, at no extra cost to the Owner.

    c. All repair materials shall match existing materials, and shall be compatible.

11. Remove, replace, patch and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

    a. Notify warrantor on completion of selective demolition, and obtain documentation verifying that the existing system has been inspected and warranty remains in effect. Submit documentation at project close out.

D. Remediation:

1. Remediation to be completed by qualified trades who specialize in each item below:

    a. After installation of services or other elements, build required curbs on roof and make necessary repairs to the vapour barrier, insulation and membrane, including flashings, flexible flashings, and caulking to seal perfectly around these elements and ensure their continuity

    b. Similarly repair the existing air/vapour barrier, insulation adequately on walls, and seal around all penetrations.

    c. Ensure continuity of air/vapour barriers and insulation of walls affected.

d. Repair and make good any parts of the roofing or walls that have been affected by the work of this Section or any other Section.

1) Refer also to Clause 3.3(C)(11)

E. Reserved

3.4 DEMOLITION OF ARCHITECTURAL FINISHES

A. Plaster: Remove loose plaster that will be exposed in new construction. Provide clean edge of both plaster and lathe where noted to remain in the drawings.

1. Loose plaster is defined as a plaster material of at least 51mm by 102mm that can be moved by touch or that sounds hollow when lightly tapped with a hammer.

2. Where unsure of extent to be removed, confirm with Consultant.

B. Flooring: Where shown, scheduled or otherwise required for the application or installation of new flooring finishes or coverings, remove existing flooring as follows

1. Remove all traces of existing flooring materials.

2. Remove adhesives, except those containing asbestos, using strippers approved by the manufacturer of new flooring materials (non toxic where possible) or grind concrete floor surfaces to completely remove adhesive.

a. Obtain Owner's approval of removal method prior to commencing removal work

3. Do not remove VCT or adhesives suspected of containing asbestos. The Owner shall verify the asbestos content of all suspect materials per Clause 1.3(D)(1)

4. Clean floor slabs of dust and adhesive residue.

C. Reserved

3.5 DISPOSAL AND CLEAN-UP

A. Do not allow demolished materials to accumulate on site. Promptly, as Work progresses, remove and legally dispose of materials away from site. Refer to requirements of SECTION 01 74 00 — CLEANING

B. Separate and salvage materials suitable for recycling from general waste stream and transport to recognized recycling facility per the guidelines of authorities having jurisdiction.

C. Selling, burning and burying of materials on site is not permitted.

D. Reserved

END OF SECTION 02 41 19

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01340 - Submittals

.2 Section 03 35 43 Polished Concrete

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

.2 ASTM C309-07, Specification for Liquid membrane-Forming Compound for Curing Concrete

.3 ASTM D1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types)

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-19.24-M90, Multicomponent, Chemical Curing Sealing Compound

.3 CSA International

.1 CSA-A23.1/A23.2-2009, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete

.2 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005)

.3 CAN/CSA-G30.18-M92 (R2002), Billet Steel Bars for Concrete Reinforcement

.4 CSA S269.1-1975 (R2003), Falsework for Construction Purposes

.5 CAN/CSA S269.3-M92 (R2003), Concrete Formwork

.4 Ontario Provincial Standard Specification (OPSS)

.1 OPSS 1315, Nov. 2008, Material Specification for White Pigmented Curing Compounds for Concrete

.2 OPSS.MUNI 1440, Nov. 2016, material Specification for Steel Reinforcement for Concrete

.5 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: in accordance with Division 1, convene pre-installation meeting one week prior to beginning concrete works.

.1 Ensure site supervisor, Consultant, specialty contractors - finishing, forming, reinforcing, concrete producer and testing laboratories attend.

.2 Verify project requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01340. Reinforcing steel and Concrete Mix Design, and Materials data sheet submittals are considered to be Category 1. Mill test reports, formwork and falsework and Materials MSDS submittals are considered to be Category 2.

.2 Shop Drawings:

.1 Submit reinforcing steel placing drawings and bar lists prepared in accordance with contract documents and RISC Manual of Standard Practice, to clearly show size, shape, location and necessary details of reinforcing. Drawings shall be in the units of the project (i.e., metric). Plans and elevations of vertical elements should be at a 1:50 scale or similar.

.2 Submit mill test certificates if requested by Consultant, in accordance with OPSS.MUNI 1440.04.

.3 Submit drawings showing formwork and falsework design. Comply with CSA S269.1, for falsework drawings and with CAN/CSA-S269.3 for formwork drawings. Drawings should show form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels and other items that visually affect cast-in-place architectural concrete.

.4 Submit formwork and falsework drawings sealed and signed by professional engineer registered or licensed in the Province of Ontario.

.5 Samples for Verification: Submit architectural concrete samples for exterior architecturally exposed concrete, to represent the 400 mm high concrete upstand panel around the building perimeter. Sample to be cast vertically approximately 450 mm x 450 mm x 50 mm (18” x 18” by 2”) with finishes, colours, textures to match design. Document concrete pour date and the date when the sandblast finish was applied, and the name of sandblasting technician.

.3 Concrete Mix Designs:

.1 Promptly after award of the Contract and before any concrete work is commenced, the Contractor shall submit to the Consultant for review, the proposed concrete design mixes.

.2 Submit mix designs to the Consultant on the either most current OPSS.MUNI 1350, OPSF 1350-1 Concrete Mix Design Submission Form, or Concrete Ontario Mix Design Submission Form. Form shall be signed by the Contractor and the Ready Mixed Concrete Supplier.

.3 Each mix design shall have an individual mix code, and shall indicate the intended application/element or location of the concrete. Relate the mix code to the project mix design table on the drawings.

.4 All portions of the Mix Submittal Form shall be completed, including all applicable parts of the “Specification” section, the “Contractors Requirements” section and the “Materials Section.” The source and type of all materials used in each mix design shall be provided, including manufacturer’s name and specific material brand name where applicable.

.5 Submit test results indicating proposed cements, blended hydraulic cements and aggregates that do not present the potential for alkali-aggregate reactivity, as determined in accordance with CSA A23.2-27A.

.6 Submit with Concrete Mix Submittal Form, batch test results not more than 12 months old, from the plant supplying ready mixed concrete for the project, for each C-XL, C-1, A-1 or CSA A23.1 "8.8 Low-shrinkage concrete" as part of the mix design submission. Concrete supplier shall certify that the sample batches utilized the same materials and sources as given in the mix design submission. Batch test reports shall be provided for all of the properties required by the specific mix design, including but not limited to chloride ion penetrability, and low-shrinkage concrete where these properties are specified by CSA A23.1 or the Contract documents.

.7 At least four weeks prior to beginning Work, submit to Consultant, Product Data Sheets, MSDS and samples of following materials proposed for use: curing compound for interior concrete, polished concrete areas, and architecturally exposed concrete where water curing is not used, joint filler and sealer, under slab insulation and vapour barrier, and waterstops.

.4 Concrete hauling time: provide for review by Consultant deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

.5 Submit proposed concrete pour schedules and confirm proposed construction joint locations. Update and maintain a set of drawings or documents of actual pour locations, date, temperatures and correlate to samples taken for testing. Coordinate with testing agency and provide a copy to consultant when requested.

1.5 QUALITY ASSURANCE

.1 Provide to Consultant, with concrete mix design submittal, valid and recognized certificate from Concrete Ontario (formerly RMCAO) for the plant(s) delivering concrete.

.1 Quality Control Plan: provide written report to Consultant verifying compliance that concrete in place meets performance requirements. Submit Quality Control Plan with Concrete Mix Design submittal package.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Consultant and concrete producer as described in CSA A23.1/A23.2.
.2 Deviations to be submitted for review by the Consultant.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

PART 2 PRODUCTS

2.1 DESIGN CRITERIA

.1 Alternative 1 – Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 – PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Consultant and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Cement: to CSA A3001, Type GU or HS, as applicable for exposure class.

.2 Blended hydraulic cement: Type GUb, or HSb to CSA A3001 as applicable for exposure class.

.3 Supplementary cementing materials: Type S, Ground Granulated Blast Furnace Slag, to CSA A3001.

.4 Water: to CSA A23.1/A23.2.

.5 Formwork: Formwork, ties and accessories to maintain alignment and position and tolerances of formwork as specified in CSA A23.1. For exposed architectural finish concrete, refer to the following:

.1 Source Limitations: Obtain each type of form-facing material from single source/manufacturer.

.2 Form Facing Panels for architectural concrete: Steel and glass-fibre reinforced plastic, or other approved non-absorptive panel materials that provide continuous, true and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

.3 Pan-Type Forms: Glass-fibre-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

.4 Form Liners: Units of Face design, texture, arrangement, and configuration. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatment of concrete.

.5 Rustication Strips: Metal or rigid plastic with sides beveled and back kerfed. Non-staining. Refer to architectural elevation for layout of joints.

.6 Chamfer Strips: metal, rigid plastic or elastomeric rubber. 19 mm x 19 mm (¾" by ¾"). Non-staining.

.7 Form Joint Tape: compressible foam tape; pressure sensitive; AAMA 800; minimum 6 mm (¼") thick.

.8 Form Joint Sealant: elastomeric sealant complying with ASTM C920, type M or Type S, Grade NS, that adheres to form joint substrates.

.9 Form-Release Agent: Commercially formulated, colourless form-release agent that will not bond with, stain or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.

.1 Basis of Design Product: BASF Corporation, MasterFinish Series.
.2 Formulate form-release agent with rust inhibitor for steel form-facing materials.

.10 Form Ties: Factory-fabricated, internally disconnecting ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

.1 Furnish ties that when removed, will leave holes 13 mm (½") in diameter on concrete surface.

.2 Furnish internally disconnecting ties which will leave no metal closer than 40 mm (1 ½") from the architectural concrete surface.

.6 Reinforcing bars: to CAN/CSA G30.18, Grade 400R. Where welding reinforcing steel use Grade 400W. Manufacture of reinforcing bars shall be in accordance with OPSS.MUNI 1440.07.01., and fabrication in accordance with OPSS.MUNI 1440.07.03.

.7 Stainless steel reinforcing bars to ASTM 955M/A 955M-12e1, minimum yield strength = 420 MPa. Manufacture of stainless steel reinforcing bars shall be in accordance with OPSS.MUNI 1440.02., and fabrication in accordance with OPSS.MUNI 1440.07.03.

.8 Welded steel wire fabric: to ASTM A185, supplied in flat sheets, rolls not acceptable.

.9 Premoulded joint filler.

.1 Asphalt/Bituminous impregnated fibreboard: to ASTM D1751 width as per joint size on plans.

.2 Foam joint filler for curved applications: to ASTM D 1752, ASTM D 5249 Type 2, and ASTM D17174-05, width as per joint size on plans. Ceramar as manufactured by W.R. Meadows of Canada or equal.

.10 Joint sealer/filler: non industrial applications to CAN/CGSB-19.24, Type 1, Class B, ASTM C920.

.1 Sikaflex 2C SL two component polyurethane sealant, colour to suit architectural requirements by Sika Canada.

.11 Concrete sealers, cure and seal, and surface densifiers to ASTM C309 and OPSS 1315.

.1 MED-CURE Concrete Curing Aid and Hardener, for interior floors as manufactured by W.R. Meadows of Canada.

.2 Sealtight VOCOMP-20 Concrete Curing & Sealing Compound for interior applications, except for floor areas to have a polished finish or having other thin adhered finishes, as manufactured by W.R. Meadows of Canada.

.3 Sealtight CS-309-30 Concrete Curing & Sealing Compound for exterior applications only, as manufactured by W.R. Meadows of Canada.

.4 LIQUI-HARD Concrete Densifier and Chemical Hardener, for exposed interior concrete floors, as manufactured by W.R. Meadows of Canada.

.12 Other concrete materials: to CSA A23.1/A23.2.

.13 Grout: Premixed compound consisting of non metallic aggregate, Portland cement and water reducing and plasticizing agents to CSA A23.1/A23.2. Compressive strengths to be 35 Mpa @ 28 days. Add potable water to provide minimum slump required to suit the application.

.1 Sealtight CG-86 Construction Grade Grout as manufactured by W.R. Meadows of Canada.

.2 SikaGrout 212 cementitious grout as manufactured by Sika Canada.

.14 Waterstops: Hydrophilic Rubber

.1 Adeka Ultraseal as distributed by OCM, Inc., Wauconda IL. Phone 1-800-999-3959. See drawings for specific types.

.2 Hydrotite CJK as distributed by MME Multiurethanes, 5245 Creekbank Road, Mississauga, ON L4W 1N3, PH. 905 564 7650.

.15 Foundation and below grade insulation: Thickness and extent see plans.

.1 High density expanded polystyrene rigid foam insulation conforming to CAN/ULC-S701-M, Type 2 minimum, as supplied by PlastiFab EPS Product Solutions or Amvic. Thickness & extent as per drawings.

.1 Insulation on faces of foundation walls, and under building floor slabs shall have a compressive resistance of 110 KPa at 10% deformation as per ASTM D 1621. Acceptable product PlastiSpan HD Insulation or Amvic Envirosheet EN-16.

.2 Insulation under exterior structural slabs or pavement on ground subject to vehicular loading shall have a compressive resistance of 200 KPa at 10% deformation as per ASTM D 1621. Acceptable product PlastiSpan 30 Insulation or Amvic Envirosheet EN30.

.16 Under slab vapour barrier: Perminator 10 mil by W.R. Meadows, including manufacturer's recommended seam tape, pipe collars and other accessories. Alternate polyolefin sheet, 10 mil thick, lapped and taped at joints meeting ASTM E-1745-97 Class A requirements for water vapour permeance, tensile strength and puncture resistance.

.17 Dovetail anchor slots: galvanized with insulation filler in slots.

.18 Bonding Agent: meeting requirements of ASTM C1059, Type II.

.1 Sealtight Intralok Bonding Agent as manufactured by W.R. Meadows of Canada.

.2 Sika Albitol Concentrate latex emulsion bonding agent by Sika Canada Inc.

2.4 MIXES

.1 Alternative 1 – Performance Method for specifying concrete: to meet Consultant performance criteria to CSA A23.1/A23.2.

.1 Ensure ready mixed concrete and concrete supplier meet performance criteria as established below and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

.2 Provide concrete mixes to meet the requirements shown on the drawings.

.3 Concrete supplier's certification.

.4 Provide quality management plan to ensure verification of concrete quality to specified performance.

PART 3 EXECUTION

3.1 PREPARATION

.1 Provide Consultant and testing laboratory 24 hours notice before each concrete pour.

.2 Place concrete reinforcing in accordance with CSA A23.1/A23.2 and Consultant reviewed shop drawings and standard procedures of the industry as outlined in RSIC guides.

.3 Use concrete chairs to support reinforcing steel in concrete cast over polystyrene insulation and where vapour barrier membranes are placed below the slab.

.4 Install waterstops in accordance with manufacturer's instructions, where shown on drawings.

.5 During concreting operations:

.1 Development of cold joints not allowed unless these are previously reviewed construction joints.

.2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.

.6 Protect previous Work from staining.

.7 Clean and remove stains prior to application of concrete finishes.

3.2 INSTALLATION/APPLICATION

.1 Do cast in place concrete work in accordance with CSA A23.1/A23.2.

.2 Sleeves, anchors and inserts:

.1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built in. Locations and dimensions for hardware and slots may be depicted on drawings of other disciplines are required by other trades.

.2 Sleeves and openings greater than 100 mm x 100 mm not indicated must be reviewed by Consultant.

.3 Set all anchor rods using templates, and tie to maintain alignment and tolerances. Protect all threads from contamination and damage. Provide plastic caps and guards to all protruding elements to address any safety issues.

.3 Grout under base, bearing, wall plates and machinery bases to ensure full contact without pockets or voids. Select the appropriate grout product to suit the gaps present and follow grout supplier instructions.

.4 Toppings to match strength of base concrete element unless noted. Provide a bonding agent mixed in to a cement slurry coat which is applied with a stiff brush into all crevices to a clean base substrate just ahead of the topping. The cement slurry is not to dry out before topping is placed. Match jointing of base concrete jointing unless noted. Refer to architectural finish schedule for topping tolerances and slopes.

.5 Isolation joints: install premoulded joint filler in to CSA A23.1/A23.2.to be full depth of slab on grade to within 10 mm of slab surface. Apply joint sealant where joints exposed to view in final condition. Where possible delay application of sealant after initial concrete curing as long as possible (90 days) to allow concrete to shrink.

.6 Control and Expansion joints: Cut and Form control joints in slabs on grade at locations indicated, to CSA A23.1/A23.2. Use "soft cut" saws where possible to complete sawcut as early as possible. Clean and prepare joint as per sealant or joint manufacturer requirements and confirm concrete temperature is within allowances and is maintained

above required temperature for curing period of sealant. Tape off or otherwise clean edges of concrete from excess sealant. Delay application of sealant after initial concrete curing as long as possible (90 days).

.7 Damproof and vapour membrane under slabs on grade where noted, sheets to be lapped 150 mm minimum and taped with membrane manufacturer's recommended product. Seal against edges of abutting elements. Place membrane on smooth granular base and provide protection when placing concrete. Note where there are slab thickenings, place membrane under the thickening and then lap and splice with membrane at higher levels under the minimum thickness slab areas.

3.3 SURFACE TOLERANCE

3.4 FINISHES

.1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA A23.1/A23.2 unless otherwise noted on architectural drawings.

.2 For exterior architectural exposed concrete around the building perimeter, typically vertical panels or concrete piers up to 400 mm above the finished floor, provide a light sandblast finish. The sandblasting is to be completed by the same blasting technician who completes the mock up panel, and the sandblasting is to be done to the concrete at the same age after the concrete pour, as the mock up panel was blasted after its pour date, so as to reproduce the appearance and colour of the accepted mock up panel as best as possible.

.3 Pavements, walks, curbs and exposed site concrete:

.1 Screed to plane surfaces.

.2 Provide rounded edges and joint spacings using standard tools.

.3 Trowel smooth to provide light brushed or broomed non slip finish.

.4 Interior floor slabs:

.1 Hand screed and smooth steel trowel finish.

.2 For polished concrete areas as designated on the architectural drawings, refer to Section 03 35 43. Do not complete polished concrete work until the mock up area has been completed, reviewed and accepted. It is suggested this be completed well in advance of pouring any new concrete so the quality level of the final product is clearly understood. Note concrete curing compounds for polished slab areas are restricted to those of section 033543.

3.5 CURING

.1 Cure concrete in accordance with CSA A23.1/A23.2. Refer to concrete mix design table on drawings.

.2 For exposed to view concrete edges, round off all sharp corners to a 3 mm minimum radius using carborundum or grinder. Note architectural tolerances. Completion of a mock up section for architecturally exposed concrete as per section 1.4, for Consultant review.

.3 Cure all Exposure Class C-XL, C-1 or A-1 concrete utilizing CSA A23.1, Table 20, curing type 3, extended wet curing.

.4 Where permitted as an alternative to wet curing, and where no applied finish or bonding agents are required, curing compounds may be used.

.5 Cure, seal and harden all interior concrete floor slabs which are exposed in their final condition, utilizing curing and sealing/hardening compounds. Apply MED-CURE, in accordance with manufacturers published application instructions, immediately after final finishing of concrete. Apply LIQUI-HARD, in accordance with manufacturers published application instructions and to Section 03 35 43 requirements.

3.6 SITE TOLERANCES

.1 Concrete floor slab finishing tolerance: Class A finish in accordance with CSA A23.1 Table 22, utilizing the straightedge method +/- 8 mm. FF =20, FL=15.

.2 Class B for slabs with thin floor coverings FF =25: FL = 20. Surface Waviness Index = 3.

.3 Tolerances for other elements other than slab surfaces to CSA A23.1 Table 15 General Dimensional Tolerances.

3.7 FIELD QUALITY CONTROL

.1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated by Consultant.

3.8 CLEANING

.1 Clean in accordance with Division 1.

.2 Use trigger operated spray nozzles for water hoses.

.3 Provide protection to other non concrete elements during the sandblasting and washing process.

.4 Designate cleaning area for tools to limit water use and runoff.

.5 Cleaning of concrete equipment to be done in accordance with Division 1.

END OF SECTION

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SECTION 03 35 43 — POLISHED CONCRETE FINISHING

PART 1 GENERAL

1.1 GENERAL REQUIRMENTS

A. Comply with requirements of Division 1

1.2 SUMMARY

A. Section includes:

1. Grinding of the slab surface to receive clear, reactive penetrating liquid hardener/densifier
2. Application of clear reactive penetrating liquid hardener and concrete dye
3. Progressively polishing and burnishing of the slab surface to receive finish requirements
4. Application of stain resistant surface treatment

1.3 RELATED WORK

A. Section 03 10 00 - Concrete Forming and Accessories

B. Section 03 30 00 09 - Cast-in-Place Concrete Shortform

1.4 REFERNECES

A. ASTM C779 - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.

B. ASTM F609 - Standard Test Method for Using a Horizontal Pull Slipmeter (HPS)

1.5 ADMNISTRATIVE REQUIREMENTS

A. Pre-Installation Meeting: Convene before the start of work on new concrete slabs, patching of existing concrete slabs and start of application of concrete finish system.

1. Require attendance of parties directly affecting work of this Section, including the Owner's representative, Contractor, Consultant, concrete installer, and applicator. Meeting should only convene when required parties are present.
2. Review the following:

a. Physical requirements of completed concrete slab and slab finish.

b. Locations and time of test areas.

c. Protection of surfaces not scheduled for finish application.

d. Surface preparation.

e. Application procedure.

f. Final appearance of dyed concrete.

g. Quality control.

h. Cleaning.

i. Protection of finish system.

j. Coordination with other work.

1.6 SUBMITTALS

A. Submit manufacturer's product data sheets and tested physical and performance properties on products to be used for the work.

B. Certificates by manufacturer stating that installer is listed applicator of special concrete finishes, and has completed the necessary training programs.

C. Certificates by manufacturer stating that installer is listed applicator of special concrete finishes, and has completed the necessary training programs.

D. Floor Protection Plan.

1.7 QUALITY ASSURANCE

A. Installer Qualifications

1. Use an experience installer and adequate number of skilled personnel who are thoroughly trained and experienced in the floor treatment.

2. The application shall either:

a. An INDUROSHINE approved applicator as certified by W. R. Meadows, having a minimum of 10 projects performed within three years of similar type, size and complexity as this contract.

b. Be a level 2 INDUROSHINE approved applicator by W. R. Meadows.

B. Mock-up

1. At location directed by Consultant, provide mock-up of type of finish required to demonstrate typical joints, surface finish, colour variation (if any), and standard of workmanship

a. Build mock-up approximately 5 m² at location directed by Consultant.

b. Notify Consultant seven days in advance of dates and times when mock-ups will be constructed.

c. Obtain Consultant's approval of mock-ups before starting construction.

d. Maintain mock-up during construction in an undisturbed condition as a standard for judging the completed work.

e. Mock-up may become part of the completed work if approved by Consultant

C. Protection

1. Protect finished concrete floors from damage and staining. Take the following and other steps, as necessary, to ensure uninterrupted effective protection at all times.

a. Provide plywood overlay when working or storing materials on top of polished concrete floor.

b. Hydraulic powered equipment shall be diapered to avoid staining of the concrete.

c. Do not park vehicles on slab. If unavoidable place drop cloths under vehicles.

d. Pipe cutting machines shall not be placed on slab.

e. Steel shall not be placed on slab.

f. Acids and acidic detergents shall not come into contact with slab.

g. Do not mix or otherwise handle liquids without adequate protection.

h. Use rubber tired equipment only.

i. Replace concrete slabs where finish has been discoloured or otherwise damaged due to improper procedures and/or inadequate protection.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage.

B. Store concrete hardener/densifier and surface protectant treatment in environment recommended on published manufacturer's product data sheets

1. Store containers upright in a cool, dry, well-ventilated place, out of the sun with temperature between 4 and 38 degrees C.
2. Protect from freezing.
3. Store away from other chemicals and potential sources of contamination.
4. Keep lights, fire, sparks and heat away from containers.
5. Do not drop containers or slide across sharp objects.
6. Do not stack pallets more than three high.
7. Keep containers tightly closed when not in use.

1.9 FIELD CONDITIONS

A. Environmental limitations

1. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting performance and finishing requirements.

B. Close areas to traffic during floor application and after application for time period recommended in writing by manufacturer.

C. Protect the completed slab to prevent damage by the other trades during floor completion.

D. Temperature Limitations:

1. Apply when surface and air temperature are between 4 degrees C and above 35 degrees C unless otherwise indicated by manufacturer's written instructions.
2. Apply when surface and air temperatures are expected to remain above 4 degrees C for a minimum of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.

E. Apply when air conditions are calm to minimize surface treatment contacting surface not intended to be finished.

F. Do not apply to frozen substrate. Allow adequate time for substrate to thaw, if freezing conditions exist before application.

G. Apply a minimum of 24 hours after rain event. Suspend application when rain is anticipated for a period of 8 hours after application, unless otherwise indicated by manufacturer's written instructions.

H. Temporary heat: Ambient temperature of 10 degrees C minimum.

I. Ventilation: Provide adequate ventilation in confined or enclosed areas in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. List of Acceptable Manufacturers

1. Prosocco
2. W. R. Meadows

2.2 MATERIALS

A. Equipment to be used for grinding/polishing shall be:

1. Three-head counter rotating variable speed floor grinding machine.
2. Dust extraction system and pre-separator.
3. 75kw MQ power generator or equivalent.

B. Equipment to be used for grinding/polishing shall possess at least 775 lb. of head pressure.

C. Equipment to be used for edge grinding/polishing shall be a hand grinder with dust extraction equipment.

D. Diamond grinding segments shall be:

1. Metal bonds: 40, 60, 80, and 150 grit.

E. Diamond polishing pads shall be:

1. Resin bonds: 100, 200, 400, 800 grit

F. Grinding pads for edges shall be:

1. Resin bonds: 40, 60, 80, 100, 200, 400, 800 grit

G. Equipment to be used for densifying and cleaning the floor after grinding/polishing procedure has been performed:

1. Tennant ride-on auto-scrubber or equivalent with a head pressure of 150lb.
2. Follow auto-scrubber's manual for cleaning instructions after densifying and conditioning the floor.
3. Do not allow densifier to remain inside the auto-scrubber after densifying.

H. Concrete densifier:

1. Liquid hardener/densifier shall be LIQUI-HARD as manufactured by W. R. Meadows, or equivalent.

I. Concrete Enhancer

1. Water-based, synthetic polymer concrete floor enhancer shall be BELLATRIX as manufactured by W. R. Meadows, or equivalent.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate with installer present for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Notify the Consultant and Owner, in writing, of conditions detrimental to the proper and timely completion of the work.

B. Do not begin installation until unsatisfactory conditions are resolved. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

C. Provide a minimum of 5 days notice of intended commencement of work to allow for coordination and approval of noise by landlord.

D. Final sheen of an 800 grit Satin level, shall be equivalent to that as accepted on the mock-up.

3.2 PREPARATION

A. Clean dirt, dust, oil, grease and other contaminants that interfere with penetration or performance of specified product from surfaces. Use appropriate concrete cleaners approved by the concrete surface treatment manufacturer where necessary. Rinse thoroughly using pressure water spray to remove cleaner residues. Allow surfaces to dry completely before application of product.

B. Remove all existing glue, and imperfections from existing slabs that may inhibit the installation, efficacy and performance of the specified products.

C. Repair, patch and fill cracks, voids, defects and damaged areas in surface as approved by the Consultant. Allow repair materials to cure completely before application of product.

D. Variations in substrate texture and colour will affect final appearance and should be corrected prior to application of sealer/hardener system and the polishing steps.

E. Protect surrounding areas prior to application. If product is accidentally misapplied to adjacent surfaces, flush with water immediately before material dries.

F. Avoid contact in areas not to be treated. Avoid contact with metal, glass and painted surfaces.

G. Seal open joints in accordance with Section 07 92 00.

H. Apply specified sealants and caulking and allow complete curing before application of penetrating concrete hardener/densifier.

I. Do not proceed until unsatisfactory conditions have been corrected.

3.3 CONCRETE POLISHING

A. General Requirements

1. Adhere to industry standard polishing procedures for dry and wet grinding/ polishing is acceptable when industry standard polishing procedures are adhered to.

2. Scrub and rinse slab surface with clean water and vacuum with auto-scrubber between and after final polishing passes.

3. Sequential progression of diamond polishing steps shall be required and limited to no more than double the grit value of the previous diamonds used.

4. Overlap adjacent polishing passes by 25 percent.

5. Perform each pass perpendicular to the other pass north/south then east/west; multiple passes may be needed.

6. Progressively grind and polish the slab surface utilizing approved diamond segments as necessary to produce Finishing requirements.

B. Application

1. To obtain satin finish that will reflect images from side lighting, ensure applicator follows the applicable procedures incorporating grinding plates in the following order:

a. Verify that the floor is clean and dry prior to polishing procedures

b. Inspect and verify that the floor does not have curled joints, large cracks, spalling or lippage. If lippage or curled joints are present, perform corrective procedures before commencing work.

c. Using the 80-grit metal bond grinding segment, grind the floor surface at a rate of 500 ft.2/hr. Vacuum the surface to remove loose particulates.

d. Using the 150-grit metal bond grinding segment, grind the floor surface at a rate of 600 ft.2/hr. Vacuum the surface to remove loose particulates.

e. Flood surface with concrete densifier and scrub into floor for 45 minutes, ensuring that no puddling of densifier occurs.

f. Squeegee off excess material.

g. Wait 24 hours.

h. Verify that the floor is dry and clear of debris prior to continuation of polishing procedure.

i. Using the 100-grit resin bond polishing segment, grind the floor surface at a rate of 600 ft.2/hr. If scratches from the previous grit are still apparent, decrease the rate of grinding by 100 ft.2 until scratches are removed. Vacuum the surface to remove loose particulates.

j. Using the 200-grit resin bond polishing segment, grind the floor surface at a rate of 700 ft.2/hr. If scratches from the previous grit are still apparent, decrease the rate of grinding by 100 ft.2 until scratches are removed. Vacuum the surface to remove loose particulates.

k. Using the 400-grit resin bond polishing segment, grind the floor surface at a rate of 700 ft.2/hr. If scratches from the previous grit are still apparent, decrease the rate of grinding by 100 ft.2 until scratches are removed. Vacuum the surface to remove loose particulates.

l. Using the 800-grit resin bond polishing segment, grind the floor surface at a rate of 1000 ft.2/hr. If scratches from the previous grit are still apparent, decrease the rate of grinding by 100 ft.2 until scratches are removed. Vacuum the surface to remove loose particulates.

m. Using the auto-scrubber, clean the floor thoroughly as per manufacturer's instructions with a white non-woven pad. Pads should be replaced approximately every 30,000 ft2.

3.4 APPLICATION OF CONCRETE HARDENER/DENSIFIER

A. Apply a single coat of hardener/densifier with a low pressure sprayer fitted with a 0.5 gpm spray tip.

B. Apply sufficient material to wet the surface without producing puddles. Use a clean soft-bristle push broom or microfiber pad to spread the hardener/densifier evenly to achieve uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary.

C. Allow treated surface to dry.

D. Continue progressively dry polishing floor with required resin diamonds to produce desired final finish

3.5 APPLICATION OF INTERIOR CONCRETE PROTECTIVE TREATMENT

A. Application of general purpose, medium gloss protective treatment:

1. Apply per manufacturer's published recommendations to clean, dry slab at the completion of mechanically polishing the slab surface.
2. Lightly wet a clean microfiber pad with PolishGuard and wring out excess, leaving the pad damp.
3. Spray-apply protective treatment using a clean, pump-up sprayer fitted with a 0.5 gpm conical or fan spray tip at an estimated coverage rate of 400 to 800 square feet per gallon. Work from one control joint to another.
4. Spread with the damp microfiber pad. Maintain a thin, even coating and wet edge. Stop spreading once drying begins. Do not overlap. Repeat steps 1 through 4. Two coats are recommended for maximum protection.
5. To increase gloss, wait at least 60 minutes after the final coat is applied, and then use a high- speed burnisher fitted with a white polishing pad. Burnish at a fast walking pace.

3.6 SLAB PROTECTION

A. Protect finished floors to prevent damage including staining, gouges and scratching by construction traffic and activities until possession.

B. Keep surface dry for a minimum of 48 hours after application.

C. Allow 72 hours before heavy traffic.

D. Do not drag or drop equipment or material across the slab which will scratch or chip it.

E. Inspect tires for debris prior to use on slab. Remove embedded items which may cause damage to floor slab.

F. Clean up spills on slab immediately. Provide cleaning chemicals and absorptive materials.

G. Develop a concrete protection procedure which addresses the following procedures:

1. Communication of protection plan to subcontractors and vendors.
2. Procedures for cleaning up slab spills, including use of and availability of cleaning chemicals and absorptive materials at Site.

3.7 FINISHING REQUIRMENTS

A. Appearance

1. Interior exposed colored finished slab areas must consist of the following:

    a. Slab surface must meet Satin Finish requirements, as discussed in pre-installation meeting and be consistent with approved mock-up.

2. Remove defects and re-polish defective areas.

3. Finish edges of floor finish adjoining other materials in a clean and sharp manner.

B. Re-polish those areas not meeting specified gloss levels per mock-up.

C. Fill joints flush to surface prior to the start of polishing operations.

3.8 FINAL CLEANING

A. Upon completion, remove surplus and excess materials, rubbish, tools and equipment.

END OF SECTION 03 35 43

SECTION 04 05 12 — MASONRY MORTAR + GROUT

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Section 04 05 19 — Masonry Anchorage and Reinforcing

B. Section 04 05 23 — Masonry Accessories

1.3 REFERENCES

A. Canadian Standards Association (CSA International)

1. CSA A179-14, Mortar and Grout for Unit Masonry

1.4 SUBMITTALS

A. Product Data

1. Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

2. Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's mortar, grout, parking, colour additives and admixtures.

B. Samples

1. Submit samples in accordance with Section 01 33 00 - Submittals

2. Submit two 10 x 10 x 100mm cured samples of each colour mortar.

C. Manufacturer's Instructions

1. Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

A. Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

1. Submit laboratory test reports in accordance with Section 01 45 00 — Quality Control.

B. Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

C. Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

A. Separate and recycle waste materials in accordance with Section 01 74 19 - Cleaning.

B. Remove from site and dispose of packaging materials at appropriate recycling facilities.

C. Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packing material in appropriate on-site bins, for recycling in accordance with Waste Management Plan.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use same brands of materials and source of aggregate for entire project.

B. Mortar, lime and grout: CSA A179-14.

C. Use aggregate passing 1.18mm sieve where 6mm thick joints are indicated.

D. Colour: ground coloured natural aggregates or metallic oxide pigments.

E. Mortar for exterior masonry above grade:

1. Load bearing: type [N] [S] [M] based on [Property] [Proportion] specifications.

2. Non-Loadbearing: type [N] [S] based on [Property] [Proportion] specifications.

3. Parapet walls, chimneys, unprotected walls: type [N] [S] based on [Property] [Proportion] specifications.

F. Mortar for foundation walls, manholes, sewers, pavements, walks, patios, and other exterior masonry at or below grade: type M based on Proportion specifications.

G. Mortar for interior masonry.

1. Loadbearing: type S based on Proportion specifications.

H. Following applies regardless of mortar types and uses specified above:

1. Mortar for calcium silicate brick and concrete brick: type O based on Proportion specifications.
2. Mortar for stonework: type N based on Proportion specifications.
3. Mortar for grouted reinforced masonry: type S based on Proportion specifications.
4. Mortar for pointing: type O based on Proportion specifications.
5. Mortar for glass block: 1 part Portland cement, 1 part hydrated lime, 4 parts aggregate by volume.
6. All mortar: use white Portland cement, and lime to produce mortar type specified.
7. Coloured mortar: use colouring admixture not exceeding 10% of cement content by mass, or integrity coloured masonry cement, to produce coloured mortar to match approved samples.
8. Use remanufactured portland lime sand mortar, Type N1-1-6 by proportion for Brick, Type S PLS mortar for all block and stone work.
9. Non-Staining mortar: use non-staining masonry cement for cementitious portion of specified mortar type.
10. Grout: to CSA A179-14, Table 3

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogues installation instructions, product carton installation instructions, and data sheets.

3.2 CONSTRUCTION

A. Do masonry mortar and grout work in accordance with CSA A179-14 except where specified otherwise.

3.3 CLEANING

A. Upon completion of installation, remove surplus materials, rubbish, tools, and equipment barriers.

END OF SECTION 04 05 12

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 45 00 – Quality Assurance and Control

.3 Section 04 05 10 – Common Work Results for Masonry

.4 Section 04 05 12 – Masonry Mortar and Grout

.5 Section 04 05 23 – Masonry Accessories

1.2 REFERENCES

.1 ASTM International Inc.

.1 ASTM A36/A36M-0, Standard Specification for Carbon Structural Steel

.2 ASTM A167-15, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

.3 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength

.4 ASTM A580/A580M-16, Standard Specification for Stainless Steel Wire

.5 ASTM A641/A641M-R2014, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

.6 ASTM-A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

.7 ASTM A1022 16B, Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA A165 Series 2004, CSA Standards on Concrete Masonry Units covers A165.1, A165.2, A165.3

.2 CAN/CSA A371 04, Masonry Construction for Buildings

.3 CSA S304.1-04, Design of Masonry Structures

.3 Reinforcing Steel Institute of Canada (RSIC)

.1 Reinforcing Steel Manual of Standard Practice, 2004

1.3 DESIGN CRITERIA

.1 Non- conventional Masonry Connectors

.1 Deflection: Maximum 2 mm, including free play when acted upon by 0.45 kN (100lbs) lateral load, in all possible positions of adjustments.

.2 Positive restraint at position of maximum adjustment.

.2 Multi-component Ties – Free Play: Maximum 1.2 mm, when assembled in any possible configuration.

1.4 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit four (4) copies of WHMIS MSDS Material Safety Data Sheets in accordance with Section 01 33 00 – Submittal Procedures. Indicate VOC's for epoxy coatings and galvanized protective coatings and touch-up products.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings consist of anchorage details, bar bending details and placement drawings. Provide details of hardware to keep reinforcing in the specified positions.

.3 On placement drawings, indicate sizes, spacing, location and quantities of reinforcement, splice locations and connectors. Provide wall reinforcing elevations at 1:50 scale drawing.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect anchorage and reinforcing materials from damage and contamination from oils and other dirt or materials that would prevent bonding to grout or adversely impact the finish or coatings.

.3 Replace defective or damaged materials with new.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with MOE Ontario Reg. 102/95 & 103/95 Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal all material waste and packaging material in separate bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility authorized to receive materials wherever possible.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Product: Masonry Connectors

.1 Slotted L-Plate: Length to suit thickness of wall cavity

.2 V-Tie: Length to provide placement of legs at centreline of solid unit veneer

.3 Insulation Support

.4 Finish: Steel Components, hot dip galvanized to CAN/CSA A370-04

.5 Spacing

.6 Typical: Maximum 800 mm on centre horizontal, maximum 600 mm on centre vertical

.7 Fasteners Per Masonry Connectors: Two (2) Self-Tapping No. 8, to CAN/CSA A307-04

.2 Horizontal joint reinforcing for concrete block: Use 3.66 mm thick steel side and cross rods mill galvanized for interior walls, and hot dipped galvanized reinforcing for exterior walls. Use ladder type reinforcing where block cells are vertically reinforced and truss type reinforcing for other walls. Use prefabricated reinforcing for standard 90 degree corners.

.3 Reinforcing steel: new, deformed, billet steel bars to CSA Standard G30.18, Grade 400R. Where welding of bars is required use Grade 400W.

.4 Anchors: to CAN/CSA-A370:

.1 Conventional Anchors: type steel bolts with bent bar anchors, through bolts, plate anchors, shape and sized to suit application.

.2 Wedge Anchors: expansion anchors type, sized to suit application.

.3 Sleeve Anchors: type sleeve and bolt hex head unless noted, sized to suit application.

.4 Self-Contained Anchors: type double-glass/plastic vial system, with epoxy resin and hardener.

.5 Dovetail Anchors: bent steel strap, 25 mm wide minimum size x1.52 mm thick, minimum 13 mm wide at neck of dovetail, galvanized to CAN/CSA-A370 Table 5.2 uncoated coated finish.

.6 Spiral Anchors: 8 mm stainless steel spiral anchors to Grade 304.

.7 Stone Anchors: series 300 stainless steel conforming to ASTM A666. Anchors manufactured according to drawings.

.8 Anchor Rods: conventional (unpatented) anchors steel plain finish unless noted, where noted as galvanized or in exposed locations use galvanized to CAN/CSA-A370 Table 5.2.

.5 Conventional Bolts:

.1 Bolts: to ASTM A36, bar stock shop threaded, straight bolts with square or hex-headed nuts or bent bar anchors, L or J shaped to suit conditions.

.2 Plate anchors: steel to ASTM A36, weld square of circular steel plate perpendicular to axis of steel bar threaded on opposite end.

.3 Through bolt rods: to ASTM A307 threaded rod or threaded ASTM A36 bar stock.

.6 Adhesive Anchors: proprietary systems, Hilti or Ucan, mixed in accordance with manufacturers' written instructions using specified equipment, drill sizes and cleaning procedures, cure times and torque installation settings.

2.2 FABRICATION

.1 Fabricate connectors in accordance with CSA A370.

.2 Ship connectors, clearly identified in accordance with drawings.

2.3 SOURCE QUALITY CONTROL

.1 Contractor to propose, in writing, to the Consultant an alternative for proposed source of material to be supplied for approval.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for anchorage and reinforcing materials installation in accordance with manufacturer's written instructions.

.2 Visually inspect substrate before installation begins.

.3 Inform General Contractor and Consultant of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions remedied and after receipt of approval to proceed from Consultant.

3.2 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.3 GENERAL

.1 Supply and install masonry connectors and reinforcement in accordance with CSA A370, CSA A371, CAN/CSA A23.1 and CSA S304.1 unless indicated otherwise.

.2 Maximum recommended spacing:

.1 800 mm Horizontal

.2 600 mm Vertical

.3 Prior to placing mortar, obtain Consultant's approval of placement of connectors.

.4 Supply and install additional reinforcement to masonry as indicated.

.5 Install grout in high lifts or low lifts in accordance with CSA-A371, and as shown on drawings. All cells to be grouted to be free of mortar. Ensure all grout is vibrated to avoid pockets or voids. Provide cleanouts at the bottom of the grouted cells for high lift masonry. Coordinate the method of grouting with the reinforcing steel detailing of bar lengths at the shop drawing production stage of the reinforcing steel supply.

3.4 BONDING AND TYING

.1 Bond walls of two or more wythes using metal connectors in accordance with CSA S304, CSA A371 and as indicated.

.2 Maintain 75 mm clear between the existing east exterior wall and the new 240 block firewall. Do not tie walls together.

.3 Tie masonry veneer to backing in accordance with NBC, CSA S304.1, CSA A371 and as indicated.

.4 In the event that the substrate is compressible, ensure tie is securely fastened to structural supports such as the wood studs, cold formed channels, back up block or concrete.

.5 Install unit, adjustable, single wythe and multiple wythe joint reinforcement where indicated and in accordance with CAN/CSA-A370 and CAN/CSA-A371.

.6 Bond walls of two or more wythes using metal connectors in accordance with CAN/CSA-A371 and as indicated.

.7 Provide horizontal joint reinforcing in every second course of solid masonry unless noted on plan schedules or sections. Joint reinforcing to stop each side of control joint locations. Lap horizontal joint reinforcing 150 mm minimum.

.8 Place masonry joint reinforcement in first horizontal joint above and below openings. Extend minimum 400 mm each side of opening.

.9 Place joint reinforcement continuous in first joint below top of walls.

.10 Connect stack bonded unit joint corners and intersections with strap anchors 400 mm on centre.

3.5 REINFORCED LINTELS AND BOND BEAMS

.1 Reinforce masonry beams, masonry lintels and bond beams as indicated. Where vertical reinforcing passes through horizontally reinforced beams, use "W" type or open cell type blocks.

.2 Place and grout reinforcement in accordance with CSA S304.1, CAN/CSA-A371, and CAN/CSA-A179.

.3 Support and position reinforcing bars in accordance with CAN/CSA-A371.

3.6 GROUTING

.1 Grout masonry in accordance with CSA S304.1, CSA A371 and CSA A179 and as indicated.

3.7 ANCHORS

.1 Supply and install metal anchors as indicated, and where replacement of existing anchors is determined by Consultant to be required.

.2 Replacement of existing anchors:

.1 Cut back existing rigid board insulation and existing air barrier to allow sufficient access to the work. Openings in the existing rigid board insulation not to exceed 300 mm x 300 mm unless otherwise approved by Consultant.

.2 Install new anchor(s) as per manufacturers' instructions.

.3 Reinstate rigid board insulation and fill any gaps in the insulation repair with one part polyurethane insulation in accordance with Section 07 21 19 – Foamed in Place Insulation.

.4 Reinstate air barrier insuring all air barrier membranes are made continuous. Sheet membranes shall be lapped a minimum of 150mm. All joints and penetrations are to be taped or sealed as indicated.

3.8 LATERAL SUPPORT AND ANCHORAGE

.1 Supply and install lateral support and anchorage in accordance with CSA S304.1 and as indicated on drawings or Typical Details.

.2 Coordinate setting of steel bearing and wall plates for support of structural steel elements, which may be supplied by others. At firewall locations, maintain 90 mm minimum solid masonry in back side of wall or pier pockets.

3.9 MOVEMENT JOINTS

.1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.10 FIELD BENDING

.1 Not applicable.

3.11 FIELD TOUCH UP

.1 Not applicable.

3.12 FIELD QUALITY CONTROL

.1 Site inspections in accordance with Section 04 05 00 - Common Work Results for Masonry.

.2 Obtain Consultant approval of placement of reinforcement and connectors, prior to placing grout.

3.13 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools, equipment and barriers.

.2 Exposed masonry to be surface cleaned of all excess mortar droppings and dirt. For masonry to be painted, obtain Architect's review to confirm satisfactory conditions.

END OF SECTION

SECTION 04 05 23 — MASONRY ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures

B. Section 01 74 19 - Construction/Demolition Waste Management and Disposal

C. Section 04 05 10 - Common Work Results for Masonry

D. Section 04 05 19 - Masonry Anchorage and Reinforcing

1.3 REFERENCES

A. American Society for Testing and Materials International, (ASTM)

1. ASTM D2240-15, Standard Test Method for Rubber Property - Durometer Hardness

B. Canadian Standards Association (CSA International)

1. CSA-A371-14, Masonry Construction for Buildings.

1.4 SUBMITTALS

A. Product Data:

1. Submit manufacturer’s printed product literature, specifications and data sheet.

2. Submit two copies of WHMIS MSDS - Material Safety Data Sheets. Indicate VOC’s for joint fillers and lap adhesives.

B. Manufacturer’s Instructions:

1. Submit manufacture’s installation instructions.

1.5 QUALITY ASSURANCE

A. Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

B. Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

C. Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirement.

1.6 WASTE MANAGEMENT AND DISPOSAL

A. Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

B. Remove from site and dispose of packaging materials at appropriate recycling facilities.

C. Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging materials in appropriate on-site bin for recycling in accordance with Waste Management Plan.

PART 2 PRODUCTS

2.1 MATERIALS

A. Control joint filler: purpose-made elastomer durometer hardness in ASTM D2240 of size and shape indicated.

B. Lap adhesive: recommended by masonry flashing manufacturer.

C. Mechanical fasteners.

D. Fllashings.

1. Plain: [0.5] [0.10] [0.75] mm thick polyethylene film bonded to asphalt treated crepes kraft.

2. Modified Bitumen such as Baker TIVF or equivalent by Soprema.

E. Aluminum flashings

1. Aluminum foil, 0.004 mm thick, asphalt laminated between two sheets of creped kraft paper with one exposed paper surface coated with asphalt-wax treatment.

F. Mortar Net

1. Mortar Net for Installation at bottom of exterior veneer/cavity walls.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

A. Install continuous control joint fillers in control joints at locations indicated on drawings.

B. Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm on centre.

3.3 CONSTRUCTION

A. Build in flashings in masonry in accordance with CSA-A371-14.

1. Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.

2. In cavity walls, carry flashings from front edge of masonry, under outerwyther, up backing to top of back of block with and across it as a thru-wall flashing for:

    a. For masonry backing embed flashing 25mm in joint.

    b. For concerte backing, insert flashing into reglets.

    c. For wood frame backing, staple flashing to walls behind sheathing paper.

        1) Delta vent, Henry vapour barrier or similar.

3. Lap joints 150 mm and seal with adhesive.

3.4 CLEANING

A. Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION 04 05 23

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 45 00 – Quality Assurance

.2 Section 04 05 00 – Common Work Results for Masonry

.3 Section 04 05 12 – Masonry Mortar and Grout

.4 Section 04 05 23 – Masonry Accessories

1.2 REFERENCES

.1 ASTM International Inc.

.1 ASTM E336-11, Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA A165 Series 2004, CSA Standards on Concrete Masonry Units covers: A165.1, A165.2, A165.3

.2 CAN/CSA A371 04, Masonry Construction for Buildings

.3 CSA S304.1-04, Design of Masonry Structures

.3 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)

.1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Product Data: provide product data, including manufacturer's printed data sheets and catalog pages illustrating products to be incorporated into project for specified products.

.3 Samples:

.1 Provide unit samples in accordance with Section 04 05 00 - Common Work Results for Masonry.

.4 Manufacturer's Written Instructions: provide in accordance with Section 04 05 00 - Common Work Results for Masonry.

1.4 QUALITY ASSURANCE SUBMITTALS

.1 Certificates: provide in accordance with Section 04 05 00 - Common Work Results for Masonry.

.2 Test and Evaluation Reports: provide certified test reports in accordance with Section 04 05 00 - Common Work Results for Masonry. Do not ship uncured units to the site.

.3 Pre-Installation Meetings: conduct pre-installation meeting in accordance with Section 04 05 00 - Common Work Results for Masonry to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle concrete unit masonry in accordance with Section 04 05 00 - Common Work Results for Masonry.

.2 Packaging Waste Management:

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Standard auto-claved concrete block units to CAN/CSA A165 Series (CAN/CSA A165.1). Use Type H/15/A/M for hollow units and type S/15/A/M for solid units.

.1 Dimensions - Nominal: 250mm wide x 200 mm high x 400 mm long (standard metric units). Standard grey colour.

.2 Special shapes: provide square, bull nosed, double bull nosed units for exposed corners. Provide purpose made shapes for lintels, beams and bond beams. Provide additional special shapes as indicated such as “W” block where horizontal and vertical reinforcing passes through the block.

.3 Where some existing block is being removed, salvage Imperial block units for areas where Imperial based units are required for repairs.

.4 Profile/Texture for Architectural Concrete Unit Masonry:

.1 Surface texture: ground face, plain units.

.5 Fire resistance characteristics: aggregate used in units and equivalent thickness of units to the National Building Code of Canada (NBC), and in accordance with CAN/ULC-S101, for fire-resistance ratings indicated.

2.2 REINFORCEMENT

.1 Reinforcement in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

2.3 CONNECTORS

.1 Connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

2.4 FLASHING

.1 Flashing: in accordance with Section 04 05 23 - Masonry Accessories.

2.5 MORTAR MIXES

.1 Mortar and mortar mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.

2.6 GROUT MIXES

.1 Grout and grout mixes in accordance with Section 04 05 12 - Masonry Mortar and Grout.

2.7 CLEANING COMPOUNDS

.1 Use low VOC products in compliance with SCAQMD Rule 1168.

.2 Compatible with substrate and acceptable to masonry manufacturer for use on products.

.3 Cleaning compounds compatible with concrete unit masonry and in accordance with manufacturer's written recommendations and instructions.

2.8 TOLERANCES

.1 Tolerances for standard concrete unit masonry tolerances in accordance with CAN/CSA A165.1, supplemented as follows:

.1 Maximum variation between units within specific job lot not to exceed 2 mm.

.2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.

.3 Out of square tolerance not to exceed 2 mm.

.2 Tolerances for architectural concrete masonry units in accordance with CAN/CSA A165.1, supplemented as follows:

.1 Maximum variation in length or height between units within specific job lot for specified dimension not to exceed 2 mm.

.2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.

.3 Out of square tolerance not to exceed 2 mm.

.4 Maximum variation in width between units within specific job lot for specified dimension not to exceed 2 mm.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify surfaces and conditions are ready to accept work of this Section.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Commencing installation means acceptance of existing substrates.

3.2 PREPARATION

.1 Protect adjacent finished materials from damage due to masonry work and from all subsequent cleaning of masonry operations.

3.3 INSTALLATION

.1 Concrete block units:

.1 Bond: running.

.2 Coursing height: 200 mm for one block and one joint (10 mm).

.3 Jointing: concave where exposed or where paint or other finish coating is specified.

.4 Install special units to form corners, returns, offsets, reveals and indents without cut ends being exposed and without losing bond or module.

.5 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated. Erect lintels over openings, and anchor masonry to concrete and structural steel elements as detailed in the general notes and standard details, and shop drawings.

.6 End bearing: not less than 200 mm and as indicated on drawings. Fill block below bearing points with grout to 200 mm depth and to 200mm each side of concentrated bearing points, and the solid bearing length shall be at least twice the length of the bearing plate unless otherwise detailed, and in no case less than 400 mm long. Form and pour concrete caps, complete with bearing plates and hardware, at highly loaded locations as shown on the structural plans.

.7 For openings in existing walls using Imperial block units, re-use existing salvaged Imperial size block where possible.

3.4 REINFORCEMENT

.1 Install reinforcing in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing. All reinforced cells to be fully grouted. Keep mortar clear of cell openings to allow proper consolidation of grout.

3.5 CONNECTORS

.1 Install connectors in accordance with Section 04 05 19 - Masonry Anchorage and Reinforcing.

3.6 FLASHING

.1 Install flashings: in accordance with Section 04 05 23 - Masonry Accessories.

3.7 MORTAR PLACEMENT

.1 Place mortar in accordance with Section 04 05 12 - Masonry Mortar and Grout.

3.8 GROUT PLACEMENT

.1 Place grout in accordance with Section 04 05 12 - Masonry Mortar and Grout.

3.9 CONSTRUCTION

.1 Cull out masonry units, in accordance with CAN/CSA A165 and reviewed approved range of colour samples, with chips, cracks, broken corners, excessive colour and texture variation.

.2 Build in miscellaneous items such as bearing plates, steel angles, bolts, anchors, inserts, sleeves and conduits.

.3 Construct masonry walls using running stack bond unless otherwise noted. Anchor or bond intersecting walls with 50 % overlap in units. Anchor walls to concrete and steel elements at 400 mm on centre.

.4 Build around frames previously set and braced. Fill behind hollow frames within masonry walls with mortar or grout and embed anchors.

.5 Fit masonry closely against electrical and plumbing outlets so collars, plates and covers overlap and conceal cuts.

.6 Horizontal runs of conduit or cables inside reinforced masonry walls are not permitted without specific location engineering review and approval. Vertical runs of plumbing within loadbearing masonry walls are not permitted.

.7 Install movement joints and keep free of mortar where indicated. Provide vertical control joints in masonry walls at 7600 mm maximum and coordinate with shear wall schedules and architectural wall elevations. Confirm locations with consultant before commencing work, coordinate with reinforcing steel placing drawings.

.8 Hollow Units: spread mortar setting bed from outside edge of face shells. Gauge amount of mortar on top and end of unit to create full joints, equivalent to shell thickness. Avoid excess mortar.

.9 Solid Units: apply mortar over entire vertical and horizontal surfaces. Avoid bridging of airspace between brick veneer and backup wall with mortar.

.10 Ensure compacted head joints. Use full or face-shell joint as indicated.

.11 Tamp units firmly into place.

.12 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.

.13 Tool exposed joints concave; strike concealed joints flush.

.14 After mortar has achieved initial set up, tool joints.

.15 Do not interrupt bond below or above openings.

.16 For pockets in firewall, maintain 90 mm minimum depth of solid masonry behind the bearing so there are no openings through the firewall.

.17 For masonry lintels, leave shoring/support in place for 30 days to allow for grout curing.

3.10 REPAIR/RESTORATION

.1 Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.

3.11 FIELD QUALITY CONTROL

.1 Site Tests, Inspection: in accordance with Section 04 05 00 - Common Work Results for Masonry supplemented as follows:

.1 Concrete masonry units will be sampled and tested by independent testing agency appointed and paid by Cash Allowance in accordance with CSA S304.1, unless

manufacturer can provide independent testing results of the same size and strength of block, fabricated within the same facility under the same mix design and process within 6 months of proposed shipping of units to the site.

.2 No masonry work shall be permitted with temperature below 5 degrees Celsius unless provisions are made for heating the materials and protecting the work. Provide a written work plan to the Consultant.

.2 Manufacturer's Field Services: in accordance with Section 04 05 00 - Common Work Results for Masonry.

3.12 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning, supplemented as follows.

.1 Progress Cleaning:

.1 Standard Concrete Unit Masonry:

.1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. For walls not exposed in their final condition, omit the rubbing with the small piece of block, leave surface smooth so mounting of furring or other components is even on the block face. Clean wall surfaces exposed to view with suitable brush or burlap.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

3.13 PROTECTION

.1 Design and engineer bracing and temporary supports to suit site conditions and construction sequencing. Brace and protect concrete unit masonry in accordance with Section 04 05 00 - Common Work Results for Masonry.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 05 21 00 Steel Joist Framing

.2 Section 05 31 00 Steel Decking

.3 Section 05 41 00 Structural Metal Stud Framing

.4 Section 05 50 00 Metal Fabrications

.5 Section 05 51 29 Metal Stairs and Ladders

.6 Section 09 91 00

1.2 REFERENCE STANDARDS

.1 ASTM International Inc.

.1 ASTM A36/A36M-08, Standard Specification for Carbon Structural Steel

.2 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless

.3 ASTM a108-07, Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished

.4 ASTM A123/A123M-09, Standard Specification for Zinc Hot Dip Galvanized Coatings on Iron and Steel Products

.5 ASTM A193/A193M-08, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications

.6 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

.7 ASTM A325-09, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

.8 ASTM A325M-09, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric

.9 ASTM A490M-08, Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints Metric

.10 ASTM A572/A 572-07 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

.11 ASTM A570-79, Standard Specification for Hot Rolled Carbon Steel Sheet and Strip, Structural Quality

.12 ASTM A653/A653M-11 Standard Specification for Steel Sheet, Zinc –Coated (Galvanized) or Zinc-Iron-Alloy Coated (Galvanealed) by the Hot Dip Process

.13 ASTM A780/A780M-09 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

.14 ASTM A992/A992M-11, Standard Specification for Structural Steel Shapes

.15 ASTM F1554-07, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

.16 ASTM F1852-08 Standard Specification or “twist off” type tension control structural bolt/nut/washer assemblies, steel, heat treated 120/105 ksi minimum tensile strength

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-85.10-99, Protective Coatings for Metals

.2 CAN/CGSB-1-GP171-98, Inorganic Zinc Coating

.3 CAN/CGSB-1.181-99, Ready Mixed Organic Zinc-Rich Coating

.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA)

.1 Handbook of the Canadian Institute of Steel Construction

.2 CISC Code of Standard Practice for Structural Steel

.3 CISC/CPMA Standard 1-73a A Quick –Drying One Coat Paint for Use on Structural Steel

.4 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel

.4 Canadian Standards Association (CSA International)

.1 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel

.2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles

.3 CAN/CSA-S16-09, Limit States Design of Steel Structures

.4 CAN/CSA-S136-07, North American Specifications for the Design of Cold Formed Steel Structural Members

.5 CSA W47.1- 09, Certification of Companies for Fusion Welding of Steel

.6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding

.7 CSA W55.3--08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings

.8 CSA W59-03, Welded Steel Construction (Metal Arc Welding)

.9 CSA W178.1-08, Certification of Welding Inspection Organizations

.10 CSA W178.2-08, Certification of Welding Inspections

.11 CSA G189-1966(R2003) Sprayed Metal Coatings for Atmospheric Corrosion Protection

.5 Master Painters Institute

.1 MPI-INT 5.1-08, Structural Steel and Metal Fabrications

.2 MPI-EXT 5.1-08, Structural Steel and Metal Fabrications

.6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International

.1 NACE No. 3/SSPC SP-6-06, Commercial Blast Cleaning

.2 SSPC SP-3, Power Tool Cleaning

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Shop Drawings:

.1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 Submittal Procedures, and CISC Code of Standard Practise for Structural Steel. Show all splices, types of shop and field connections, and weld details. Show large scale details depicting precautions to be taken.

.2 The General Contractor or Construction Manager is to ensure that the office preparing the erection and shop drawings is copied with a complete set of contract drawings including the structural drawings, specifications plus all addenda and revisions.

.3 Identify on the drawings, any dimensions which have been derived from field measurements.

.4 Make corrections to shop and erection drawings required by previous reviews, before resubmitting drawings. Do not add completely new details to previously submitted drawing sheets; add new drawing sheets as applicable.

.3 Erection drawings:

.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:

.1 It is advisable to submit erection drawings and sketch details of special connection conditions for review before preparing detail drawings.
.2 Description of methods.
.3 Sequence of erection and division of work areas on plans.
.4 Type of equipment used in erection.
.5 Temporary bracings.

.2 Indicate locations, mark or type number, orientation and setting requirements for components fabricated and supplied by the steel trade, but not installed by the steel erection crew, such as anchor rods, bearing plates on masonry or concrete, lintels and other miscellaneous components.

.3 Indicate fieldwork required to existing elements, to support new structural steel.

.4 Re-issue applicable erection drawings, or partial drawings during construction to coordinate additional field work or repairs to already erected steel.

.5 Maintain a set of reviewed erection drawings on site. Use only these drawings and the contract drawings to erect structural steel. Make these drawings available to independent inspection agencies or consultants when on site.

.6 Clearly indicate on the erection drawings, which components are designated as Architecturally. Exposed Structural Steel (Category 2), so additional care can be afforded such pieces during the storage and erection of same.

.4 Fabrication drawings:

.1 Submit fabrication drawings showing designed assemblies, components and connections sealed and signed by qualified professional engineer licensed in Ontario, Canada.

.2 The fabricator's design engineer shall provide proof of personal or corporate professional liability errors and omissions insurance in the amount of $ 1 000 000.00 per claim.

.3 Submit if requested, a signed and sealed letter to the Consultant stating that all shop fabrication drawings have been prepared and reviewed under the connection Design Engineer's supervision.

.4 It is the consultant's discretion whether the fabrication drawings will be accepted for the record, reviewed in detail, and or returned with comments.

.5 Samples:

.1 Prepare sample of typical exposed structural connections in accordance with CISC Specifications of Architecturally exposed structural steel for approval of Architect. Samples to be judged upon alignment of surfaces, uniform contact between surfaces, smoothness and uniformity of finished welds. When approved, sample units will serve as a standard for workmanship, appearance and material acceptable for entire project.

.2 Submit samples in accordance with Section 01 33 00 Submittal Procedures.

.6 Source Quality Control Submittals:

.1 Submit 4 weeks prior to fabrication of structural steel.

.1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
.2 Provide mill test reports certified by metallurgists qualified to practise in Province of Ontario.

.7 Fabricator Qualification and Reports:

.1 Provide structural steel fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

.2 Fabrication and erection is to be completed by a member of the Canadian Institute of Steel Construction. Alternately submit qualifications and quality assurance programme and a list of recent references for similar type project work, **prior** to tender closing for review and acceptance or rejection by the Consultants. Welding shall be performed by firms fully approved by the Canadian Welding Bureau under the requirements of CSA Standard W47.1.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.

.2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact. Joists to be tagged with a permanent label identifying type and mark to correlate with the erection plan. All other steel components to be marked, showing member orientation, in a location not viewable in the buildings finished condition, but viewable during construction, correlated to the member mark shown on the erection drawings.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Design details and connections in accordance with requirements of CAN/CSA S16 and CAN/CSA S136 to resist forces, moments, shears and allow for movements indicated. Special consideration shall be given to seismic detailing consistent with the “R” value shown on the drawings or notes to provide adequate capacity and ductility. All loads indicated shall be considered as service loads unless indicated as factored loads.

.2 Connections:

.1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.

.2 Select or design shear connections to support the reaction from a maximum uniformly distributed load that can be safely supported by the beam in bending, provided no point loads act on beam; or the minimum connection service load in kN at each end is equal to the nominal depth of the beam in mm multiplied by 0.5 whichever is larger, in cases when actual shear forces are not indicated.

.3 For composite beams, increase the end shear connection loads to 75% of the total uniformly distributed factored load on the steel section, unless indicated otherwise.

.4 Use double angle headers or end connection plates whenever possible. Single angle headers shall not be used for beam depths greater than 530 mm deep. Minimum depth of headers and end plates shall be one half of the beam depth. Seated beam connections are to have top clip angles for stability. Cantilevered plate connections are not desirable and will only be considered for secondary members carrying minor loads. Provide all eccentrically loaded spandrel beams, including loads from curtainwall connections, with top and bottom flange connections for torsional restraint. Bolted connections will have two bolts minimum.

.5 Provide web and flange stiffener plates where indicated, and as required by design. Reinforce all column webs for shear forces in excess of web capacity.

.6 For hot dip galvanised members, all welds are to be designed as continuous and design all drainage and vent holes to suit the galvanising process. Coordinate requirements with the galvanising plant.

.7 Design connections at the end of compression and tension members, to develop the capacity of the member, or for the loads as specifically shown, and in keeping with the seismic ductility requirements.

.8 Design and connect diagonal lateral load carrying bracing members to have a pre-stress of approximately 14 MPa, to eliminate slack in the member. Provide detailed procedures to achieve the prestress on the erection drawings.

.9 Refer to project abbreviations and symbols. Unless otherwise noted, “C” = compressive axial load in kN; “T” = tension axial load in kN; “M” = bending moment in kN.m, where Mx = strong axis and My = weak axis, “MT” = torsional bending moment in kN.m, “V” = shear force in kN.

.10 Provide for future connections or extensions where the plans indicate a future addition.

.11 Bolted connections shall be bearing type unless otherwise indicated. Oversize holes subject to approval, and shall be designed to slip critical requirements unless approved otherwise.

.3 For composite construction select or design minimum end connection to resist reaction resulting from factored moment resistance as tabulated in the "Handbook of the Canadian Institute of Steel Construction" assuming 100% shear connection with depth of steel deck and/or slab shown on drawings.

.4 Submit sketches, and design calculations when requested, stamped and signed by qualified professional engineer licensed in Ontario, Canada for non standard connections.

2.2 MATERIALS

.1 Structural steel – rolled W and WT wide flange sections and Tees and WWF welded wide flange sections: to CAN/CSA G40.20/G40.21 Grade 350W, ASTM A992 Grade 50. Steel plate to CAN/CSA G40.20/G40.21 Grade 300W. Rolled channel, C shapes, and angles L to CAN/CSA G40.20/G40.21 Grade 300W. S shapes to ASTM A572 Grade 50 Fy = 345 MPa. HSS Structural Sections to CAN/CSA G40.20/G40.21 Grade 350W Class C or ASTM A500 Grade C Fy=345 MPa.

.2 Cold formed C channels and Z sections to CSA G40.20/G40.21 and CAN/CSA S136, material ASTM A653/A653M for coated sections and ASTM A1011/A1011M for uncoated sections, both Grade 50 Fy = 345 MPa.

.3 Pipe to ASTM A53, minimum Fy= 240 MPa.

.4 Steel Grating: Steel bars to ASTM A1011/A1011M Commercial Steel (type 2), cross rods ASTM A510. Selected configuration to sustain a maximum deflection of span/180 for total loading. Edge banded for all panels.

.5 Joint filler for exposed steel work: Epoxy resin.

.6 Existing Structural steel, unless otherwise shown or noted, assume Fy=230 MPa minimum. For existing joists in Community Hall, existing rod web members 300W, chord members 350W.

.7 Anchor rods and end plates: to CSA-G40.20/G40.21, Grade 300W or CSA G30.18 Grade 400W for deformed anchors (rebar).

.8 High strength structural bolts, nuts and washers: to ASTM A325/ASTM A325M.

.9 Machine bolts, nuts and washers to fasten non steel components to structural steel to ASTM A307.

.10 Welding materials: to CSA W59 CSA W48 Series and certified by Canadian Welding Bureau. Welding electrodes to metric classification series E49XX unless noted. Welding of stainless steel, review with consultant.

.11 Shop coat paint: CISC/CPMA 1-73a only where steel is concealed by final finishes, the steel is in a conditioned environment and when it is not required to be painted with an architectural finish paint.

.12 Zinc rich shop primer paint: CAN/CGSB – 1.132.

.13 Shop paint primer: to CISC/CPMA 2-75 solvent reducible alkyd, red or grey oxide. Ensure compatibility with final finish paint, expected to be white in colour.

.14 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600g/m2.

.15 Shear studs: ASTM A108, Grades 1015 – 1020, Fy = 350 MPa, to CSA W59, Appendix H.

.16 For headed anchors to be cast in concrete, use Nelson H4L anchors, diameter and length as per plans.

.17 Drilled wedge type mechanical anchors: Supplied by Hilti Canada, ITW, or UCAN Fastening Products, size to suit design loading and clearances, hot dipped galvanized unless noted.

.18 Bolts can be Metric or Imperial; however, all nuts and bolts must be consistently of one type for the entire project.

2.3 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S136 and CAN/CSA-S16 and in accordance with reviewed shop drawings.

.2 Provide cambers for beams as specified, and where not specified, orient beams so that cambers within mill tolerances are erected upwards.

.3 Continuously seal members by continuous welds for exterior exposed steel and intermittent welds and plastic filler for interior steel. Grind smooth. Provide effective drainage holes to prevent accumulation of water in hollow sections and as required to permit hot dip galvanising operations where applicable.

.4 Provide holes in or weld studs to flanges for attachment of wood nailers and other architectural components. Indicate on fabrication drawings.

.5 Clearly mark pieces by stamping or painting, to avoid removal during shipping and handling, for individual pieces with designations matching those specified in the final erection drawings. Also mark member orientation, such as for cambered elements.

.6 The minimum size of welds shall be as per CSA W59. For cold rolled steel the minimum fillet weld size is 3 mm. For hot rolled steel the minimum fillet weld size is 5 mm, unless otherwise required by W59. Minimum length of 50 mm unless noted.

.7 Trusses: The structural drawings show the overall depth, web configuration, member service forces and camber for trusses, as well as minimum member sizes when indicated. A professional engineer retained by the fabricator shall design member connections and confirm member sizes, or design member sizes where not shown.

.8 Loose Lintels: Provide loose lintels cut to the required lengths, a minimum 150 bearing, but at least the full length of any bearing plate where such bearing is more than 150 mm long. Lintels are shown on plans as well as typical details for coordination with other trades. All members in exterior walls to be hot dipped galvanised. Weld together built up lintels.

.9 Bearing Plates and Anchors: Provide beams and joists with bearing plates and anchors and coordinate locations on the erection drawings. Provide 2 – 20 mm diameter x 450 long rod anchors with 50 end hooks welded to the underside of the bearing plate unless noted. Weld bearing plate to supported member with 6mm fillet weld x 75 long on all flanges which contact the plate unless noted. Design bearing plates for a bearing pressure of 3.5 MPa on engineered masonry, or 0.5 f'c on concrete, using factored loads where sizes are not tabulated on the drawings. Beams shall fully bear on the length of the bearing plate with the edge of the plate set back 25 mm from the edge of the concrete or masonry support.

.10 Support Angles: Provide angles on column faces for support of precast slabs, steel deck or other components, where such support has been interrupted by the column, piping runs and similar obstructions.

2.4 SHOP PAINTING

.1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S136 and CAN/CSA-S16.

.2 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to SSPC SP 3 for interior members to be coated with CISC\CPMA 1-73 shop coat paint - non exposed and where steel is not otherwise given an architectural finish. Prepare surface according to NACE No.3/SSPC-SP-6 for all components to be painted with primer and finished paint.

.3 Apply one coat of primer (CISC/SPMA Standard 2-75) in shop to steel surfaces to achieve minimum dry film thickness of 37 to 50 micrometres (1.5 to 2 mils) except:

.1 Surfaces to be encased in concrete.

.2 Surfaces to receive field installed stud shear connections.

.3 Surfaces and edges to be field welded.

.4 Faying surfaces of slip-critical connections.

.5 Below grade surfaces in contact with soil.

.6 Surfaces to be fireproofed by sprayed on material.

.7 Areas to receive intumescent paint, see separate architectural specifications.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C, steel surfaces are not damp and relative humidity is under 85%, or as required by the paint manufacturer's specifications where more stringent.

.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

.6 Complete hot dip galvanising process after the shop welding is complete to shelf angles, lintels and hangers in exterior walls, exposed steel members, and other members as noted.

2.5 EXPOSED STEEL

.1 Conform to the requirements of the C.I.S.C Specification for Architecturally Exposed Structural Steel (AESS) based on the specified Category 2 class and to the additional requirements below and elsewhere in the contract documents, when fabricating and erecting steel members which will remain permanently exposed to view.

.2 Remove mill and shop marks and other imperfections which are unsightly.

.3 Provide continuous welding at exposed joints or fill between welds with an approved epoxy resin filler finished to the same profile as the weld. Welds to be inspected before application of any resin filler. Fill all gouges with resin filler. Joints shall be weathertight and suitable for finish painting.

.4 Where exposed bolted connections are permitted, exposed bolt heads shall all be on the same side of the member and the bolt extension on the other side of the connection shall be uniform and not exceed 25 mm beyond the nut.

PART 3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S136 and CAN/CSA-S16.

.2 Welding: in accordance with CSA W59.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

.4 Temporary erection bracing shall be in accordance with CSA S16 and the responsibility for same is with the steel erector and fabricator. Design and provide the required bracing to maintain a plumb, stable and aligned structure. Confirm all erection sequencing with the general contractor so that site work flows are coordinated with other trades and access routes. Final design bracing shown on the structural drawings, will not have considered divisions of work and staging, and should not be solely relied upon as the only erection or temporary bracing.

.5 Provide support framing for holes cut into steel deck on site. Refer to typical details or specific details on the structural drawings.

.6 Do not substitute member sizes due to stock unavailability, without reviewing alternate components with the structural consultant.

3.3 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Consultant for direction before commencing fabrication. The general contractor is to provide access to existing areas for subtrades in a timely manner.

3.4 MARKING

.1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. For any steel exposed to view in the final project condition, locate members marks in locations that cannot be seen from viewing areas when the building will be in its normal occupancy or use.

.2 Match marking: shop mark for fit and match, and to match erection drawing marks.

3.5 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S136 and CAN/CSA-S16 and in accordance with reviewed erection drawings, the contract documents, and in accordance with the requirements of the CISC Code of Standard Practice, unless more stringent requirements are shown in these specifications or on the contract documents, the more stringent requirements shall govern.

.2 Tolerances to be in conformance with referenced CSA documents, unless tighter tolerances are otherwise shown.

.3 Visit the site to check on available access, material storage and working areas. Store all materials to prevent damage to finishes, and to prevent member distortion. Rectify interferences, or potential interferences, with any existing services before commencing steel erection.

.4 Deliver products that are supplied under this section to the location directed by the General Contractor or Construction Manager, and in accordance with the project schedule.

.5 The general contractor shall provide a survey of the position of the anchor rods, bearing elevations, and conditions for which the steel erection depends. Identify deviations that impact the structural steel erection beyond allowed for tolerances to the architects and structural engineers, submit documents for response and clarifications.

.6 Install all hardware integral to the functioning of the structural steel system, such as bearings and specialty proprietary fasteners in accordance with the hardware manufacturer's instructions and erection drawings.

.7 Use ASTM A325 bolts, snug tight as defined in CSA S16 in locations other than where the use of pretensioned bolts are required as per CSA S16-09 clause 22.2.2. Pretensioning is required in all slip critical connections, shear connections proportioned in according with seismic requirements of clause 27, all crane and hoist connections, connections subject to impact and/or cyclical loading, connections subject to net tension loads, and connections where oversize or slotted holes are used, except where these are designed to allow movement during service such as at expansion joints. All connections where cyclical loads may be present, such as machine support connections, cranes and hoist connections, shall use Stover or Automation Grade C type lock nuts. Before commencing bolted connections, coordinate with the inspection and testing agency for an agreed upon procedure to site witness and verify pretensioning and tightening of the bolts.

.8 Submit a description of proposed erection methods and sequence, and division of the work, to the Consultant if requested.

.9 Set base plates on pre grouted levelling plates, when the levelling plate is under 500 mm in length on any side, to be level 2 mm across the plate unless noted. Epoxy grouts may be required for large levelling plates. For larger base areas use steel shims or levelling nuts and grout after steel is erected and adjusted after inspection.

.10 Do not make permanent connections to lateral stability systems until the structure has been aligned within tolerances.

.11 Columns and column splices must bear evenly with respect to the centroid of the contact area. At least 65% of the contact area shall be in full bearing and the separation of any remaining area shall not exceed 0.5 mm.

.12 Do not field cut structural members unless these modifications are shown on the erection drawings, or such proposed field modifications have been reviewed by the structural consultant.

.13 Report ill-fitting connections, provide proposed field repair documents as issued by the fabricator's steel connection design engineer, for review by the consultants before proceeding with field modifications. A copy of any agreed upon repairs are to be copied to the testing and inspection agency.

.14 Install bar type grating by welding of two bearing bars of each grating panel to every supporting beam, unless mechanical fasteners are shown or otherwise approved.

.15 When the base metal is colder than 0 C, preheat steel to at least 10C as per Table 5.3 of CSA W59. Do not weld in an ambient temperature below -18C unless special procedures are established and reviewed by the General Contractor and Engineer in writing. Submit quality assurance procedures to engineer in advance of cold weather welding.

.16 Remove weld slag from all field welds to allow for inspection by testing agency.

.17 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.18 Take precautions and responsibility necessary to protect any adjacent structures or finished work from damage. Follow owner's fire watch procedures and protection measures.

3.6 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship in the shop and at the project site will be carried out by a qualified testing laboratory and inspection firms qualified by CSA W178.1, designated by the Consultant.

.2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by the Consultant.

.3 The Owner will pay costs of tests as specified in Section 01 29 83- Payment Procedures for Testing Laboratory Services.

.4 Scheduling of inspections and testing shall be coordinated by the General Contractor to suit the project schedules. Fabrication shall not commence until inspection services are arranged and scheduled with the inspection agency. Assist the agency in their work, making available all current contract drawings and reviewed erection and shop drawings for their reference. Keep fabricated members accessible for inspection.

.5 Work will be inspected in the shop, and in the field when erected. Submit reports within 5 working days of the completion of the inspection. to the Architect, Engineer, and General Contractor clearly indicating components reviewed, including details of deficiencies and non conformance. The general contractor shall circulate such reports to all subcontractors involved with the steel work.

.1 Inspection shall include:

.1 Checking certified mill test correlation with actual materials being fabricated.
.2 Ensuring fabrication and erection procedures conform to specifications.
.3 Company certification is in accordance with CSA W47.1 Division 1 or 2.
.4 Checking CWB certification of welders.
.5 Welding procedures are approved by the CWB in accordance with CSA W47.1 and CSA W59.
.6 Checking fabricated members against specified member shapes.
.7 Inspection of all welded connections including sampling for connection fit up and tolerances.
.8 Review of cambers and sweeps.
.9 Undertake non destructive testing of all butt welds in tension.
.10 Inspection of base metal preparation, environmental conditions for painting, shop paint, and field paint touch up, with confirmation of products being used meet specifications. Inspect fabricated steel prior to shipping for hot dip galvanizing, where that is the specified finish.
.11 The inspector is to be present during welding of 25% of the moment connections and 50% of butt welds in tension.
.12 The inspector shall be present during a representative sample of the connection work to confirm “turn of nut” method of bolt pretensioning is being followed. The remaining bolt inspections are to conform to the procedures outlined in CSA S16-01. Nuts shall be removed from 1% of all bearing bolts to confirm that the thread is excluded from the shear planes.

.6 Test shear studs in accordance with CSA W59.

3.1 REJECTED WORK

.1 Do not deliver to the site any materials which are known not to meet project requirements and the requirements of this specification. Materials rejected or damaged at the site are to be returned to the shop for repair.

.2 Where the Consultant’s review of test reports or physical work of this section reveals work which appears to have failed to meet the specified quality or tolerances, the Consultant shall have the authority to order further tests of materials, to order detailed field surveys; to order structural element analysis or to order load tests. All such work will be carried out in order to assist in determining whether the structure may, in the Consultant’s opinion, be accepted, with or without strengthening or modification. All expenses occurred in such determinations shall be chargeable to the General Contractor regardless of the results.

3.2 FIELD PAINTING AND COATINGS

.1 Paint in accordance with Section 09 91 23- Interior Painting.

.1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

.2 Touch up of hot dipped galvanized members shall be with cold galvanizing compound, not primer or other paints. Submit proposed product for review.

3.3 CLEANING

.1 Clean in accordance with Section 01 74 11- Cleaning.

3.1 FINAL INSPECTION

.1 The professional engineer responsible for the steel connection design shall furnish at the end of the project a letter confirming that the structural steel installations are complete and in general conformance with the connection designs. Submit the report to the Architect and Engineer.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 05 21 00 Steel Joist Framing

.2 Section 05 31 00 Steel Decking

.3 Section 05 41 00 Structural Metal Stud Framing

.4 Section 05 50 00 Metal Fabrications

.5 Section 05 51 29 Metal Stairs and Ladders

1.2 REFERENCE STANDARDS

.1 ASTM International Inc.

.1 ASTM A36/A36M-08, Standard Specification for Carbon Structural Steel

.2 ASTM a108-07, Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished

.3 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

.4 ASTM A325-07a, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

.5 ASTM A325M-08, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric

.6 ASTM A570-79, Standard Specification for Hot Rolled Carbon Steel Sheet and Strip, Structural Quality

.7 ASTM A653/A653M-11 Standard Specification for Steel Sheet, Zinc –Coated (Galvanized) or Zinc-Iron-Alloy Coated (Galvanealed) by the Hot Dip Process

.8 ASTM A992/A992M-11, Standard Specification for Structural Steel Shapes

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-85.10-99, Protective Coatings for Metals

.2 CAN/CGSB-1-GP171-98, Inorganic Zinc Coating

.3 CAN/CGSB-1.181-99, Ready Mixed Organic Zinc-Rich Coating

.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)

.1 Handbook of the Canadian Institute of Steel Construction

.2 CISC Code of Standard Practice for Structural Steel

.3 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel

.4 Canadian Standards Association (CSA International)

.1 CSA G40.20/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel

.2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles

.3 CAN/CSA-S16-09, Limit States Design of Steel Structures

.4 CAN/CSA-S136-07, North American Specifications for the Design of Cold Formed Steel Structural Members

.5 CSA W47.1- 09, Certification of Companies for Fusion Welding of Steel

.6 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding

.7 CSA W55.3--08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings

.8 CSA W59-03, Welded Steel Construction (Metal Arc Welding)

.9 CSA W178.1-08, Certification of Welding Inspection Organizations

.10 CSA W178.2-08, Certification of Welding Inspections

.11 CSA G189-1966(R2003) Sprayed Metal Coatings for Atmospheric Corrosion Protection

.5 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual - current edition

.2 MPI-INT 5.1-08, Structural Steel and Metal Fabrications

.3 MPI-EXT 5.1-08, Structural Steel and Metal Fabrications

.6 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International

.1 NACE WAB-4/SSPC SP-7, Brush Off Wet Abrasive Blast Cleaning

.2 SSPC SP-2, Hand Tool Cleaning

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for steel joist framing and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 Submittal Procedures, and CISC Code of Standard Practise for Structural Steel. Show all steel elevations, splices, types of shop and field connections, and weld details. Show large scale details, in isometric view if required, depicting precautions to be taken.

.2 The General Contractor or Construction Manager is to ensure that the office preparing the erection and shop drawings is copied with a complete set of contract drawings (in addition to the structural drawings), specifications plus all addenda and revisions.

.3 Identify on the drawings, any dimensions which have been derived from field measurements.

.4 Make corrections to shop and erection drawings required by previous reviews, before resubmitting drawings. Do not add completely new details to previously submitted drawing sheets; add new drawing sheets as applicable.

.5 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

.6 Indicate on erection drawings, relevant details such as joist mark, depth, spacing, location relative to main building grid lines or reference points for joist layout, bridging lines, bearing, and anchorage details.

.7 Indicate particulars, on shop drawings, relative to joist geometry, framed openings, splicing details, bearing and anchorage. Include member size, properties, specified and factored member loads, and stresses under various loadings, deflection and camber.

.4 Erection drawings:

.1 It is advisable to submit erection drawings and sketch details of special connection conditions for review before preparing detail drawings.

.2 Coordinate the steel joist erection drawings, with the erection drawings, or the structural drawings, such that all assumed support locations are shown and located.

.3 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:

.1 Description of methods.
.2 Sequence of erection and division of work areas on plans.
.3 Type of equipment used in erection, lifting points and weldments required for lifting.
.4 Temporary bracings.
.5 Indicate locations, mark or type number, orientation and setting requirements for components fabricated and supplied by the steel trade, but not installed by the steel erection crew, such as anchor rods, bearing plates on masonry or concrete, lintels and other miscellaneous components.
.6 Indicate fieldwork required to existing elements, to support new structural steel.

.4 Re-issue applicable erection drawings, or partial drawings during construction to coordinate additional field work or repairs to already erected steel.

.5 Maintain a set of reviewed erection drawings on site. Use only these drawings and the contract drawings to erect steel joists. Make these drawings available to independent inspection agencies or consultants when on site.

.6 Clearly indicate on the erection drawings, which components are designated as Architecturally Exposed Structural Steel, so additional care can be afforded such pieces during the storage and erection of same.

.5 Delegated Design Submittals:

.1 Submit drawings for review to Consultant at least 4 weeks prior to fabrication.

1.4 QUALITY ASSURANCE

.1 Submit 4 weeks prior to fabrication of steel joists and accessories. Reports to show:

.1 Chemical and physical properties.

.2 Other details of steel to be incorporated into work.

.3 Certification by qualified metallurgists confirming that tests conform to requirements of CSA G40.20/G40.21

.2 Submit affidavit prepared by fabricator of structural steel joists stating that materials and products used in fabrication conform to this specification.

.3 Fabrication and erection is to be completed by a member of the Canadian Institute of Steel Construction. Alternately submit qualifications and quality assurance programme and a list of recent references for similar type project work, prior to tender closing for review, and acceptance or rejection by the Consultants.

.4 Welding shall be performed by firms fully approved by the Canadian Welding Bureau under the requirements of CSA Standard W47.1.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address. Each joist to be tagged at one end to correspond with mark on erection drawing.

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.3 Follow handling guidelines from joist manufacturer’s engineer so that the joists are not overstressed by lifting from wrong location or orientation.

PART 2 PRODUCTS

2.1 DESIGN CRITERIA

.1 Design details and connections in accordance with requirements of CAN/CSA S16 and CAN/CSA S136 to resist forces, moments, shears and allow for movements indicated on the structural drawings, including process loading and future allowances. All loads indicated shall be considered as service loads unless indicated as factored loads.

.2 Design steel joists and bridging to carry loads indicated in joist schedule shown on drawings to CSA S136 and CSA S16.

.3 Design joists and anchorages for uplift forces, moment connections and rollover forces due to horizontal diaphragm shears at joist shoe bearing locations, as indicated.

.4 Ensure joists are manufactured to consider load effects due to fabrication, erection and handling.

.5 Limit roof joist deflection due to specified live load to span/360.

.6 Where joists are part of moment resisting frames, where the end moments are due to lateral loads, also design joists as simple span elements for full gravity loading. Once all the dead load due to self weight and other structural components are applied, then make final chord connections to the structure to provide the end moment capacity, unless otherwise noted.

.7 Where joists from opposite sides bear on a common wall, offset the joist locations such that the joist reaction is within the middle third of the wall thickness unless noted.

.8 Unless otherwise noted joists are top chord bearing and the joist shoe depths for horizontal joists up to a span of 15 000 is 100mm, for joist spans 15000 to 27000 shoe depth is 125 mm minimum, for joist spans over 27400 shoe depth is 190 mm. For sloped joists see plans and details.

.9 Refer to project abbreviations and symbols. Unless otherwise noted, “C” = compressive axial load in kN; “T” = tension axial load in kN; “M” = bending moment in kN.m, where Mx = strong axis and My = weak axis, “MT” = torsional bending moment in kN.m, “V” = shear force in kN.

2.2 MATERIALS

.1 Open web steel joists: to CSA S136 and/or CSA S16.

.2 Structural steel: to CSA S136 and CSA G40.20/G40.21 Grade 300W or ASTM A992 Grade 50. Cold formed C channels and other shapes to CSA G40.20/G40.21 and CAN/CSA S136, material ASTM A653/A653M for coated sections and ASTM A1011/A1011M for uncoated sections, both Grade 50 Fy = 345 MPa.

.3 Anchor rods and end plates: to CSA-G40.20/G40.21, Grade 300W or CSA G30.18 Grade 400W for deformed anchors (rebar).

.4 High strength structural bolts, nuts and washers: to ASTM A325.

.5 Machine bolts, nuts and washers to fasten non steel components to structural steel where designated to ASTM A307.

.6 Welding materials: to CSA W59.

.7 Shop paint primer: to CISC/CPMA 2-75 solvent reducible alkyd, red or grey oxide suitable for white coloured finished coat.

.8 Zinc rich shop primer paint: CAN/CGSB – 1.132 to CISC/CPMA-2 CISC/CPMA-1 MPI - INT 5.1B MPI - INT 5.1A.

.9 For headed anchors to be cast in concrete, use Nelson H4L anchors, diameter and length as per plans.

.10 Drilled wedge type mechanical anchors: Supplied by Hilti Canada, ITW, or UCAN Fastening Products, size to suit design loading and clearances, hot dipped galvanized unless noted.

2.3 FABRICATION

.1 Fabricate steel joists and accessories as indicated in accordance with CSA S16 and CSA S136 and in accordance with reviewed shop drawings.

.2 Weld in accordance with CSA W59.

.3 Provide chord extensions where indicated.

.4 Provide diagonal and horizontal bridging and anchorages as indicated.

.5 Provide cambers for joist as specified, and to be a minimum of 0.002 of the span as per CSA S16 clause 16.5.14, unless noted.

.6 Bearing Plates and Anchors: Unless provided by the fabricator under structural steel specification section 05 12 23, provide joists with bearing plates and anchors and coordinate locations on the erection drawings. Provide 1 – 20 mm diameter x 450 long rod anchor with 50 end hooks welded to the underside of the bearing plate unless noted. Weld bearing plate to supported member with 6mm fillet weld x 75 long on two sides of the joist shoe unless noted. Design bearing plates for a bearing pressure of 3.5 MPa on engineered masonry, or 0.5 f'c on concrete, using factored loads where sizes are not tabulated on the drawings. Set the edge of the plate set back 25 mm from the edge of the support.

2.4 SHOP PAINTING

.1 Clean, prepare and shop prime surfaces of steel joists to SSPC SP7 where CISC/SPMA 2-75 primer is applied to achieve dry film thickness of .065 mm to .080 mm. This primer is used when the joists are exposed to view in their final erected location and are painted with an architecturally specified finish paint.

.2 Clean members of loose mill scale, rust, oil, dirt and other foreign matter.

.3 Apply one coat of paint or primer to steel except:

.1 Surfaces to be encased in concrete.

.2 Surfaces to receive field installed stud shear connectors and steel decks.

.3 Surfaces and edges to be field welded.

.4 Faying surfaces of friction-type connections.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C, and humidty level is within paint manufacturer's application limits.

.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

.6 Strip painted bolt threads before prime coat is dry.

2.5 EXPOSED STEEL

.1 Conform to the requirements of the C.I.S.C Specification for Architecturally Exposed Structural Steel (AESS) (CISC Table I1) based on the specified Category 2 of AESS and to the additional requirements below and elsewhere in the contract documents, when fabricating and erecting steel members which will remain permanently exposed to view.

.2 Remove mill and shop marks and other imperfections which are unsightly.

.3 Where exposed bolted connections are permitted, exposed bolt heads shall all be on the same side of the member and the bolt extension on the other side of the connection shall be uniform and not exceed 25 mm beyond the nut.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for steel joist framing installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate and supporting elements.

.2 Inform Consultant and General Contractor of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Do structural steel work: to CSA S136 and CSA S16 and CISC Code of Practise.

.2 Do welding: in accordance with CSA W59.

.3 Ensure installers are certified to CSA W47.1 for fusion welding CSA W55.3 for resistance welding.

.4 Submit certification that welded joints are qualified by Canadian Welding Bureau.

3.3 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work; report discrepancies and potential problem areas to General Contractor and Consultant for direction before commencing fabrication.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Consultant.

.2 Testing laboratory will inspect representative joists for integrity, accuracy of fabrication and soundness of welds, cleanliness of steel and application of primer. Testing laboratory will also monitor test loading of joists used by manufacturer to verify design (where applicable) and check representative field connections.

.3 Submit test report to Consultant within 7 days. Identify any items of an urgent nature verbally or via email to the General Contractor and Consultant prior to leaving the construction site or fabrication plant.

.4 Owner will pay costs of tests as specified in Section 01 29 83- Payment Procedures: Testing Laboratory Services.

3.5 ERECTION

.1 Erect steel joists and bridging as indicated and in accordance with CAN/CSA-S136, CAN/CSA-S16 and in accordance with reviewed erection drawings, the contract documents, and in accordance with the requirements of the CISC Code of Standard Practice, unless more stringent requirements are shown in these specifications or on the contract documents, the more stringent requirements shall govern.

.2 Visit the site to check on available access, material storage and working areas. Store all materials to prevent damage to finishes, and to prevent member distortion. Rectify interferences, or potential interferences, with any existing services before commencing steel erection.

.3 Deliver products that are supplied under this section to the location directed by the General Contractor or Construction Manager, and in accordance with the project schedule.

.4 Install all hardware integral to the functioning of the joist system, such as specialty proprietary fasteners in accordance with the hardware manufacturer's instructions and erection drawings.

.5 Report ill-fitting connections, provide proposed field repair documents as issued by the fabricator's steel connection design engineer, for review by the consultants before proceeding with field modifications. A copy of any agreed upon repairs are to be copied to the testing and inspection agency.

.6 Do not weld in an ambient temperature below -10C and preheat and follow other procedures in accordance with CSA W59. Communicate and coordinate site requirements for cold weather practice with the general contractor.

.7 Remove weld slag from all field welds to allow for inspection by testing agency.

.8 Complete installation of bridging and anchorages before placing construction loads on joists.

.9 Field cutting or altering joists or bridging that are not shown on reviewed drawings: to approval of Consultant.

.10 Clean and touch up shop primer to bolts, welds, burned or scratched surfaces at completion of erection.

3.6 FIELD & FABRICATION QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be carried out by a qualified testing laboratory and inspection firms qualified by CSA W178.1, designated by Consultant.

.2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Consultant.

.3 Owner will pay costs of tests as specified in Section 01 29 83- Payment Procedures for Testing Laboratory Services.

.4 Scheduling of inspections and testing shall be coordinated by the General Contractor to suit the project schedules. Fabrication shall not commence until inspection services are arranged and scheduled with the inspection agency. Assist the agency in their work, making available all current contract drawings and reviewed erection and shop drawings for their reference. Keep fabricated members accessible for inspection.

.5 Work will be inspected in the shop, and in the field when erected. Submit reports within 5 working days of the completion of the inspection to the Consultant and General Contractor clearly indicating components reviewed, including details of errors and non-conformance. The general contractor shall circulate such reports to all subcontractors involved with the steel work.

.1 Inspection shall include:

.1 Checking certified mill test correlation with actual materials being fabricated.
.2 Ensuring fabrication and erection procedures conform to specifications.
.3 Company certification is in accordance with CSA W47.1 Division 1 or 2.
.4 Checking CWB certification of welders.
.5 Welding procedures are approved by the CWB in accordance with CSA W47.1 and CSA W59.
.6 Checking fabricated members against specified member shapes.
.7 Inspection of all welded connections including sampling for connection fit up and tolerances.
.8 Review of cambers and sweeps.
.9 Undertake non destructive testing of all butt welds in tension.
.10 Inspection of base metal preparation and cleaning prior to paint application, review of shop paint, and field paint touch up, with confirmation that products being used meet specifications. Report on and confirm environmental conditions required for painting have been met, such as temperature, humidity, airborne dust and debris, ventilation and lighting levels.
.11 The inspector is to be present during welding of 25% of the moment connections and 50% of butt welds in tension.

3.7 REJECTED WORK

.1 Do not deliver to the site any materials which are known not to meet project requirements and the requirements of this specification. Materials rejected or damaged at the site are to be returned to the shop for repair.

.2 Where the Consultant's review of test reports or physical work of this section reveals work which appears to have failed to meet the specified quality or tolerances, the Consultant shall have the authority to order further tests of materials, to order detailed field surveys; to order structural element analysis or to order load tests. All such work will be carried out in order to assist in determining whether the structure may, in the Consultant's opinion, be accepted, with or without strengthening or modification. All expenses occurred in such determinations shall be chargeable to the General Contractor regardless of the results.

3.8 FIELD PAINTING

.1 Paint: in accordance with Section 09 91 23- Interior Painting.

.2 Touch up all damaged surfaces and surfaces without shop coat with CISC/CPMA-1 MPI - INT 5.1B MPI - INT 5.1A CISC/CPMA-2 in accordance with manufacturers' recommendations. Remove all weld slag and spatter, and clean surfaces prior to field paint touch up of connections.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.10 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by steel joist framing installation.

3.11 FINAL INSPECTION

.1 The professional engineer responsible for the open web steel joist design shall furnish at the end of the project a letter confirming that the joist installations are complete and in general conformance with the designs. Ideally this review should be completed when all components to be connected to the joists have been installed, such as steel deck, or suspended lifting equipment such as monorails. Submit the report to the Consultant and General Contractor.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 05 21 00 Steel Joist Framing

.2 Section 05 12 23 Structural Steel

.3 Section 05 31 00 Steel Decking

.4 Section 05 41 00 Structural Metal Stud Framing

.5 Section 05 50 00 Metal Fabrications

.6 Section 05 51 29 Metal Stairs and Ladders

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A653/A653M-09a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.2 ASTM A792/A792M-09a, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating

.3 CSA International

.1 CSA C22.2 No.79 1978(R2008), Cellular Metal and Cellular Concrete Floor Raceways and Fittings

.2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles

.3 CSA S16-09, Design of Steel Structures

.4 CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members

.5 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures

.6 CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum

.7 CSA W59-03(R2008), Welded Steel Construction, (Metal Arc Welding)

.4 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI 10M-08, Standard for Steel Roof Deck

.2 CSSBI 12M-08, Standard for Composite Steel Deck

.5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1113-A2007, Architectural Coatings

.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for steel decking and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

.2 Submit design calculations if requested by Consultant.

.3 Identify on the drawings, any dimensions which have been derived from field measurements.

.4 The General Contractor or Construction Manager is to ensure that the office preparing the erection and shop drawings is copied with a complete set of contract drawings (in addition to the structural drawings), specifications plus all addenda and revisions.

.5 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

.6 Make corrections to shop and erection drawings required by previous reviews, before resubmitting drawings. Do not add completely new details to previously submitted drawing sheets; add new drawing sheets as applicable.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect decking from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 DESIGN CRITERIA

.1 Design steel deck to CSA S136 & CSSBI 10M.

.2 Make sections continuous over 3 supporting spans or increase the deck thickness to give the equivalent strength and thickness of a 3 span deck, unless otherwise approved by the Consultant.

.3 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, and uplift as indicated. The sidelaps and their connections, between deck sheets must also carry the above loads as well as construction loads. Provide the welding or mechanical fastener designs and clearly show fastening patterns on the erection plans. Any alternative designs to those shown on the contract drawings must provide equal or higher overall diaphragm stiffness and connection strength. All alternate designs must bear the seal of a P. Eng. at the time of shop drawing submissions.

.4 Design reinforcing for deck openings where the reinforcing is not otherwise shown on the plans or covered by the general conditions noted on the Burnside Typical Detail sheets.

.5 Prefinished exposed deck must be fastened with power actuated or screw fasteners, not field welds.

.6 Design the roof deck and anchorage for gross service uplift loads of 2.2 KPa on cantilevers and 1.5 KPa elsewhere, unless otherwise shown on the drawings.

.7 Deflection under specified live load not to exceed 1/240 of the span, except that when gypsum board ceilings are hung directly from deck, live load deflection not to exceed 1/360 of span.

2.2 MATERIALS

.1 Zinc-iron Alloy (ZF) coated steel sheet: to ASTM A653/A653M structural quality Grade 230, with ZF75 coating, for interior surfaces not exposed to weather, unpainted factory finish, 0.76 mm minimum base steel thickness – see plan schedules for thicker deck and location.

.2 Decks to be painted: zinc-iron alloy coated decks suitable for finish painting.

.3 Zinc (Z) coated steel sheet: to ASTM A653/A653M structural quality Grade 230 with ZF275(G90) coating, regular spangle surface, for exterior surfaces exposed to weather, or elsewhere designated as “galvanized” on the drawings. For non exposed deck, or non exposed interior painted deck provide ZF75(A25) coating, prepared suitable for site applied interior painting. All deck 0.76 mm minimum base steel thickness, refer to plans and schedules where heavier gauge deck is required.

.4 Closures: Cover plates, cell closures and flashings: in accordance with manufacturer's recommendations. steel sheet with minimum base steel thickness of 1.22 mm minimum. Metallic coating same as deck material.

.5 Primer: zinc rich, ready mix to CAN/CGSB-1.181 .

.1 VOC limit 350 250 g/L maximum to SCAQMD Rule 1113 GS-11

.6 Caulking: to Section 07 92 00- Joint Sealants.

.1 Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168

2.3 TYPES OF DECKING

.1 The following are acceptable manufacturer’s of steel deck along with profile types. Other manufacturer’s may be considered for acceptance by the Consultant. Refer to the plans for the minimum profile and the appropriate locations where they are used.

.1 For **38 mm deep** deck: VicWest RD938, Canam P-3615 or P3606, Agway Metals Inc. RD36.

.2 For **76 mm deep** deck VicWest RD308, Canam P-2436, P-2404, Agway Metals Inc RD75-150. RD75-200, RD75-300.

.3 Provide deck edge profile, lapped or nested to match with specified fastening method between sheets – see plan schedules.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for steel decking installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Consultant and General Contractor of unacceptable conditions immediately upon discovery.

.3 Ship and store deck to prevent, damage to the finish, denting, deformation and rusting by careful handling and physical protection. Replace any damaged deck before erecting. Crate or bundle the deck on a blocked slope to allow drainage. Preferably store indoors, separate wet sheets and allow to dry.

.4 Secure loose bundles of deck in place, tie to ensure stability against wind uplift, whether this is on the ground or placed on the superstructure. Do not stack bundles of deck on the structure that would exceed the construction loading allowance and capacity of the supporting components.

.5 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Structural steel work: in accordance with CSA S136 and CSSBI 10M.

.2 Welding: in accordance with CSA W59, except where specified otherwise.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding. Deck erection firms to be approved by the deck suppliers.

.4 Mark materials to match erection drawing marks For any deck surfaces exposed to view in the final project condition, locate member marks in locations that cannot be seen from viewing areas when the building will be in its normal occupancy or use.

3.3 ERECTION

.1 Erect steel deck as indicated and in accordance with CSA S136 CSSBI 10M CSSBI 12M and in accordance with reviewed erection drawings.

.2 Do not erect the deck until all supporting member field reviews have been completed, that may impact the position and elevation of supporting deck members.

.3 Submit a description of proposed erection methods and sequence, and division of the work, to the Consultant if requested.

.4 Lap ends: to 50 mm minimum.

.5 Align deck end to end for accurate fit and alignment with corresponding sections.

.6 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer for ZF75 deck or cold galvanizing compound for ZF275 deck where burned by welding.

.7 Temporary shoring, if required, to be designed to support construction loads, wet concrete and other construction equipment. Contractor's engineer to design and specify all shoring components. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.

.8 Coordinate with the general contractor for all temporary guarding and covering, especially for holes cut in the deck.

3.4 CLOSURES

.1 Install closures in accordance with approved details. Provide fitted steel closures to fill hollow spaces between flutes immediately above beams, partitions and walls transverse to deck when a ceiling is not specified. Where deck is continuous over support provide closures on each side and pack with glass fibre insulation. Where deck span is parallel to walls and partitions, install sheet steel closure strips to provide a neat juncture. Provide interior and exterior closures where deck cantilevers over exterior walls, packing in between with glass fibre insulation, or prefabricated neoprene where approved.

3.5 OPENINGS AND AREAS OF CONCENTRATED LOADS

.1 No reinforcement required for openings cut in 38 mm or deeper deck which are smaller than 150 mm square.

.2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer or a minimum of L55x55 x 6mm steel angle under the flutes at each end of the opening, extending across 3 flutes on either side, which ever repair is greater.

.3 For deck openings with any one dimension greater than 300 and less than 450 mm across the flutes mm and for areas of concentrated load, reinforce in accordance with structural framing details or a structural analysis of the loads involved, except as otherwise indicated. Openings larger than 450 mm wide shall be completed by the structural steel trade.

.4 Cut deck to fit around columns and other protrusions such as structural bracing, pipes, stacks and similar. Supports on column faces will be supplied unless noted, by the structural steel trade.

3.6 CONNECTIONS

.1 Where the deck profiles and fastening and connection types vary depending upon their location in the structure, refer to the plans so as to identify the criteria for each "zone".

.2 For welded deck, connect deck at all bearing points on structural steel with 20mm diameter fusion welds, use weld washers where specified or as required to achieve the specified capacity. Stagger welds along the flanges of supporting members to the maximum obtainable by the width of the flange. Place a weld each side of the side lap, in each flute. Practice welds to be made prior to the actual job welding to check the adequacy of the welding rod amperage and burn off rate necessary to produce

satisfactory fusion for the welds required. Pry test to demonstrate metal to metal fusion. Touch up deck welds at ZF 275 galvanized deck with cold galvanizing compound and at other deck finishes with zinc rich primer.

.3 Locate a flute of the deck directly over steel beams or edge angles or bent plate spanning parallel to the deck flute direction, and at the same elevation as the main deck support.

.4 When fastening deck to sloping members, or support members less than 3 mm thick, use mechanical fasteners, not welded connections. Where not otherwise specified on the contract drawings or shop drawings, provide hex head 6mm diameter self-drilling screws at every second flute and no more than 300 mm on centre. For fastening wood or similar sheathing to the deck, revise the hex head to a bugle type head and drive flush to the surface of the sheathing.

.5 For deck fastened with power actuated mechanical fasteners or pins, use fasteners with a knurled shank, a minimum 12 mm diameter washer under the head of the pin, electroplated zinc finish to ASTM B633 Type 3 meeting CSSBI, SDI and Factory Mutual approval.

.1 Acceptable fasteners include Hilti X-EDNK22 THQ12, X-EDN19 THQ12, X- ENP19-19L15. For light gauge supporting steel thicknesses from 3 to 10 mm thick use Hilti X EDNK22 or X EDN19.

.2 Use the Hilti Selector Gauge, in coordination with the Hilti representative and the shop drawings to select the most appropriate fastener especially when the supporting steel thickness varies within one deck application “zone”.

.3 Use the Hilti X ENP-19L15 for supporting steel thicker than 10 mm and for steel between 6 and 10 mm as shown on the shop drawings.

.4 Gain approval of design engineer for any fastener type changes and spacings not shown on the shop drawings.

.5 Complete practice applications on site so as to optimize the power settings of the driving tools, in accordance with manufacturer’s setting specifications.

.6 For nestable deck profiles, the sidelap mechanical connectors are to be self-drilling sheet metal screws. Acceptable fasteners include Hilti SLC 01 M and SLC 02 M both HWH type screws.

.7 For interlock type side lap profiles, the sidelap connections should be “button punched”.

.8 “Zone 1” deck areas, as a minimum, unless otherwise shown on plan or on plan schedules, shall consist of 0.76 mm CNT deck, with welds at every second deck flute or 150 mm on centre, with an extra weld at each deck edge, with side lap button punches at 600 mm on centre (pattern 914/9 metric or 36/9 imperial typical). Welds to supporting members parallel to the deck flutes are to be no more than 300 mm on centre. For mechanically fastened deck, the fasteners shall be at the same 914/9 metric or 36/9 Imperial pattern, with sidelap screws at 600 spacing.

.9 Install connections in accordance with CSSBI recommendations as indicated.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day. No loose deck is to be left in such a position that it could become airborne under wind loads.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction, including those below the level at which the deck is being installed. Take responsibility for any damage and make General Contractor and Consultant aware of any issues during the erection process, and do not proceed with any remedial work until authorized by the Consultant.

3.9 INDEPENDENT INSPECTION AND TESTING

.1 Costs for inspection will be paid out of the Cash Allowance for testing.

.2 The inspection agency will submit reports to the consultant and the contractor, noting the work inspected, the quality of work and any deficiencies observed. It is suggested that at least one inspection is completed near the start of the deck erection to address any significant issues - such as connection capacity as verified by pry testing, and additional inspections when the work is nearing completion.

.3 The inspection shall review as a minimum:

.1 Correlation of mill test steel reports with actual deck provided or suitable equivalent.

.2 Checking welder's CWB certification where deck welding is used for fastening.

.3 Deck profiles, thicknesses and deck finish.

.4 Actual deck weld quality including on site "pry tests".

.5 Deck crimping for sidelaps where applicable.

.6 Installation of closures and opening reinforcing.

.7 Mechanical fastener types and verification of installation and spacing.

.8 Touch ups of welds and damaged surfaces with proper coatings.

END OF SECTION

SECTION 05 40 00 — COLD FORMED STEEL FRAMING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 SECTION INCLUDES

A. Structural metal studs and track.

B. Metal studs and track accessories

C. Cold rolled metal studs and framing at exterior assemblies supporting exterior cladding materials bearing weight loads including but not limited to:

1. Metal Cladding

2. Soffit Cladding

1.3 RELATED SECTIONS

A. Section 05 12 23 - Structural Steel for Buildings

B. Section 06 10 00 - Rough Carpentry

C. Section 07 26 00 - Vapor Retarders

D. Section 07 27 00 - Air Barriers

E. Section 07 62 00 - Sheet Metal Flashings and Trims

F. Section 09 29 00 - Gypsum Board

1.4 QUALITY ASSURANCE

A. Execute work only by a trade contractor who has adequate equipment and skilled workers to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified during a period of at least the immediate past 5 years.

B. Conduct a pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions. Independent inspection and testing company shall attend the pre-installation meeting.

C. Company specializing in manufacturing products specified in this section with minimum five years documented experience.

D. Welding Standards: Comply with all applicable provisions of the governing Structural Welding Code in the province of the project.

E. Qualify welding processes and welding operators in accordance with governing Standard Qualification Procedures in the province of the project.

1.5 SUBMITTALS

A. Submit required submittals in accordance with Section 01 33 00 - Submittals.

B. Submit Manufacturer's data sheets on each product to be used, including

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods

C. Structural elements shall be designed under direct supervision of professional engineer experienced in design of this Work and registered in the province of the project. Said engineer shall review, sign and seal shop drawings, and perform field reviews supplemented to include the following:

1. Checking that mill test reports are properly correlated to materials
2. Sampling fabrication and erection procedures for general conformity to requirements of the Contract Documents.
3. Checking fabricated members against specified member shapes
4. Sample checking of screwed and bolted joints.
5. Sample checking that tolerances are not exceeded during fit-up or erection.
6. General review of field cutting and alterations required by other sections.

D. Shop drawings shall show both design and installation requirements

E. Include necessary shop details and erection diagrams. Indicate member sizes, locations thicknesses exclusive of coating, coatings and materials. Include connection details for attaching framing to itself and for attachment to the structure. Show splice details where permitted. Indicate dimensions, openings, requirements of Related Sections and critical installation procedures. Show temporary bracing required for erection purposes. Indicate welds by welding symbols as defined in CSA W59.

F. Indicate design loads and design calculations.

G. Shop drawings to be submitted in the metric dimensional system.

H. Certify products meet or exceed specified requirements

1.6 DESIGN REQUIREMENTS

A. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 67 degrees C (120 degrees F).

B. Design framing system to accommodate deflection of primary building structure and construction tolerances.

C. Design exterior non-load-bearing wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.

D. Design shall be based on limit states design principles using factored loads and resistances.

E. Loads and load factors shall be in accordance with the 2012 OBC. For service load calculations, the reference velocity pressure, q, shall be based on a 1 in 50 years probability of being exceeded in any one year for strength design and 1 in 10 years for deflection.

F. Resistances and resistance factors shall be in accordance with the building code and CAN/CSA S136-12.

G. Conform to the requirements of fire rated assemblies which have been tested in accordance with CAN/ULC S101-14 and provide indicated fire resistance rating.

H. Adjust stud material thicknesses and spacing, as required by the design criteria.

I. Conform to requirements of specified fire rated assemblies.

J. Drywall sheathing is NOT to be considered to provide lateral support to member flanges.

K. Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress effects due to torsion between lines of bridging. Collateral sheathing may be used to help restrain member rotation and translation perpendicular to minor axis for:

   1. Lightweight steel framing.

L. Design anchorage and splice details for bridging.

M. Design for local loading due to anchorage of cladding and interior wall mounted fixtures.

N. Maximum deflections under specified loads shall conform to following:

1. L/360 minimum, unless otherwise specified or indicated.

2. Design components or assemblies to accommodate specified erection tolerances of the structure.

O. Provide head, sill and jamb members and connections to frame openings larger than 104 mm (4") in any dimension.

P. Limit free play and movement in connections perpendicular to the plane of the framing to ± 0.5 mm (0.019") relative to the building structure.

Q. Space framing members at 400 mm (16"). Use lesser stud spacing if required by the design criteria.

R. Anchor top and bottom track to the structure at a maximum spacing of 400 mm (16") centre to centre. Closer spacing may be required to satisfy structural requirements.

S. Allow for movement of structure. Design bearing stud end connections to accommodate floor/roof deflections such that studs are not loaded axially. Provide “sliding” or double tracks for non-axial loaded studs, leaving a minimum gap of 12mm, more if required by calculation or specified elsewhere.

T. Connections between lightweight steel framing members shall be by bolts or sheet metal screws.

U. Resistances for sheet metal screws shall be based on manufacturer's lowest bound test values multiplied by appropriate resistance factor, given in CAN/CSA S136-12.

V. Load-bearing wall studs include:

1. Wall studs subjected to lateral loads (no axial load other than self weight andthe weight of applied finishes).

2. Steel bridging.

3. Top and bottom track.

4. Head and sill members and jamb studs for wall openings.

5. Stud bridging and track connections.

6. Top and bottom track connections to main structure including detailing to accommodate floor deflections.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging with identification labels intact until ready for installation.

B. Protect and store materials protected from exposure to rain, snow or other harmful weather conditions. Products to be handled per AISI's "Code of Standard Practice".

C. Products shall be protected from conditions that may cause physical damage or corrosion.

1.8 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel shall conform to requirements of CAN/CSA S136-12 and shall be identified as to specification, type grade and mechanical properties.

B. Members forming part of exterior building envelope shall have a minimum coating of Z275 galvanizing in accordance with ASTM A653/A653M-17. Other coatings providing equal or better corrosion protection may be used, subject to acceptance of Consultant.

C. Welded materials: to CSA W59 and certified by Canadian Welding Bureau.

D. Sheet metal screws shall have a minimum coating thickness of 0.008 mm of zinc. Other coatings providing equal or better corrosion protection may be used, subject to acceptance of the Architect.

E. Zinc rich paint for touching up damaged metallic coatings shall conform to CAN/CGSB 1.181-99.

F. Minimum steel thickness exclusive of coating shall be as follows:

1. 1.22 mm (0.048”) minimum or thicker to satisfy the design requirements.

G. Concrete anchors shall have a minimum coating thickness of 0.008 mm (0.00032”) of zinc. Other coatings providing equal or better corrosion protection may be used.

H. Screws:

1. Screw diameter shall be as specified in the shop drawings but in no case less than a #8 size screw. The length of the screw must be a minimum of 5mm longer than twice the thickness of the steel members being connected, with a penetration beyond the joined material of at least 3 exposed threads unless noted.
2. Steel screws shall be equal or exceed minimum diameter indicated on shop drawings.
3. Penetration beyond joined materials shall be not less than 3 exposed threads.
4. Types and drilling capability shall conform to manufacturer's recommendations.
5. Screws covered by sheathing materials shall have low profile heads.

2.2 FABRICATION

A. Wind Bearing Stud for Exterior Walls: engineer stud framing for exterior wall to resist wind load. Stud depths as engineered, and shown in drawings. Adjust stud material thickness and spacing as required by design criteria. Design to CAN/CSA-S136. Space wall studs at 600mm maximum. Use lesser stud spacing if required. Submit engineered stamped shop drawings for review.

B. Framing components may be pre-assembled into panels prior to erecting.

C. Fabricate panels square, with components attached in a manner so as to prevent racking or distortion.

D. Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.

E. Provide insulation as specified elsewhere in all double jamb studs and double header members, which will not be accessible to the insulation contractor.

F. Axially Loaded Studs shall be Installed to have full bearing against inside track web (1/8 inches (3.2 mm) maximum gap) prior to stud and track attachment.

G. Splices in axially loaded studs are not permitted.

H. Fasten components using self-tapping screws or welding.

I. Welding: Welding is permitted on 18 gauge or heavier material only.

1. Specify welding configuration and size on the Structural Calculation submittal.
2. Touch up all welds with zinc-rich paint in compliance with ASTM A 780

J. Provide cut-outs centered in webs of members to accommodate mechanical and electrical services. Effect of cut-outs on strength and stiffness of members shall be considered.

K. Steel thickness exclusive of coating shall be marked on each member by embossing, stamping with indelible ink or by colour coding.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of metal framing in accordance with manufacturer's installation instructions.

B. Verify bearing elevations supporting members are correct before framing materials are installed.

C. Select fasteners of adequate type, number, and quality to perform intended functions.

D. Verify that rough-in utilities and chases are in correct locations and do not interfere with framing placement.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding

F. Commencement of work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 ERECTION

A. Metal stud framing shall be erected true and plumb within specified tolerances. Temporary bracing shall be employed wherever necessary to withstand loads to which the structure may be subject during erection and subsequent construction. Temporary bracing shall be left in place as long a required for safety and integrity of structure. Erector shall ensure that during erection a margin of safety consistent with the requirements of the building code and CAN/CSA S136-12.

B. Certification of companies: CSA W47.1 for fusion welding, and CSA W55.3 for resistance welding and/or ANSI/AWS D1.3, whichever is applicable. Companies shall have welding procedures approved and welder qualified for the base material types and thicknesses to be welded.

C. Erection Tolerances:

1. For purposes of this section, camber is defined as deviation from straightness of a member or any portion of a member or any portion of a member with respect to its minor axis.
2. For load bearing studs, out of plumbness shall not exceed 1/500th of member length. Out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.
3. Studs shall seat into top and bottom tracks. Gap between end of stud and web of track shall not exceed 4 mm (0.158") for wind bearing studs.
4. Nest top track into deflection channel minimum of 30.0mm and maximum of 40.0mm
5. Do not fasten tracks together
6. Stagger joints.
7. For track, camber shall not exceed 1/1000th of member length.
8. Align adjacent prefabricated panels to provide surface continuity at interface.
9. Spacing of studs shall not be more than 3 mm (1/8") from design spacing. Cumulative error in spacing shall not exceed requirements of finishing materials.
10. Install 50.0mm minimum telescoping track at top of walls where required to accommodate vertical deflection.

D. Make field measurements necessary to ensure proper fit of members.

E. Cutting of members may be by saw or shear. Torch cutting is not permitted.

F. Holes that are field cut into lightweight steel framing members shall conform to requirements of Paragraph 2.02.G.1 and 3.03.D.4.

G. Insulation equal to that specified shall be placed in jamb and header assemblies that will be inaccessible after their installation into wall. Ensure that insulation is kept dry and not compressed.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Performance.

END OF SECTION 05 40 00

SECTION 05 50 00 — METAL FABRICATIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Reserved

B. Section 03 10 00 - Concrete Forming and Accessories

C. Section 03 33 00 09 - Cast-in-Place Concrete Short Form

D. Section 05 12 23 - Structural Steel for Buildings

E. Section 05 21 00 - Steel Joist Framing

F. Section 05 31 00 - Steel Decking

G. Section 09 91 00 - Painting

1.3 REFERENCES

A. Reserved

B. American Society of Testing and Materials International (ASTM)

1. ASTM A53/A53M-12, Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless

2. ASTM A269-15a, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service

3. ASTM A307-14e1, Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile Strength

C. Canadian General Standards Board (CSGB)

1. CAN/CSGB-1.40-[97], Anti Corrosive Structural Steel Alkyd Primer

2. CAN/CSGB-1.181-[92], Ready Mixed, Organic Zinc-Rich Coating

D. Canadian Standards Association (CSA)

1. CAN/CSA-G40.20/G40.21-13. General Requirements for Rolled or Welded Structural Quality Steel

2. CAN/CSA-G164-[M92(R2003)], Hot Dip Galvanized of Irregularly Shaped Articles
3. CAN/CSA-S16.-14, Limit States Design of Steel Structures
4. CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in Cooperation with the Canadian Welding Bureau)
5. CSA W59-13, Welded Steel Construction (Metal Arc Welding)(Imperial Version)

1.4 DESCRIPTION

A. Unless clearly shown to be part of the work of another Section, the work of this Section includes all metal work required including but not limited to railings, guards and other interior architectural fittings and components.

B. Refer to Section 05 12 00 for Structural Steel Framing, else refer to Structural Engineer standard Specification.

1.5 QUALITY ASSURANCE

A. Qualifications of Welders: welding shall be performed by fabricator certified under CSA W47.1-03, for appropriate class of work.

B. Comply with applicable requirements of CSA S16-14.

C. The work of this section that functions to resist forces imposed by dead and live loads shall conform to requirements of jurisdictional authorities.

1.6 SUBMITTALS

A. Submit list of fabrications to be provided as part of the work of this Section.

B. Submit manufacturer's Product data sheets for products proposed for use in the work of this section.

C. Shop Drawings:

1. Submit shop drawings in accordance with General Conditions.
2. Submit detailed shop drawings, including plans, sections and large scale details of all metal fabrications required, showing profiles, members, fastenings (incl. proposed site connections and methods), thicknesses, finishes and other pertinent data.
3. Shop drawings for stairs, supporting framing for stairs, ladders, balustrades, railings, guards shall bear stamp and signature of a professional engineer registered in the province of Ontario.

4. Review of Shop drawings constitutes review of general methods only and will not include approval of dimensions, figures or quantities.

D. Consultant reserves the right to request mock-ups of fabrications, connections, perforations etc for review in conjunction with submitted shop drawings.

1.7 DESIGN REQUIREMENTS

A. Design, fabricate, and install in accordance with the building code and requirements of all other governing authorities.

B. Design assemblies and connections to withstand own dead load, super-imposed dead loads, and fabrication forces, without permanent distortions or deformation, to maximum allowable deflection of L/360, within the following construction tolerances:

1. Maximum variation from plumb in vertical lines

    a. 3.2 mm (1/8") in 3 m (10 ft)

2. Maximum variation from level:

    a. 3.2 mm (1/8") in 9 m (30 ft).

3. Maximum variation from straight:

    a. 3.2 mm (1/8") in 3 m (10 ft) under a 3 m (10 ft) straight edge.

4. Maximum variation from angle indicated:

    a. 10 seconds.

5. Tolerances shall be non-cumulative.

1.8 WORK SUPPLIED BY FABRICATOR BUT NOT INSTALLED

A. Supply following items for installation under the Sections of work: anchor bolts, bearing plates, sleeves and other inserts to be built into concrete and masonry elements and required for anchorage and support of metal fabrications.

B. Supply other Sections with instructions, and if required, templates, necessary for accurate setting of inserts and components.

1.9 PRODUCT HANDLING

A. Deliver, handle and store fabricated components to prevent permanent distortion, corrosion and damage.

B. Label, tag or otherwise mark metal fabrications supplied for installation by other sections to indicate its function, location in building and shop drawing designation.

C. Deliver work to location at the Place of the Project designated by Construction Manager and to meet requirements of construction schedule.

D. Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating before shipping to job site

1. Leave protective coverings in place until final cleaning of building. Provide written instructions for the removal of protective coatings.

PART 2 PRODUCTS

2.1 GENERAL

A. Include materials, products, accessories and supplementary parts necessary to complete assembly and installation of work of this section.

B. Incorporate only metals that are free from defects that are visible, or that impair strength or durability. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharply defined profiles.

C. Refer to the Architectural Plans, Elevations, Finishes Schedule, Millwork Schedule and Millwork Drawings and associated details for information pertaining on finishes and sizing of metal fabrications.

2.2 MATERIALS

A. Steel sections and plate: CAN/CSA G40.21-13 minimum 300W Grade.

B. Square steel tube: CAN/CSA G40.21-13, Grade 350W.

C. Steel pipe: ASTM A53, Type E, Grade A.

D. Sheet steel: hot dip galvanized, cold rolled, with stretcher level degree of flatness to ASTM A653; zinc coating designation Z275.

E. Typical Perforated Metal Panels (unless otherwise noted):

1. Plate and sheet gauge as required, review to Consultant drawings and details.

2. Factory cut and prepare sheet sizes as indicated per drawings

3. Refer to Consultant Drawings for perforation specification

4. Provide perforated panels with minimum width margins

5. Equip panels with return edges, mounting holes, attachment brackets, clips, penetrations and all other accommodations for interferences as detailed and dimensioned on drawings and approved shop drawings

6. Provide perforated metal fabricated panels with electrostatically applied coloured polyester powder coating, heat cured to chemically bond finish to metal substrate; colour as selected by Architect

F. Welding materials: CSA W59 13.

G. Powder coating: Colour as specified by Consultant

H. Shop primer: CAN/CGSB 1.40 97.

I. Bituminous enamel: alkali resistant asphaltic coating.

J. Grout: non shrink, non metallic, flowable, 15 MPa at 24 hours.

2.3 FABRICATION GENERAL

A. Fabricate metal fabrications with machinery and tools specifically designed for the intended manufacturing processes and by skilled tradesmen.

B. Fabricate components in the shop in largest size practicable to minimize field jointing.

C. Fabricate components square, straight, true, free from warpage and other defects. Accurately cut, machine file and fit joints, corners, copes and mitres.

D. Reinforce fabricated components to safely withstand expected loads using materials, component sizes, metal gauges, reinforcing, anchors, and fasteners of adequate strength to withstand intended use, and within allowable design factors imposed by jurisdictional authorities.

E. Fabricate items from steel unless otherwise noted.

F. Make joints in built up sections with hairline joints in least conspicuous locations and manner.

G. Fasten work with concealed methods unless otherwise indicated.

H. Make allowance for thermal expansion and contraction when fabricating exterior work.

I. Joints shall be welded unless otherwise indicated and unless details of construction do not permit welding. Bolt where not possible, and cut off bolts flush with nuts. Countersink bolt heads, and incorporate method to prevent loosening of nuts. Ream holes drilled for fastenings.

J. Exposed welds shall be continuous and shall be ground flat and fill flush with filler compatible with finish coating system, where exposed to view.

K. Close exposed open ends of tubular members with welded-on steel plugs.

L. Where work of other Sections is to be attached to work of this Section, prepare work by drilling and tapping holes, as required to facilitate installation of such other work.

M. Work of this Section, supplied for installation under other Sections, shall be prepared as required ready for installation by: drilling, countersinking and tapping holes, forming shapes and cutting to required sizes.

N. Grind off mill stampings and fill recessed markings on steel components left exposed to view.

2.4 SPECIFIC COMPONENTS

A. Stairs:

1. Build stairs and landings to detail shown in the drawings. Sizes of stringers and other structural members shown are minimum sizes.

2. Construct stairs and landings to safely support minimum load of 150 psf evenly distributed over treads and landings.

3. Cope and crank stringers as necessary to line with floor steel members at framed openings for stairs. Apply continuous welds to cranked stringer joints.

4. Fabricate tread pans and support brackets for metal pan stairs from minimum 1/8” sheet steel and continuously weld to support members. Grind exposed welds smooth.

5. Where indicated provide checkered plate steps bolted or welded to stringers.

6. Between stair stringers and wall provide minimum 1/8” thick steel trim.

7. Reserved

B. Guard Rails:

1. The term “railing” shall be taken to mean balustrades guards, rails and railings of all types.

2. Fabricate railings to conform to applicable building code requirements. If such code requirements are in conflict with the design intent of the drawings, notify Consultant for clarification and direction.

3. Construction: unless otherwise indicated:

   a. Close open ends of tubular members with welded steel plugs.

   b. Turn exposed ends of wall rails into wall.

   c. Support railings at each end and at maximum 4’0” o.c. between.

1) Unless explicitly indicated in drawings or provided in writing otherwise, provide equal spacing between all guard rail supports supports.

d. Tub wall thickness: minimum .1".

e. At corners, angles and intersections cope or mitre and weld and grind smooth.

f. Pickets shall be solid bars.

4. Reserved

C. Handrails:

1. Fabricate handrails to conform to applicable building code requirements. If such code requirements are in conflict with the design intent of the drawings, notify Consultant for clarification and direction.

2. If number of handrail supports indicated in Consultant drawings is considered insufficient by fabricator, seek clarification from Consultant on location and spacing of additional supports as required.

a. Unless explicitly indicated in drawings or provided in writing otherwise, provide equal spacing between all handrail supports.

3. At corners, angles and intersections cope or mitre and weld and grind smooth.

D. Fixed Aluminum Vertical Ladder

1. Basis of Design: Precision Ladders, FL-02 (no walk-thru)

2. Unit Capacity: 680.38 kg loading.

3. Rung Capacity: 1360.78 kg loading.

4. Ladder Stringer: 64mm by 27mm by 3mm extruded 6005-T5 aluminum channel. Pitch 90.

5. Ladder Tread: 58mm by 19mm by 6mm extruded 6005-T5 aluminum with deeply serrated top surface

6. Ladder Mounting Bracket: bracket to suit mounting depth through exterior wall assembly. Aluminum angle.

7. Mounting Brackets: 102mm by 102mm by 6mm aluminum plate

8. Side Rails: 1067mm side rail extension for through ladders exits.

9. Height: to suit application.

10. Finish: powder coated to match adjacent standing seam panels.

11. Provide engineered stamped shop drawings.

2.5 FINISHES

A. Thoroughly clean steel of loose scale, rust, oil, dirt and other foreign matter. Suitably prepare steel surfaces by power tool cleaning to receive specified finishes.

B. Grind smooth sharp projections.

C. Remove oil and grease by solvent cleaning.

D. Apply coatings in the shop and before assembly. Where size permits, galvanize components after assembly.

E. Interior components: shop-apply coat of primer to interior components after fabrication except where other finish is required.

F. Apply coat of bituminous enamel to contact surfaces of metal components in contact with cementitious materials and dissimilar metals.

G. Where indicated, galvanizing shall be undertaken following fabrication except where impossible. Paint galvanized surfaces that are cut, welded or threaded with LEED VOC compliant zinc rich paint to ensure a minimum coating of .1mm immediately following damage to galvanized protection

PART 3 EXECUTION

3.1 EXAMINATION

A. Take measurements at the Place of the Project to ensure that metal fabrications are fabricated to fit surrounding construction, around obstructions and projections in place, or as indicated, and to suit service locations.

3.2 INSTALLATION

A. Install components plumb, square, straight and true to line. Drill, cut and fit as necessary to attach this work to adjoining work.

B. Provide temporary supports and bracing required to position components until they are permanently anchored in place.

C. Securely anchor components in place; unless otherwise indicated, anchor components as follows:

1. To interior concrete and solid masonry with corrosion resistant expansion type anchor bolts

2. To exterior concrete and solid masonry with.non-shrink epoxy cement
3. To hollow construction with toggle bolts.
4. To thin metal with screws or bolts.
5. To thick metal with bolts or by welding.
6. To wood with bolts or lag screws.
7. Fill space between railing members and sleeves with non shrink grout.
8. Provide all components required for anchoring. Make anchoring in concealed manner wherever possible. Make exposed fastenings, where approved by Consultant, neatly and of same material, colour, texture and finish as base metal on which they occur. Keep exposed fastenings evenly spaced.

D. Dissimilar metals and metals in contact with cementitious elements shall have contact surfaces coated with bituminous paint or be isolated by other means as approved by Consultant.

E. After installation, clean and refinish injured finishes, welds, bolt heads and nuts. Refinish with zinc rich paint or primer to match original finish.

F. Remove damaged, dented, defaced, defectively finished or tool marked components and replace with new.

3.3 PROTECTION

A. Maintain protection of work of this section from time of installation until final finished are applied or to final clean-up

B. Protect finished surfaces from damage.

END OF SECTION 05 50 00

SECTION 06 10 00 — ROUGH CARPENTRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Section 02 41 19 - Selective Demolition

B. Section 05 12 23 - Structural Steel For Buildings

C. Section 05 50 00 - Metal Fabrications

D. Section 06 20 00 - Finish Carpentry

E. Section 08 14 16 - Wood doors

F. Section 08 51 13 - Aluminum Windows

G. Reserved

1.3 REFERENCE STANDARDS

A. Reserved

B. The latest applicable edition of following reference standards and codes shall govern all work specified herein as appropriate:

1. The Ontario Building Code

2. American Society for Testing and Materials International (ASTM):

    a. ASTM C1396/C1396M, Standard Specification for Gypsum Board.

    b. ASTM D5055, Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

3. Canadian Standards Association (CSA International)

    a. CSA B111, Wire Nails, Spikes and Staples.

    b. CSA 0112.9, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

    c. CSA O121, Douglas Fir Plywood.

    d. CAN/CSA-O141, Softwood Lumber.

e. CSA O151, Canadian Softwood Plywood.

f. CAN/CSA-O325.0, Construction Sheathing.

4. National Lumber Grades Authority (NLGA): Standard Grading Rules for Canadian Lumber

1.4 QUALITY ASSURANCE

A. Lumber shall bear the grading stamp of an agency certified by The Canadian Lumber Standards Administration Board.

B. Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

C. All lumber shall be sound, straight, dressed all sides and kiln dried, and moisture content at any time during shipment and storage shall not exceed 19%.

1.5 SUBMITTALS

A. If requested by Consultant, submit erection drawings for components requiring Building Code compliance, or required to withstand dead or live loads.

1.6 WORK SUPPLIED BUT NOT INSTALLED

A. Supply to other Sections anchors, bolts, rough hardware and other items required to be built into work of other Sections to receive, accommodate, secure work of this Section.

B. Provide other Sections with instructions to ensure accurate setting of built in items.

1.7 PRODUCT HANDLING

A. Store materials on site to prevent deterioration, loss or impairment of their structural and other essential properties. Prevent excessive moisture gain of materials.

B. Do not store seasoned materials in wet or damp areas.

C. Store materials on raised supports. Cover materials with waterproof covering. Provide adequate air circulation and ventilation.

PART 2 PRODUCTS

2.1 FRAMING AND LUMBER MATERIALS

A. Lumber Materials:

1. Unless otherwise specified use softwood, S4S, moisture content of 19% or less in accordance with the most current versions of CSA-O86-09 Strength

Group D (spruce pine fir) and CAN/CSA-O141 05 and National Lumber Grading Authority (NLGA) Standard Grading Rules

2. Furring, blocking, nailing strips, grounds, rough bucks, fascia backing and sleepers:

   a. Board sizes: NLGA ”Standard" or better grade.

   b. Dimension sizes: NLGA ”Standard" light framing or better grade.

   c. Post and timbers sizes: NLGA ”Standard" or better grade.

B. Plywood/Panel Materials:

1. Refer to wall sections and other detailed architectural drawings for locations and specification of various plywoods.

2. Plywood, OSB and wood based composite panels: to CAN/CSA-O325.0.

3. Exterior Sheathing: Douglas Fir to CSA O121 08 Unsanded Sheathing Grade ,Exposure I classification.

4. Standard Plywood: Douglas Fir to CSA O121 08 Unsanded Sheathing Grade

5. Fire Retardant Plywood: Canadian Softwood Plywood to CSA O151-09, Sanded grade, solid two sides, fire retardant pressure treated

C. Pressure treated material to be Alkaline Copper Quaternary (ACQ).

D. Wood I-joists in accordance with Prefabricated Wood I-Joists ASTM D5055.

E. Reserved

2.2 FASTENERS AND CONNECTING HARDWARE

A. Nails: to CSA B111 1974, hot dip galvanized steel for exterior work including components located in exterior walls and roofs; bright finish steel in all other locations. Unless otherwise indicated use common spiral flathead nails.

B. Staples: CSA B111 1974, hot dip galvanized steel.

C. Screws: zinc, cadmium or chrome plated.

D. Bolts, nuts, washers: ASTM A307, hot dip galvanized steel.

1. Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

E. Connectors, anchors, brackets, spikes: hot dip galvanized structural quality steel.

F. Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.

G. Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, type approved by Consultant.

H. Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

I. Fasteners in contact with preservative pressure treated wood shall be stainless steel unless otherwise approved by Consultant.

J. Galvanized fasteners, where required, shall adhere to CAN/CSA-G164 for exterior work.

1. Exposed fasteners for cladding and other architectural elements shall be as per manufacturer specification

K. Reserved

2.3 ACCESSORIES

A. Exterior wall sheathing paper: to CAN/CGSB-51.32 single ply, spunbonded olefin type coated impregnated as indicated.

B. Polyethylene Film: to CAN/CGSB-51.34-M86, 100 micrometre thick.

C. Sealing Tape: minimum 60 mm width, polypropylene sheathing tape with acrylic adhesive, or duct tape of same width.

D. Sill Gasket Air seal: closed cell polyurethane or polyethylene.

E. Sealants: see requirements of Section 07 91 00 – Joint Sealants.

F. General purpose adhesive: to CSA O112.9.

G. Subfloor adhesive: Titebond All Weather Subfloor Adhesive or LePage PL400 Subfloor and Deck Adhesive

H. Reserved

2.4 WOOD TREATMENT

A. Use preservative pressure treated lumber and plywood within exterior wall and roof systems and at other locations indicated on drawings.

1. Pentachlorophenol use is restricted to building components that are in ground contact and subject to decay or insect attack only. Where used,

pentachlorophenol-treated wood must be covered with two coats of an appropriate sealer

2. Surface applied wood preservative shall be clear or copper apthenate or 5% pentachlorophenol solution, water repellant preservative
3. Structures built with wood treated with pentachlorophenol and inorganic arsenicals must not be used for storing food nor should the wood come in contact with drinking water.
4. Fire retardant pressure treated components: to CAN/CSA O80 Series 08 for maximum flame spread of 25 and labelled by ULC.

B. Surface cut, bore and trim components to sizes required as much as possible prior to pressure treatment.

C. Where it is necessary to cut, bore or otherwise alter pressure treated components in the field, treat cut surfaces with heavy coat of wood preservative.

D. Reserved

PART 3 EXECUTION

3.1 GENERAL

A. Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

B. Where required, treat surfaces of material with wood preservative, before installation.

1. 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.
2. Treat all material as follows:

    a. Wood fascia, backing, curbs, nailers.

    b. Wood furring for sheeting/siding on outside surface of exterior masonry concrete walls.

    c. Wood sleepers supporting wood subflooring over concrete slabs in contact with ground or fill.

C. Erect work plumb, level, square and to required lines. Ensure that materials are rigidly and securely attached to each other and to adjacent building elements and will not be loosened by work of other Sections.'

D. Construct continuous members from pieces of longest practical length.

E. Where other materials and components are to be applied directly over wood members recess heads of fastening devices below wood surfaces.

F. Where work remains exposed to view, fasteners shall be uniformly and evenly spaced and neatly installed.

G. Reserved

3.2 SHEATHING AND SUBFLOORS

A. Install plywood sub flooring, sheathing and roof decking with end joints staggered, with grain of face plies running perpendicularly to wood framing members and with ends bearing on framing members.

B. Provide continuous bead of subfloor adhesive below plywood subfloor, provide double bead at panel joints.

C. Screw fasten plywood subfloor to supporting framing at maximum 150mm o.c. along edges and maximum 300mm o.c. at intermediate bearings.

D. Leave 1.5mm space between exterior sheathing panels.

E. Provide minimum 6mm thick plywood underlayment, nailed or stapled and glued, below resilient flooring. Provide additional plywood underlayment as required to achieve flush finish flooring transition to adjacent finish flooring.

3.3 NAILS, BLOCKINGS, COPINGS, GROUNDS, CURBS

A. Provide wood nailers, blocking, copings, strapping, bucks, grounds and other rough carpentry components to sizes and in locations required for satisfactory support of fabricated items and other work. Provide wood blocking at steel stud framed gypsum board partitions for support of wall mounted components.

B. Unless otherwise indicated, provide minimum 1 ½” thick materials. Grounds may be 7/8” thick material unless otherwise indicated.

C. Provide built up wood curbs for rooftop mounted equipment. Unless otherwise detailed, provide 3 5/8” thick curbs extending minimum 12” from top of roof membrane to top of curb.

D. Reserved

3.4 ANCHORS AND FASTENERS

A. Provide rough hardware including nails, screws, bolts, washers, brackets, hangers, and fastening devices of all types.

B. Unless otherwise indicated, attach wood members at maximum 600 mm o.c. as follows:

1. To concrete and solid masonry with expansion or friction type anchor bolts.
2. To hollow masonry with toggle bolts.
3. To heavy gauge metal with bolts.
4. To light gauge metal with screws or bolts.
5. To wood with nails, screws or bolts as required to ensure stability.

C. Fasten wood copings to supporting masonry elements with ½" galvanized steel bolts minimum 12" long spaced maximum 24" o.c. Where width of coping plate exceeds 4", stagger bolts off centre.

D. Countersink bolts where necessary to provide clearance for other work.

E. Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

F. Reserved

3.5 BACKBOARDS

A. Where required by Division 09, Division 10, Divison 26, provide minimum 19 mm thick fire retardant treated plywood backboards mounted on strapping, if required.

B. Size backboards to adequately accommodate equipment to be mounted. Secure boards with countersunk fasteners to supporting walls in manner which will carry equipment load without damaging wall.

C. Reserved

END OF SECTION 06 10 00

SECTION 06 20 00 — FINISH CARPENTRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1

1.2 RELATED WORK

A. Section 05 50 00 Meal Fabrications

B. Section 06 10 00 Rough Carpentry

C. Section 06 61 19 Quartz Surfacing Fabrications

D. Section 08 14 16 Wood Doors

E. Section 08 80 00 Glazing

F. Section 09 84 00 Acoustical Wall Treatments

G. Section 09 91 00 Painting

1.3 QUALITY ASSURANCE

A. Reference Standards: unless otherwise specified, carry out finish carpentry work in accordance with requirements of “Architectural Woodwork Quality Standards” (latest issue) of Architectural Woodwork Institute (AWI) and Architectural Woodwork Manufacturers’ Association of Canada (AWMAC), Custom Grade.

1.4 SUBMITTALS

A. Submit detailed shop drawings for wood paneling showing proposed assembly connections, anchorage, materials, dimensions, thickness and finishes. Verify dimension on site prior to fabrication.

B. Submit replicate samples of each type of solid wood and plywood used in exposed work prior to fabrication. Include all types of finishes including plastic laminates and metals.

1.5 MOCK UPS

A. At location directed by Consultant, construct mock-up of wood paneling, minimum 8x8’, incorporating edge details and junctions to each panel type and thickness.

B. Submit 8” long samples of each type of trim, moulding and handrail

C. Mock-ups may be incorporated into finished work, once approved by architect.

1.6 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Protect cabinetwork against damage, including damage by excessive changes in moisture content. Maintain minimum storage temperature of 16 degree celsius and relative humidity of 25% to 55%.

B. Cover plastic laminate faces at shop with heavy Kraft paper

C. Do not deliver finish carpentry components to site before all wet trades are completed, the building is closed in and humidity conditions on site are acceptable Do not deliver during rain or damp weather.

D. From time of fabrication until installation, store handle and transport materials so as to prevent deterioration or loss or impairment of essential properties. Prevent moisture gain of kin dried materials.

1.7 PROTECTION

A. Provide coverings as necessary to protect finish carpentry components from damage of any kind during storage and after installation.

1.8 QUALITY ASSURANCE

A. Company specializing in finish carpentry work, possessing a minimum of 5 years of experience work of this nature.

B. Company must be an active member in good standing in the Architectural Woodwork Manufacturer's Association of Canada (AWMAC).

1.9 COORDINATION

A. Coordinate provision of concealed blocking or supports.

B. Ensure that back-priming of finish carpentry surfaces concealed after installation, has been performed as specified in Section 09 91 00 Painting, prior to installation.

1.10 WARRANTY

A. At no cost to Owner remedy and defects in work of this Section due to defects in materials and workmanship, including but no necessarily limited to delaminating, warping, and other defects detrimental to appearance and/or performance for a period of 2 years from the date of Substantial Performance.

PART 2 PRODUCTS

2.1 MATERIALS

A. Refer also to Room Finish Schedule for finished plywood specifications and veneer designations.

B. Solid Wood:

1. Unless otherwise indicated, provide AWI/AWMAC Premium Grade
2. All wood materials shall be new, straight and clean, free of sap, knots, pitch, and other defects, except as permitted by applicable grading rules.
3. All wood shall be kiln dried to a maximum moisture content of 6% to 8% for interior work.
4. Hardwood: refer to to finishes legend for Veneer specfications
5. Softwood: to CSA O141-05, dressed all sides used in concealed locations only except where shown otherwise. Concealed framing.

C. Panel Materials:

1. Hardwood plywood: to CSA O115-1982, Type I, AWI/AWMAC AA, Refer to Finishes Legend for Veneer Specifications.
2. Softwood Plywood: to CSA O151-17 Sanded Grade, solid two sides; use in concealed locations only.
3. Particleboard: ANSI A208.1, minimum 700 kg/m3 density.
4. Medium Density Fibreboard: ANSI A208.1, minimum 750 kg/m3 density.
5. Hardboard: CGSB 11-GP-3M, Type 2
6. Melamine faced panels: melamine resin impregnated sheet, thermally fused to particleboard; colours/textures selected by Consultant from full range of products by Uniboard Canada Inc., or Panolam Surface Systems or other products approved by Consultant.
    a. Colour: to be selected by Consultant.

D. Plastic Laminated Components:

1. Plastic laminate facing sheet: ANSI/NEMA LD3-2005, Grades HGS, VGS and HGP; colours, gloss and texture will be selected by Consultant from full range of products by Formica, Arboreta, Nevamar, Wilsonart, Pointe. Colours to be selected by Consultant.
2. Backing Sheet: BKL Grade by manufacturer of facing sheet.
3. Core: ANSI A208.1 minimum density 700 kg/m3.
4. Laminating Adhesive: CSA-O112 Series M1977.
5. Core Sealer: Clear water resistant synthetic resin sealer.

E. Fastener and Adhesive:

1. To suit size and nature of components being fastened. Unless otherwise noted:

   a. Nails and staples: CSA B111-1974, galvanized.

   b. Screws: zinc, cadmium or chrome plated steel.

   c. Adhesive: CSA-O112 Series - M1977, waterproof type as approved by Consultant.

F. Cabinet Hardware: Refer to appended millwork schedule. Unless otherwise noted, products listed below shall be a standard of acceptance. Products by other manufacturers, of equal quality and similar appearance may also be provided subject to review and approval by architect.

1. Hinges for 3/4” door Blum 91-650, 170 degree with self-closing spring.

2. Door and drawer pull: GSH 302 x 4”, CTC 7.5mm o.d. brushed stainless steel.

3. Drawer slides: full extension for 100 lbs load @ 20”, KV 1429 by K&V or Accuride.

4. Drawer locks: Olympus 078 or CompX National C8702 or Corbin CCL 02066.

5. Cabinet locks: Olympus 078 or CompX National C8702 or Corbin CCL 02067, keyed as directed by architect.

6. Automatic door bolt per double doors: Hafele 245.58.754

7. Pilaster and Clips: KV 255, 256.

8. Hardware Finish: unless otherwise indicated chrome or nickel plated.

2.2 FABRICATION

A. Fabricate items rigid, plumb and square, as detailed, with tight, hairline joints. Sand work smooth, set all nails and screws.

B. Build-in finished carpentry to receive all reinforcing, bracing, anchors.

C. Make cutouts in work of this Section as required to accommodate work of other Sections.

D. General Requirements:

1. Exposed Surfaces:

a. Provide wood members free from bruises, blemishes, mineral marks, knots, shakes, and other defects, except as specifically permitted by grade rules.

b. Select exposed surfaces in any one area for balanced overall appearance free of stark contrasts.

c. Sand smooth all exposed surfaces to provide even and uniform finish free of defects detrimental to appearance.

2. Exposed joints and edges:

a. Uniformly space exposed joints unless otherwise indicated.

b. No edge grain shall be visible; mitre external corners, house internal corners. Secure corners with corrugated metal fasteners. Glue mitred corners.

c. All exposed edges of plywood and particleboard shall have solid wood edging =, pressure glued, unless required to be covered with plastic laminate or melamine.

3. Mechanical fasteners:

a. Inconspicuously locate mechanical fasteners. Wherever possible conceal fastenings.

b. Countersink nail heads.

c. Where exposed to view, countersink screw and bolt heads and fill holes with matching plugs.

E. Standing and Running Trim

1. Fabricate trim of 1/2” hardwood.

2. Length: standing trim shall be in one piece. Running trim shall be in longest practicable lengths.

F. Plastic Laminate Components:

1. Unless otherwise specified herein meet requirements of AWI/AWMAC “Quality Standards”.

2. Assembly: bond plastic laminate to core with adhesive using pressure. Bond plastic laminate to both faces or core using same adhesive and same pressure.

3. Core: unless otherwise indicated 3/4” thick plywood or particleboard.

4. Balanced construction: plastic laminate covered components shall be of balanced construction, with plastic laminate on both faces of core. Seal core edges not covered with plastic laminate.

5. Use largest practicable plastic laminate sheet size.

6. Provide joints symmetrically; provide joints at corners and at changes in superficial areas; provide concealed draw bolt anchors at joints. All but joints shall have a blind spline.

7. Construct counter with performed front edge and square corner splash back. Chamfer edges uniformly at approximately 20 degrees, do not mitre.

8. At L-shaped corners mitre plastic laminate to outside outside corner. Accurately fit members together to provide tight and flush butt joint.

9. Apply self-edged minimum .06" thick plastic laminate to exposed ends of countertops.

10. Apply self-edged minimum 4" high or higher where indicated. Return splash back at ends except where indicated otherwise.

11. Openings and Cutouts:

    a. Radius internal corners at least 1/8" and chamfer edges.

    b. Where core edge is to remain exposed, cover with plastic laminate edging.

    c. Where core edge is to be concealed, seal in sealer.

12. Wood Paneling:

    a. Fabricate wood paneling of hardwood with solid 1/4" hardwood edges matching panel veneer on all sides.

    b. Select hardwood plywood for each area where paneling is used, so as to produce a well blended appearance, free of starkly contrasting veneer colours within any one area. Run wood grain in direction shown on drawings. Replace components which in Consultant's opinions are not of a satisfactory appearance.

    c. Prepare paneling for mounting with concealed metal hangers.

    d. Factory finish all wood paneling with a stain and polymerizing two components catalytic conversion varnish system; colour and sheen to be selected by Consultant. All surfaces shall be carefully prepared and sanded before and between coats to provide final finish which shall be smooth, even and uniform free of machine marks, hammer marks, depressions and imperfections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine existing conditions to ensure that they are satisfactory to receive the work of this section. Start of installation shall imply acceptance of conditions.

3.2 INSTALLATION

A. Install components plumb, true and level and securely fasten in place. Accurately scribe and closely fit components to irregularities of adjacent surfaces.

B. Accurately fit joints in true plane, locate joints over bearing or supporting surfaces.

C. Provide mechanical fastening devices such as nails, screws and bolts required for fastening wood components. Unless permitted provide concealed fastening of components.

D. Where permitted, nail with small headed finishing nails. Countersink nail heads with nail setter.

E. Install plastic laminate components using concealed fastening devices.

F. Where components are fastened with screws or bolts, countersunk screw and bolt heads and provide wood plugs matching surrounding wood.

G. Where cabinetwork abuts other building elements provide wood trim matching cabinetwork except where otherwise detailed.

H. Prepare work of this section to receive services, fittings and fixtures provided by Division 22 and 26.

I. Where access is required to valves and other mechanical and electrical components, located behind cabinetwork, provide removable plywood access panels of size required and secure with four brass screws.

J. Check operation of all movable parts and, if necessary, adjust to ensure proper and smooth function.

K. Upon completion of installation, inspect work of this section and touch up, where required, minor or damaged surface finish to restore it to original condition Replace damaged components which, in the opinion of the architect, cannot be satisfactorily repaired.

END OF SECTION 06 20 00

SECTION 06 40 00 — ARCHITECTURAL WOODWORK

PART 1 SECTION INCLUDES

1.1 Fabrication, supply and installation of all casework, millwork, cabinetry and related products, hardware and materials required to complete those components.

1.2 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.3 RELATED SECTIONS

A. Section 06 10 00 Rough Carpentry

B. Section 06 20 00 Finish Carpentry

C. Section 09 30 00 Tile

D. Section 09 91 00 Painting

1.4 REFERECE STANDARDS

A. ANSI/BMHA A156.9-1994, American National Standard for Cabinet Hardware.

B. “Architectural Woodwork Quality Standards Illustrated”, latest edition, published by the Architectural Woodwork Institute of the U.S. and jointly copyrighted with the Architectural Woodwork Manufacturer's Association of Canada (AWMAC). This document is herein referred to as the “AWMAC Manual”.

C. Canadian General Standards Board (CGSB), CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

D. Canadian Standards Association (CSA International):

1. CSA B111-74(R2003), Wire Nails, Spikes and Staples.

2. CSA O112.4 Series-M1977(R2006), Standards for Wood Adhesives.

3. CSA O112.5-Series-M-1977(R2006), Urea Resin Adhesives for Wood (Room- and High Temperature Curing).

4. CSA O112.7-Series M-1977(R2006), Resorcinol and Phenol-Resorcinol Resin Adhesives for Wood (Room- and Intermediate-Temperature Curing).

5. CSA O121-17, Douglas Fir Plywood.

6. CSA O141-05 (R2014), Softwood Lumber.

7. CSA O151-17, Canadian Softwood Plywood.

8. CSA O153 -13, Poplar Plywood

1.5 SUBMITTALS

A. Provide submittals in accordance with Division 01.

B. Product Data: Submit manufacturer's product literature for items not manufactured by architectural woodwork manufacturer, when requested.

C. Care and Maintenance Data: provide written instructions for surfaces which require specific cleaning products and techniques.

D. Shop Drawings:

1. Indicate materials, factory finishes, thicknesses, and hardware. Include plans, elevations, sections and details at the following minimum drawing scales:

   a. Plans and elevations – 1:20

   b. Sections – 1:10

   c. Details – 1:2

2. Indicate construction details, locations of built-in items, connections, attachments, anchorage and location of exposed fastenings, as applicable.

E. Samples:

1. Submit 215 mm x 280 mm samples of panel products for each factory applied finish system.

2. Submit 32 mm x 350 mm samples of lumber of each species.

3. Finish one side and edge of samples representing items to receive factory finishes.

4. Submit samples of veneer flitches and finishes.

5. Submit samples of plastic laminate for selection of colour.

6. Quality Assurance Submittals: Submit manufacturer’s installation instructions.

7. Submit MSDS sheets or official manufacturer literature stating no urea-formaldehyde was used to composite wood.

F. PROJECT RECORD DOCUMENTS

1. Provide project record sheet identifying project title and address, Contractor and architectural woodwork manufacturer.

2. Provide one set of reviewed shop drawings, indicating modifications to materials and shop finishes, and type and source of hardware and any specialty items used.

G. QUALITY ASSURANCE

1. Materials and workmanship shall meet or exceed recommendations and requirements of "AWMAC Manual".
2. Requirements of this Section shall govern in case of conflict between this Section and the AWMAC Manual.
3. Reference to custom or premium grade in this Section shall be as defined in the AWMAC Manual.
4. Items without a grade specified shall be custom grade.
5. Maintain a copy of the specified AWMAC Manual at the factory, readily available for duration of work.
6. Installer shall be responsible for supplying field dimensions that will affect the work of this Section.D
7. Supply materials certified as Forestry Stewardship Council (FSC).

H. DELIVERY STORAGE AND HANDLING

1. Deliver to site after receiving and storage areas have stable humidity and temperature conditions as recommended in AWMAC Manual.
2. Protect architectural woodwork items against dampness during and after delivery. Store architectural woodwork items on level surfaces in ventilated areas, protected from direct sunlight and extreme changes in temperature or humidity.

I. COORDINATION

1. Coordinate installation of the following items during fabrication of casegoods:
    a. Electrical conduit, junction boxes, fixtures and receptacles
    c. Mechanical grilles
    d. Plumbing runs and drains

J. WASTE MANAGEMENT

1. Separate waste materials in for reuse and recycling in accordance with best practices and Division 01

K. WARRANTY

1. Provide a two year extended warranty on the work of the architectural woodwork trade, commencing on the date of Substantial Performance. The terms of this extended warranty shall be the same as those provided under the terms of the AWMAC Certificate of Guarantee.
2. The architectural woodwork subcontractor or supplier must be a member of AWMAC.

PART 2 PRODUCTS

2.1 LUMBER GENERAL

A. Materials: to AWMAC Manual, except where otherwise specified.

1. Framing lumber: specified species, no. 1 grade, S4S.
    a. CSA O141
    b. NLGA Standard Grading Rules for Canadian Lumber.
2. Hardwood lumber: meeting AWMAC premium grade, for species specified.
    a. National Hardwood Lumber Association (NHLA).
    b. AWMAC premium grade, moisture content as specified.

B. Moisture Content: between 4 to 9%

2.2 PANEL PRODUCTS, GENERAL

A. Provide panel products manufactured with phenol-formaldehyde or, if avialable formaldehyde free adhesive.

B. Materials and Moisture Content: to AWMAC Manual, except where otherwise specified.

C. Particleboard: to ANSI A208.1-1999, grade M-2, sanded faces, minimum density 700 kg/m3.

D. Softwood Plywood: to applicable CSA standards referenced in AWMAC Manual, G2S.

E. Hardwood Plywood: to CSA-O115-M1982 (R2001). Graded in accordance with the Official Grading Rules for Canadian Hardwood Plywood.

F. Veneers

1. Open-grain species: minimum 0.71 mm thick.

2. Close-grain species: minimum 0.61 mm thick.

G. High Pressure Decorative Laminate (HPDL): to AWMAC Manual.

H. Silicone Sealant: to CAN/CGSB-19.13-M87, Shore A hardness 15-25.

2.3 CASEWORK HARDWARE

A. Where products are specified by proprietary names, other unnamed products may be used as alternates in accordance with the requirements of Division 01.

B. Hinges: to ANSI-A156.9, B01612 – concealed hinge, self closing, 120 to 125 degree of opening, full overlay type for screw attachment complete with mounting plates. Acceptable products:

1. Model “71T558” by Blum.
2. Model “HD1311-552” by Mepla.
3. Model “A00P94” by Salice.
4. Model “9956” by Hettich.

C. Door and Drawer Pulls: refer to millwork schedule.

D. Drawer Slides For Drawers Up To 150 mm Deep: to ANSI-A156.9, B85051, side mount, steel construction, 3⁄4 extension, ball bearing operation, rail disconnect system, bright zinc finish, length as required. Acceptable Products:

1. Model “2132” by Accuride.
2. Model “8300” by Knape & Vogt.
3. Model “4500” by Waterloo.
4. Model “5632” by Hettich.

E. Drawer Slides For Drawers Deeper Than 150 mm: to ANSI-A156.9, B85051, side mount, steel construction, full extension, ball bearing operation, bright zinc finish, length as required. Acceptable Products:

1. Model “3832” by Accuride.
2. Model “8400” by Knape and Vogt.
3. Model “3690” by Waterloo.
4. Model “5632” by Hettich.

F. Adjustable Shelving Standards: to ANSI-A156.9, B84071, steel construction, adjustable in 13 mm increments, refer to millwork schedule for finish. Acceptable Product:

1. Model: “KV-255” by Knape & Vogt.

G. Shelf Rests: to ANSI-A156.9, B84091, steel construction, to match shelving standards. Acceptable Product:

1. Model: “KV-256” by Knape & Vogt

H. Locks: Inlay or rim style deadbolt or cam lock system. Locks to match decorative hardware as specified in millwork schedule. Confirm keying required (master keyed, keyed alike in groups or keyed differently – supply keying schedule).

2.4 CASEWORK GENERAL

A. Fabricate casework to AWMAC grade specified in the individual casework articles in this Section.

B. Furring, Blocking, Nailing Strips and Grounds: standard grade, to NLGA grading rules, for boards and dimension lumber.

C. Framing: pine species (unless otherwise noted).

D. Unless otherwise noted, minimum fabrication standards shall be as follows:

1. Case Bodies, Ends, Dividers, Bottoms and Doors and Exposed Backs: 3/4" (19 mm) unfinished thickness

2. Non-exposed Backs: 1/4" (6 mm) unfinished thickness for all base, tall and wall cabinets with hanging strips and minimum of 1/2" (12 mm) for wall cabinets without hanging strips

3. Maximum Unsupported Shelf Length: 48" (1219 mm) (unless otherwise noted or inappropriate to usage).

4. Thickness of Shelves prior to Finishing:

a. Unsupported lengths up to 32" (813 mm):

1) 3/4" (19 mm) particle board. or 3/4" (19 mm) veneer core plywood.

b. Unsupported lengths between 32" (814 mm) and 36" (914 mm):

1) 3/4" (19 mm) veneer core plywood.

c. Unsupported lengths between 36" (915 mm) and 42" (1066 mm):

1) 1" (25 mm) particle board or 1- 1/16" (27mm) veneer core plywood.

d. Unsupported lengths between 42" (1067 mm) and 48" (1219 mm):

1) 1- 1/16" (27mm) veneer core plywood.

5. Fabricate drawers of box construction as follows:

a. Perimeters: 1/2" (12 mm) thickness prior to finishing, solid birch for clear and opaque finishes and particleboard for plastic laminate or melamine finish.

b. Bottoms: 1/4 (6 mm) thickness prior to finishing, melamine or tempered hardboard, dadoed or grooved into perimeter, captured on 3 sides, screwed to back of drawer with a minimum of 4 screws.

c. Faces: 3/4" (19 mm) thickness prior to finishing.

6. Edge banding: hardwood, or ABS laminate. PVC edge banding is not acceptable. Refer to millwork schedule.

7. Apply panel face HPDL to overlap edges of edge banding HPDL.

8. Mortise shelf standards fully into casework.

9. Maximum gap between adjacent doors or drawers shall be 3 mm.

10. When screw fastening, fasten into core by pre-drilling holes as required and inserting plastic or metal screw dowels to receive screw fasteners.

2.5 CASEWORK, STAIN WITH CLEAR FINISH

A. AWMAC Quality Grade: Premium

B. Construction: to AWMAC Manual for flush overlay, except as otherwise detailed on drawings.

C. Edge Banding: as detailed on drawings, no. 1 grade material to match face veneer, 1/8" (3 mm) thickness.

D. Exposed and Semi-Exposed Parts:

1. Panel Products:

a. Plywood Species: Refer to interior finish legend and millwork schedules.

b. Core: Veneer

c. Veneer Grade: AA

d. Veneer Cut: Rotary Cut

e. Veneer Match: Slip and Sequence matched.

2. Hardwood Lumber

a. Species: Refer to interior finish legend and millwork schedules.

b. Grade: No. 1

c. Grain: Mixed

E. Wood Finish

1. Semi-Transparent stain, followed by clear finish. Refer to drawings for colours and locations.

2.6 CASEWORK, HIGH PRESSURE DECORATIVE LAMINATE (HPDL) FINISH

A. AWMAC Quality Grade: Premium

B. Construction: to AWMAC Manual for flush overlay, except as otherwise detailed on drawings.

C. Exposed and semi-exposed parts:

1. Panel Products:

a. Core: Hardwood specs, shop sanded exterior grade veneer core plywood, G2S, or industrial grade particleboard. use only particle board core for doors and drawer fronts.

2. High Pressure Decorative Laminate (HPDL):

a. Horizontal General Purpose Grade (HGS): thickness of 1.2mm ±0.12 mm, used on the following:

1) Laminate finish and colour as specified in interior finish legend and millwork schedules

2) Horizontal surfaces, unless specified otherwise.

3) Core: poplar, spruce or birch shop sanded exterior grade veneer core plywood, G2S, minimum 3/4" (19mm) thickness or industrial grade particleboard, minimum 1-1/8" (29 mm) thickness.

4) Backing: HPDL backer applied to underside of countertops and back of splash backs.

5) Edge Type: HGS high pressure decorative laminate as detailed on drawings.

6) Splash back: profile as detailed on drawings.

3. Vertical General Purpose Grade (VGS): thickness of 0.7mm to ±0.10 mm, used on the following:
    a. Vertical surfaces, unless specified otherwise.
    b. Exposed portions of case bodies, including ends, divisions and bottoms.
    c. Exposed shelves.
    d. Casework Doors: exposed and semi-exposed surfaces.
    e. Drawer Faces: exposed and semi-exposed surfaces.
4. Low Pressure Laminate Grade: minimum 0.5 mm (0.020”) low pressure laminate (melamine) thermally fused to low VOC emission/low formaldehyde emission MDF core, meeting the requirements of ANSI/NEMA used in the following locations:
    a. Concealed shelves.
    b. Interior portions of case bodies.
    c. All concealed surfaces of drawer boxes.
    d. Colour: refer to interior finish legend and millwork schedules for acceptable manufacturers and colours

2.7 FABRICATION

A. Details for casework shall conform to flush overlay design.

B. Set nails and countersink screw, apply plain wood filler to indentations, sand smooth and leave ready to receive finish.

C. Shop install cabinet hardware.

D. Use draw bolts in countertops and casework joints.

E. Provide hairline joints in architectural woodwork.

F. Fabricate work for delivery to site in sizes easily handled and to ensure passage through building openings.

G. Shop Assembly:

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer’s printed instructions and technical bulletins.

2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Reinforce with strip of solid polymer material, 50mm wide.
3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
    a. Rout cutouts, radii and contours to template
    b. Smooth edges.
    c. Repair or reject defective and inaccurate work.

2.8 FACTORY FINISHING MATERIALS

A. Factory finishing materials: Use only products included in Manufacturers' Product List of the Master Painter Institute Architectural Specification Manual, latest edition.

B. Backprimers: white alkyd enamel primer or gloss varnish thinned 25%, compatible with exposed finish, as applicable.

C. Do not use combination filler/stain.

2.9 FACTORY FINISHING

A. Comply with applicable requirements and recommendations for factory finishing in AWMAC Manual.

B. Refer to Millwork Schedule at end of this Section for factory finishing requirements.

C. Applied and cured coatings shall be uniform in thickness, sheen, colour and texture, and free of defects detrimental to appearance or performance.

D. Backprime the following surfaces that will be concealed after installation:
    1. Surfaces in contact with concrete, masonry, floors or floor finishes.
    2. Underside of front edges of countertops and toe-spaces.
    3. Other surfaces that may be subjected to moisture during normal use or cleaning operations

E. Use two coats white alkyd wood primer to back prime components receiving opaque finishes.

F. Use gloss varnish, clear urethane or clear lacquer to back prime components receiving clear finishes.

PART 3 EXCECUTION

3.1 VERIFICATION OF CONDITIONS

A. Verify job site conditions in accordance with AWMAC Manual.

B. Examine substrates and conditions, with fabricators present for compliance with requirements for installation tolerances and other conditions affecting performance of work.

C. Verify humidity and temperature conditions are stable and as recommended in AWMAC Manual.

D. Do not deliver to site until job site conditions comply with the requirements outlined in the AWMAC Manual.

3.2 INSTALLATION, GENERAL

A. Install items in accordance with AWMAC Manual.

B. Position items accurately, secure and rigid.

C. Scribe and cut as required to fit neatly to abutting walls and recesses and to projecting, intersecting or penetrating objects.

D. Apply smallest practicable bead of silicone sealant at junction of splashbacks and adjacent wall finish.

E. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

F. Back prime surfaces of cut-outs for sinks, drains and other mechanical services that will be concealed after installation.

3.3 INSTALLATION, SOLID SURFACE MATEIRAL

A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

B. Provide product in the largest pieces available.

C. Form field joints using manufacturer’s recommended adhesive, with joints inconspicuous in finished work. Exposed joints/seams shall not be allowed

D. Reinforce field joints with solid surface strips extending a minimum of 25mm on either side of the seam with the strip being the same thickness as the top.

E. Cut and finish component edges with clean, sharp returns.

F. Rout radii and contours to template.

G. Anchor securely to base cabinets or other supports.

H. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.

I. Carefully dress joints smooth, remove surface scratches and clean entire surface.

J. Install countertops with no more than 3 mm sag, bow or other variation from a straight line.

K. Coved backsplashes and sidesplashes:

1. Provide coved backsplashes and sidesplashes at all walls and adjacent millwork.

2. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on the drawings.

3. Adhere to countertops using manufacturer's standard color-matched Joint Adhesive

3.4 REPAIR

A. Repair or replace damaged work which cannot be repaired to Consultant's satisfaction

3.5 CLEANING AND PROTECTION

A. Keep components clean during installation

B. Remove adhesives, sealants and other stains.

END OF SECTION 06 40 00

SECTION 07 21 00 — THERMAL AND ACOUSTIC INSULATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 SUMMARY

A. Section includes:

1. Rigid board insulation
2. Semi rigid board insulation
3. Mineral-wool blanket
4. Glass-Fibre blanket
5. Foamed-in-Place insulation

B. Refer to Section 07 52 00 Modified Bituminous Roofing and 07 61 00 Sheet Metal Roofing for Rigid Cellular Polyisocyanurate roof insulation.

1.3 RELATED SECTIONS

A. Section 02 41 19 - Selective Demolition

B. Section 03 30 00 - Cast In Place Concrete

C. Section 04 22 00 - Concrete Unit Masonry

D. Section 05 12 00 - Structural Steel Framing

E. Section 06 10 00 - Rough Carpentry

F. Section 07 26 00 - Vapour Retarders

G. Section 09 29 00 - Gypsum Board and Framing

H. DIVISION 22 - Plumbing

I. DIVISION 23 - Heating, Ventilating and Air Conditioning

J. Reserved

1.4 SUBMITTALS

A. Product Data: for each type of product

B. For each product, submit tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. If requested by Consultant, submit for each type of product:

1. Printed product literature, specifications and material safety data sheets
2. Material installation instructions
3. Test reports, verifying qualities of insulation meet or exceed requirements of this specification, including test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics
4. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and manufacturers warranty.

B. Apply or install insulation materials only when surfaces and ambient temperatures are within the manufacturer's prescribed limits

C. Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions , product carton installation instructions and data sheets

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction

C. For spray applied insulations, protect adjacent surfaces and equipment from overspary, fall-out and dusting of insulation materials. Provide temporary enclosures to prevent spray from contaminating air beyond application area.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND SUBSTITUTIONS

A. Requests for substitution shall be made In accordance with Division 1.

2.2 ACCESSORIES

A. Insulation fasteners: HDPE washer, zinc plated pin finish, pins purpose made to suit substrate materials, 50mm (2") minimum insulation holding diameter; direct fasten type, washer depth length to suit insulation thickness.

1. Acceptable Products

a. ITW Ramset 'InsulFast'

B. Batt insulation wire mesh restraint; locations where insulation is not sandwiched by sheet metal or board materials: Zinc coated woven wire and mechanical fasteners.

2.3 RIGID INSULATION - FOUNDATION AND UNDER SLAB

A. Type IV; Extruded Polystyrene, Ship-lapped edges; Thickness as indicated on drawings. Conforms to ASTM CC518, ASTMD1621, ASTM E96, ASTM D696, ASTM D2842, ASTM C203, CAN ULC S7-01 -Type 4, thermal resistance of R 5.0 per 25 mm thickness, compressive strength 30 psi.

B. Thermal resistance (RSI / R-Value) as indicated in architectural assembly schedule.

C. Acceptable Products:

1. Styrofoam SM by Dow

2. Formula 400 by Owens Corning Canada Inc.

3. Celfort 300 by Owens Corning Canada Inc.

2.4 SEMI RIGID INSULATION

A. Mineral-fibre to CAN/ULC S702-09, Type 1, 48 kg/m3 (3 lb/ft3) minimum density to ASTM C612-10 for glass fibre miserable-fibre insulation, and 72 kg/m3 (4.5 lb/ft3) minimum density to ASTM C612-10 for basalt rock and steel slag mineral-fibre insulation.Thickness as indicated on drawings

B. Acceptable Products:

1. Roux 'CavityRock (MD/DD)

2.5 CLOSED CELL SPRAY FOAM INSULATION

A. Containing integral fire inhibitor; with fire hazard classification of 10/500/0 when tested to CAN4 S102-M83 or ASTM E84-85. Thermal resistance of 1.41 RSI/ 25mm thickness. Density (ASTM D1622) 30.3 kg/M3. Thickness as indicated on drawings.

B. Spray polyurethane medium density, closed cell insulation to CAN/ULC-S705.1.

C. Thermal Resistance (R-value per inch at 75 degree F for 1 inch material: ASTM C518; R6.5.

D. Air Permeance (for 1 inch of material): ASTM E283 less than 0.02 /L/s.m2 at 75Pa.

E. Water Transmission (for 1.5 inch of material): ASTM E96 Desiccant Method; 0.9 perms.

F. Functions as vapour barrier. Ensure sufficient minimum thickness.

G. Closed Cell Content: 90%

H. Flame Spread and Smoke Developed Rating: ASTM E 84

1. Flame Spread: Less than 450

2. Smoke Development: Less than 450

I. Bacterial and Fungal Growth and Food Value: ASTM C 1338; not a source of food for mold (no growth).

J. Acceptable Products

1. Icynene MD-C-200

2. CertainTeed CertaSpray Closed Cell Foam

3. Demilec Headlock HFO High Lift

4. BASF Walltite Eco

5. Heatlok Soya by Demilec

PART 3 EXECUTION

3.1 PREPARATION

A. Ensure all in-wall construction is complete before beginning installation

B. Ensure services are installed and inspected prior to installation of insulation.

C. Install insulation after building substrate materials are dry and air/vapour barrier has been verified as properly installed.

D. For spray applications, clean substrates of dirt, dust, grease, oil, loose material and other matter which may affect bond of insulation.

E. If recommended by manufacturer, prime substrates in accordance with manufacturer's recommendations.

3.2 INSTALLATION

A. General

1. Install insulation materials in accordance with manufacturer's installation instructions applicable to products and applications indicated.
2. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time
3. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
4. Provide sizes to fit applications indicated and selected from manufacturer’s standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
5. Install attachment at rate as required to prevent displacement of insulation boards during construction operations.
6. Butt joints tightly and offset vertical joints to form an unbroken thermal envelope. Use only insulation boards free from chipped or broken edges. use largest possible dimensions to reduce number of joints.

B. Rigid Insulation - Foundation and Under Slab

1. Exterior Applications: see drawing for locations and extent.
2. Install insulation in accordance with manufacturer’s instructions
3. Install insulation in accordance with SB-10 requirments.

C. Semi Rigid Insulation

1. Mechanically fasten to substrate with minimum of 5 insulation fasteners (dice pattern) per insulation board and maximum spacing for 610mm (24”) on centre.

D. Closed Cell Spray Foam Insulation

1. Where applicable, fill pressed steel door frames 75% full with foam-in-place insulation prior to installation of door frames. Fill the remainder of the frame after installation, through the gap between the frame and the wall construction. In masonry walls, fill the frame members as wall is being built, at lifts no

greater than 1200mm, unless otherwise permitted by the material manufacturer

2. Install foam-in-place insulation around protrusions through the exterior building envelope to achieve and maintain the continuity of air/vapour seal.
3. Install foam-in-place insulation through all structural elements that penetrate the building envelope. Install foam-in-place insulation to warm side of structural elements to provide a thermal barrier to interior of heated spaces where structural elements are continuous form interior to exterior of building envelope.
4. Cut back excess foam-in-place insulation once cured, flush with surrounding surfaces, or recess back for application of sealant.
5. Upon completion of foam-in-place insulation work clean adjacent surfaces of over-spray and dusting.
6. Protect insulation from exposure to sunlight and hydrocarbons. Do not use insulation which has been so exposed.
7. Install insulation to maintain continuity of thermal protection to building elements and spaces.
8. Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN4-S604 type A chimneys and CAN1-B149.1 and CAN1- B149.2 type B and L vents.
9. Do not use insulation which has had its hard skin punctured.

3.3 THERMAL INSULATION FOR HVAC AND PLUMBING

A. Refer to Division 22 and 23 for locations of ducts and pipes to be insulated.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 27 00 — AIR BARRIERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 SECTION INCLUDES

A. Supply of labour, materials and equipment for a continuous fully attached water-resistive weather barrier materials and assemblies

B. Completion of work as shown in the Consultant's Drawings and specified herein to bridge gaps and seal the water resistive vapour permeable air barrier membrane against leakage and water intrusion, including:

1. Connections of the walls to the roof membrane
2. Connections of the walls to the foundations
3. Seismic and expansion joints
4. Openings and Penetrations of window and door frames, store front and curtain wall
5. Piping, conduit, duct and similar penetrations
6. Masonry ties, screws, bolts and similar penetrations
7. All other air leakage pathways in the building envelope

C. Installation of fully self adhered water resistive vapour permeable roof underlayment membrane, weather barrier flashing, lap seam tape, metal flashings, ventilation strips, roof finish system complete with clips, metal valley flashings and accessories.

D. Ensure continuity and proper shingling of the self-adhered water-resistive vapor permeable air barrier system throughout the scope of this section.

1.3 RELATED SECTIONS

A. Section 04 26 13 - Masonry Veneer

B. Section 04 43 13 - Stone Masonry Veneer

C. Section 06 10 00 - Rough Carpentry

D. Section 07 21 00 - Thermal Insulation

E. Section 07 26 00 - Vapour Retarders

F. Section 07 46 46 - Fiber-Cement Siding

G. Section 07 52 00 - Modified Bituminous Roofing

H. Section 07 62 00 - Sheet Metal Flashing and Trims

I. Section 07 84 00 - Fire Stopping and Smoke Seals

J. Section 07 92 00 - Joint Sealants

K. Section 08 14 00 - Wood Doors

L. Section 08 50 00 - Windows

1.4 REFERENCES

A. The latest applicable edition of following reference standards and codes shall govern all work specified herein as appropriate:

1. American Society for Testing and Materials International (ASTM)

    a. ASTM D 5034, Test Method for Breaking Strength and Elongation of Textile Fabrics

    b. ASTM E 96/E 96M, Test Method for Water Vapour Transmission of MAterials

    c. ASTM E398, Standard Test Method for Water Transmission Rate of Sheet Materials Using Dynamic Relative Humidity Measurement

    d. ASTM E2178, Standard Test Method for Air Permeance of Building Materials

    e. ASTM E 2357, Standard Method of Determining Air Leakage of Air Barrier Assemblies

    f. ASTM E 283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

    g. ASTM E 84, Test Method for Surface Burning Characteristics of Building Materials

2. American Association of Textile Chemists and Colorists (AATCC)

    a. AATCC 127 - Test Method for Water Resistance: Hydrostatic Pressure Test.

3. International Code Council Evaluation Service Inc. (ICC-ES)
    a. ICC-ES Ac38, Acceptance Criteria for wAter Resistive Barriers

B. Additional References for Roofing Underlayments:

1. American Society for Testing and Materials International (ASTM):
    a. AC48, Acceptance Criteria for Roofing Underlayments for Use in Severe Climate Areas
    b. AC207, Acceptance Criteria for Polypropylene Roof Underlayments
    c. ASTM D4869, Test for Liquid Water Transmission to ASTM D4869
    d. ASTM D3462, Standard Test Method for Fastener Pull-thorugh Resistance

1.5 SUBMITTALS

A. If requested by Consultant, submit manufacturers' current product data sheets, details and installation instructions for the water-resistive vapor permeable air barrier membrane components and accessories.

B. If proposing a substitution for the specified Air Barrier, submit samples of the following:

1. Manufacturer's sample warranty
2. Water-resistive vapor permeable air barrier sheet, minimum 8 by 10 inches (203 by 254 mm)
3. Components, minimum 12-inch (305-mm) lengths
4. Membrane flashings

1.6 QUALITY ASSURANCE

A. Single Source: Self-adhered water-resistive vapor permeable air barrier membrane components and accessories must be obtained as a single-source membrane system to ensure total system compatibility and integrity.

B. Manufacturer Qualifications:

1. Manufacturer of specified products listed in this Section to have minimum 10 years of continued experience in the manufacture and supply of highly vapor permeable water resistive air barrier products successfully installed in similar project applications.

2. Manufacturer of specified products listed in this Section to have experienced in-house technical and field observation personal qualified to provide expert technical support.

C. The GC shall coordinate the work of all trades to ensure that a continuous plane of water and air tightness is created.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

B. Store roll materials on end in original packaging. Protect rolls from direct sunlight and inclement weather until ready for use.

PART 2 PRODUCTS

2.1 AIR BARRIER MANUFACTURERS

A. Products: a triple layer, spun bonded polypropylene, water resistant, breathable underlayment for rain screen wall systems:

1. SRP- AirOutshield by SRP Canada Inc. www.srpcanada.ca. Roll size 1.5m wide by 50 m long as distributed by Engineered Assemblies.

2. SRP- AirOutshield SA 280 by SRP Canada Inc. www.srpcanada.ca. Roll size 1.45m W x 50m L (57” W 164’ L) as distributed by Engineered Assemblies.

B. Underlayment Physical Properties

1. Colour: Orange exterior, White interior

2. Thickness and Weight: 0.58mm thick and 120g/m2

3. Install products, components and assemblies (including transition membranes and flashings) across exterior walls, soffits and roof assemblies (including windows, glass, doors, , roof hatches and skylights and other interruptions to the integrity of wall and roof systems) with the following performance requirements:

a. Maximum air leakage:

1) Air Permeance: 0.0002 L/s-m2 @ 75 Pa per ASTM 2178 per AC 38 (No Air Leakage)

b. Water Vapour Permeance:

1) Water Vapour Transmission (before heat aging): 8923 ng/Pa/s/m2 or 156.1 perms per ASTM E 96.

2) Water Vapour Transmission (after heat aging as per CCM): 10,433 ng/Pa/s/m2 or 182 perms per ASTM E 96, proc. A.

c. Products shall be a zero VOC sheet consisting of multiple layers of UV stabilized proprietary membrane with allowable UV exposure for a minimum of:

1) Walls: 180 days

2) Roofs: 120 days

d. Fire Performance Characteristics: Provide water-resistive barrier meeting the following fire-test characteristics:

1) Surface-Burning Characteristics: ASTM E 84 Class A Rated.

2) Flame Spread Index: 25 or less

3) Smoke Developed Index: 450 or less

C. Window and door flashing shall be a liquid-applied vapour permeable air barrier flashing material with vapour permeance and resistance to air leakage properties compatible with the primary air barrier membrane.

D. Unless otherwise specified in the Consultants Assembly Schedule, battens installed over the air barrier system shall be black vinyl extrusions with pre-formed fastener and moisture drainage channels configured to create a ventilated airspace between wall cladding and weather-resistive air barrier. The GC shall coordinate the spacing of battens to suit specified cladding system.

E. Provide sealant for penetrations as recommended by manufacturer.

F. Primary self-adhered water-resistive, vapour permeable air barrier membrane and water resistive, vapour permeable roof underpayments, components and accessories (including water resistive, vapour permeable transition membranes and flashings) must be obtained as a single-source to ensure total system compatibility and integrity, adhering to the following performance requirements.

2.2 AUXILIARY MATERIALS

A. Tape

1. Detail Tape:

a. Seam Tape: SRP 60 UV Seam Seal Tape: Black single sided seam tape distributed by SRP Canada Inc. To seal vertical and horizontal seams between layers of SRP-AirOutshield.

b. SRP 4” Detail Tape, single sided. To seal SRP-AirOutsheild to itself and to other surfaces and substrates and mod bit members.

c. Seam Tape: SRP 1” D.S (double sided) Seam Tape distributed by SRP Canada Inc. To seal vertical and horizontal seams between layers of SRP-AirOutshield.

2. Self Adhered Membrane

a. Self adhered membrane

1) Regular temperatures

3. Fasteners

a. Fasteners: Minimum No. 12-gage [0.109-inch-shank-diameter (2.77mm)] corrosion-resistant steel or stainless steel nails having a minimum 3/8-inch diameter (9.5mm) head, or minimum No. 14 gauge [0.083-inch-shank-diameter (2.11mm)] corrosion-resistant steel or stainless steel screws or nails installed with a 1-inch diameter (25.4 mm) caps, plate or washer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements and other conditions affecting performance.

B. Refer to the most recent version of the manufacturer’s installation guide as available at www.srpcanada.ca

C. Surface and ambient temperature must be - 6*C and rising at the time of installation.

D. For self-adhered barrier: to confirm that the installed product will have adequate adhesion conduct a field test. Install a sample SRP AirOutsheild SA 280 in accordance with this installation guide and allow it to cure for at least 6 hours at 20*C (or longer for cold temperatures) before testing.

3.2 SURFACE PREPARATION

A. Clean and prepare to provide a clean and dry substrate free of frost, loose nails, dirt, debris or other contaminants that would adversely affect the installation of the breathable underlayment.

B. Do not expose the membrane to chemicals including surfactants (soaps) or solvents.

C. Ensure any penetrations including vents, conduits, pipes, etc. are installed prior to proceeding with barrier membrane installation.

3.3 PENETRATIONS

A. SRP-AirOutshield

1. Pipes and Conduits:

   a. Cut a piece of SRP-AirOutshield membrane to act as a skirt around counter flashed penetrations. Distance from penetration to edge of barrier “skirt” minimum of 2”.

   b. Make four cuts to form a start shape and place over penetration snugly. Extend “ears” of material along vertical penetration and seal with SRP-4” Detail Tape.

   c. Tape top edge of “skirt” to wall using SRP 60 UV Seam Seal Tape. Do not tape bottom edge at
   this time.

2. Windows and Doors Already Installed:

   a. Ensure that the window installers have wrapped the opening with membrane (SRP 4” detail tape or equivalent) and have installed an apron piece of AirOutshield at the bottom of the window prior to installing the window.

   b. Place a piece of AirOutshield below the window and apply the apron piece over it in shingle style.

   c. Install AirOutshield over the wall and window in shingle style.

   d. Cut the AirOutshield around the window being careful not to cut the window flange or membrane around the opening.

   e. Tape the AirOutshield to the window using SRP-60 UV Seam Seal Tape.

3. Openings for Windows and Doors to be installed after the AirOutshield in installed:

   a. Install AirOutshield over the entire wall and openings in shingle style.

   b. Cut the AirOutshield horizontally along the head of the opening.

   c. At the top corners of the opening place a diagonal cut approx 6” long to create a flap. Fold this flap upwards and use tape to keep it out of the way.

d. Cut the AirOutshield down the middle of the opening approx 2/3 the way down and tie this cut into each of the lower corners on a diagonal.

e. Fold the AirOutshield into the opening, fasten and trim off excess.

f. Install SRP 4" detail tape as a flashing over the base of the opening, up the vertical sides at least 2" over the AirOutshield. If more than one width is needed, ensure they are installed in shingle style.

g. Starting with the sides, seal AirOutshield to window flange using SRP-60 UV Seam Seal Tape or 4" Detail Tape. Overlap the sill flashing by at least 2".

h. At the top of the window apply a head flashing using SRP 4" Detail Type. This is to be applied directly over the sheathing and onto the frame of the window to ensure drainage to the exterior. Cover this with the flap of AirOutshield installed previously.

i. Tape all seams around the opening using SRP-60 UV Seam Seal Tape of SRP-4" Detail Tape.

B. SRP-AirOutshield SA 280

1. Identify all areas to be detailed including penetrations, openings, structural connections, expansion joints, and connections with other adjacent components.

2. Do not apply AirOutshield SA 280 to areas of exposed water ponding.

3. Install SRP AirOutshield SA 280 to all penetrations to create a watertight and airtight seal and ensure water is routed to the exterior in all areas. Reverse laps should be avoided and sealed with a bead of compatible sealant or tape.

4. Remove release film, apply to the surface and apply pressure using a rubber roller or similar.

5. Seal all penetrations using SRP AirOutshield SA 280 in combination with SRP Tapes, Self adhered membranes or compatible sealants.

3.4 APPLICATION

A. SRP-AirOutshield

1. Breathable Underlayment Application

a. In this section SRP-AirOutshield is installed as a secondary drainage plane under the primary water shedding cladding system. Install printed side out, laid such that it forms a continuous membrane over the entire

area, allowing any water to drain down to the through wall flashings. Avoid blockages that would otherwise obstruct the water flow.

1) Starting at base of wall, unroll AirOutshield horizontally across wall. Extend 6” over starting corner.

2) Fasten at top and bottom of roll within 2” of edge 12” on centre and at a maximum of 24” on centre in field.

3) Shingle next layers AirOutshield ensuring minimum 6” horizontal and minimum 12” vertical laps.

4) Ensure AirOutshield is slipped under bottom edge of penetration “skirt” and shingled over taped top edge

5) Seal top and sides with SRP-1” DS Seam Tape

6) Ensure whole “skirt” assembly is flashed appropriately with metal

7) Do not place vertical laps above windows

8) For delayed installation of siding/masonry determine the amount of fasteners for wind exposure. Use cap nails or screws with washers

2. Air Barrier Installation

a. In addition to the above, observe the following when installing SRP-AirOutshield as an Air Barrier

1) Form a continuous air barrier at all details using the SRP tapes

2) Connect to flashings and air barriers in adjacent areas as installed by others

3) Increase fasteners to maximum 6” on centre vertically and maximum 16” on centre horizontally

4) Tape all vertical and horizontal laps using SRP 60 UV Seam Seal Tape

B. SRP-AirOutshield SA 280

1. Air Barrier Installation

a. Plan the layout of the membrane noting that it can be installed horizontally or vertically.

b. Once all of the detailing has been completed, install the AirOutshield SA 280 over the entire wall in such a way that it drains all precipitation to the exterior and forms an air tight seal.

c. Ensure overlaps are a minimum of 75mm in all areas in the field and 150mm in corners.

d. Tie into detail membranes already installed ensuring a shingle style overlap.

e. Using a roller apply pressure to all installed membrane, flashings and details to ensure appropriate surface adhesion is achieved.

f. Ensure water is not able to penetrate the edges of the membrane. At the end of each day of work, seal the top edge of the membrane where it meets the substrate with compatible sealant. Apply a bead and trowel it to form a feather edge to seal termination and shed water.

g. During installation, protect membrane from rainwater runoff from roofs (overhands/eaves/valleys).

h. Repair any damaged material.

3.5 FIELD QUALITY CONTROL

A. Make notification of when sections of work are complete to allow review prior to covering self-adhered water-resistive vapor permeable air barrier system.

3.6 PROTECTING AND CLEANING

A. Protect installed air barrier from damage due to ultraviolet light, harmful weather exposure, physical abuse, exposure to solvents or soaps and other causes.

B. Remove mud and similar marks with a water scrub; do not use soap or solvents. If chemicals have been spilled on underlayment, remove and replace as stated above.

C. Repair torn breathable underlayment as follows:

1. Inset a full height piece of underlayment extending 12” horizontally beyond the damage and extend up and under the underlayment above. Mechanically attach underlayment to substrate top and bottom. Tape all seams.

END OF SECTION 07 27 00

SECTION 07 26 00 — VAPOUR RETARDERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Reserved

B. Section 02 41 19 - Selective Demolition

C. Section 03 30 00 09 - Cast-in-Place Concrete Short Form

D. Section 04 22 00 - Concrete Unit Masonry

E. Section 05 40 00 - Structural Steel Framing

F. Section 06 10 00 - Rough Carpentry

G. Section 07 21 00 - Thermal and Acoustic Insulation

H. Section 07 27 00 - Air Barriers

J. Section 07 52 00 - Modified Bituminous Membrane Roofing

K. Section 07 84 00 - Fire Stopping and Smoke Seals

L. Section 07 92 00 - Joint Sealants

M. Section 09 29 00 - Gypsum Board

1.3 REFERENCES

A. Reserved

B. The latest applicable edition of following reference standards and codes shall govern all work specified herein as appropriate:

1. Canadian General Standards Board (CGSB)

    a. CGSB-51.34-[M86], Vapour Barrier, Polyethylene Sheet, for Use in Building Construction

2. Underwriters Laboratories Canada (ULC)

    a. CAN/ULC S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.4 INTENT

A. The intent is to provide an effective and continuous barrier to water vapour transmission through any joints in the building envelope. Provide flexible sheet membrane at the following locations:

1. Adhered to wall substrates, bridging joints and gaps;
2. Installed to permit an effective seal at window frames, door frames, and other components fitted into openings in building envelope, and;
3. Sealed to pipes, ducts, conduits, masonry connectors and other items penetrating the building envelope.

1.5 SUBMITTALS

A. If requested by Consultant, submit manufacturer's printed product literature, specifications and datasheet and include:

1. Product characteristics, performance criteria and limitations.
2. Certificates certifying that materials comply with specified performance characteristics and physical properties.
3. Manufacturer's installation instructions, written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions.

B. The Owner and the Consultant reserve the right to review a mock up of sheet vapour barrier along one lap joint, one inside joint, and at one electrical box prior to installation of interior finishes.

1. The mock up will be used to review workmanship, substrate preparation and material applciation, and will demonstrate the minimum standard of quality required for this work.

PART 2 PRODUCTS

2.1 VAPOUR RETARDER

A. Vapour retarder

1. 6 mil thick polyethylene to CAN/CGSB-51.34-M86.
2. Closed Cell Spray Foam Insulation. Refer to Section 07 21 00 - Thermal and Acoustic Insulation

B. Roof vapour retarder:

1. Aquablock-50

2. Comply with requirements of Section 07 52 00 - Modified Bituminous Protected Membrane
3. Application:
    a. This product should always be stored, installed and otherwise used in accordance with good roofing practices and all applicable building and safety codes
    b. For proper adhesion, apply only when the temperature of the air, deck and material is above 40*F.
    c. For applications where the air, deck and material temperature is below 40*F, use nails to mechanically fasten until fully adhered.
    d. Where nailing is needed, apply nails in selvage and cover nails by overlapping with the next sheet.
    e. For re-roofing applications, first remove all old roofing materials and other loose debris. Never install product directly on old roof covering.
    f. Always prime non-wood surfaces (including concrete and masonry) prior to installation).
    g. Always install from the lowest to the highest point on the roof deck.
    h. For valley or ridge applications, cut product to a manageable length, centre the product over the valley or ridge and apply pressure first to the middle and work towards the outside edges.
    i. For most applications, side laps must be a minimum of three inches, end laps a minimum of six inches, and drop edges a 3/8-inch minimum. Good roofing practices may require increased minimums for certain applications.
    j. When adhering end laps together, SBS trowel grade mastic is recommended to properly seal to the adjoining membrane.

C. Under Slab Vapour Barrier

1. Refer to Section 03 30 00 09 Cast-in-Place Concrete Short Form, item 2.3.16 for under-slab vapour barrier specifications.

2.2 ACCESSORIES

A. Joint sealing tape: air resistant pressure sensitive adhesive tape, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

B. Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

C. Vapour retarder sealant (Tremco Acoustical Sealant or equivalent product): compatible with vapour retarder as recommended by vapour retarder manufacturer

D. Staples: minimum 6 mm leg.

E. Spray foam sealant and insulation: refer to requirements of Section 07 21 00 - Thermal Insulation.

F. Primers, Surface Conditioners and Mastic: as recommended by membrane manufacturer, compatible with substrates, including, but not limited to, the following:

1. Metal substrates.

2. Concrete which may contain form release agents.

3. Wood substrates to which preservative or fire retardant treatment has been applied.

PART 3 EXECUTION

3.1 EXAMINATION

A. Ensure services are installed and inspected prior to installation of retarder.

B. Verify substrate conditions are clean, dry, sound, smooth, continuous and acceptable before starting installation of membranes.

C. Prepare substrate surfaces in accordance with membrane manufacturer's printed recommendations. Prior to installation, the roof deck must be clean and free from any moisture, ice, dust, loose nails, protrusion, voids and other debris. When re-roofing, be sure all old roofing components are removed prior to installation of underlayment.

D. Apply primer to substrates to receive vapour barrier, in accordance with manufacturer's recommendations.

E. Only install vapour barrier on primed surfaces that have been primed within 8 hours of installation time, allowing proper time for curing of primer as directed by the manufacturer.

3.2 INSTALLATION

A. Install vapour retarder on warm side of exterior wall and ceiling space assemblies prior to installation of gypsum board to form continuous retarder.

B. Install vapour retarder above rigid insulation when installed below concrete slab on grade or below basement slabs. Refer to Section 03 30 00 09 - Cast-in-Place Concrete Short Form, item 2.3.16.

C. Install vapour retarder above granular substrate when installed in crawlspaces.

1. Secure vertical retarder to top of foundation walls with nylon expansion fasteners. Leave min 3” gap between sill plate and top of Sheet vapour retarder. Do not fasten to sill plate. Provide continuous sealant along top edge of barrier
2. Provide 12” min horizontal extension at crawlspace floor. Cut and install floor pieces, lap over extensions, tape and seal all transitions and seams a min 12”
3. Tape and seal all penetrations in vapour retarder.

D. Use sheets of largest practical size to minimize joints.

E. Lap horizontal membrane joints to shed water to exterior.

F. Neatly trim terminations of vapour barrier.

G. Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

H. The following are unacceptable:

1. Fishmouths and folds;
2. Blisters and bulges;
3. Insufficient overlaps;
4. Inadequate adhesion;
5. Punctures, tears, cuts.

3.3 JOINTS AND GAPS

A. Vapour barrier at joints and gaps must be continuously supported and must not span gaps greater than 20mm.

B. Seal lap joints of sheet vapour barrier as follows:

1. Attach first sheet to substrate.
2. Apply continuous bead of sealant over solid backing at joint.
3. Lap adjoining sheet minimum 200 mm and press into sealant bead.
4. Install staples through lapped sheets at sealant bead into wood substrate.
5. Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

C. Lap ends of vapour barrier minimum 150 mm.

D. Seal perimeter of vapour barrier as follows:

1. Apply continuous bead of sealant to substrate at perimeter of sheets.
2. Lap sheet over sealant and press into sealant bead.
3. Install staples through lapped sheets at sealant bead into wood substrate.
4. Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4 TRANSITIONS TO ROOFING, CLOSED CELL SPAY FOAM INSULATION AND VAPOUR RETARDER BELOW FLOOR SLAB

A. Lap vapour barrier at transition, a minimum 200 mm over roofing vapour retarder, closed cell spray foam insulation in walls and vapour retarder below floor slab.

B. Comply with requirements of Section 07 52 00 - Modified Bituminous Protected Membrane Roofing.

3.5 EXTERIOR SURFACE OPENINGS

A. Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

B. Provide flanged membrane collar around mechanical and electrical penetrations. Flange shall be at plane of surrounding membrane.

C. Apply mastic where membrane has been cut to fit around penetrations.

3.6 ELECTRICAL BOXES

A. Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:

1. Install moulded box vapour barrier or wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
    a. Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

END OF SECTION 07 26 00

SECTION 07 40 00 — METAL ROOFING AND SIDING PANELS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 SECTION INCLUDES

A. Prefinished, prefabricated structural standing seam roof and wall system with continuous interlocking field formed seams and welded transition edges from roofs to walls.

B. Coordinated hip, gable, and valley flashings, ridge and peak caps, eave and shelf drips, and counterflashings.

C. Clips, fasteners, closures, and sealants as necessary to meet design criteria and ensure weathertight installation.

D. Integrated Composite Rainwater Gutter and Liner fabricated from manfacturers insulated metal panels with continuous purpose bent galvanized sheet metal edges and FPO liner overlays, with applied site seaming.

1.3 RELATED SECTIONS

A. Section 05 12 23 – Structural Steel for Buildings

B. Section 05 31 00 – Steel Decking

C. Section 05 50 00 – Metal Fabrications

D. Section 06 10 00 – Rough Carpentry

E. Section 07 62 00 – Sheet Metal Flashings and Trim

F. Section 07 72 00 - Air Barriers

G. Section 07 40 00 - Metal Roofing and Siding Panel

H. Section 07 21 00 - Thermal and Acoustic Insulation

I. Section 07 92 00 - Joint Sealants

1.4 REFERENCES

A. Aluminum Association:

1. 2005 Edition of the Aluminum Design Guide

B. American Society for Testing and Materials (ASTM):

1. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
2. ASTM E1680 Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
3. ASTM E1646 Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
4. ASTM E1592 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

1.5 PERFORMANCE

A. Design Requirements

1. Design criteria shall be in accordance with current edition of the Ontario Building Code.
    a. Dead Load: The dead load shall be the weight of the structural standing seam roof system.
    b. Live Load: The roof panel and concealed clips shall be capable of supporting a minimum uniform live load of 20 psf.
    c. Snow Loads: The roof snow load shall be as shown on the contract drawings. Snow drift effects shall be taken into consideration as applicable.
    d. Wind Loads: Wind loads shall be as shown on the contract drawings or calculated per Building Code components / cladding criteria. The greater uplift pressure shall govern.
    e. Thermal Loads: Roof panels shall be free to expand / contract resulting from a total temperature differential of 150 degrees F.
2. Structural Requirements
    a. Panel structural properties are to be determined in accordance with latest edition of Aluminum Association's "Aluminum Design Manual – Specifications and Guidelines for Aluminum Structures".
    b. Metal roof system must be tested in accordance with ASTM E-1592 "Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference" for determination of negative (uplift) load capacity.
3. Environmental Requirements

a. Resistance to air infiltration: Maximum of .024 cfm per square foot when tested in accordance with ASTM E 1680 at static test pressure differential of 6.24 psf.

b. Resistance to water infiltration: No leakage through panel joints when tested in accordance with ASTM E 1648 at static test pressure differential of 12 psf.

1.6 SUBMITTALS

A. General

1. General:

   a. Submit listed submittals in accordance with Conditions of the Contract and Division 01.

2. Product Data:

   a. Submit manufacturer's specifications, standard details, and installation manual.

3. Shop Drawings:

   a. Show roof panel system with flashings and accessories in plan and elevation; sections and details. Include metal thicknesses and finishes, panel lengths, joining details, anchorage details, flashings and special fabrication provisions for termination and penetrations. Indicate relationships with adjacent and interfacing work.

   b. Do not proceed with manufacture of roofing materials prior to review of shop drawings and field verification of all dimensions.

   c. Submit shop drawings, technical information, liner technical data and related manufacturer's literature for Composite Rainwater Drainage System.

   d. Submit engineered layout of Snow Guard System.

4. Samples

   a. Submit sample of panel section, 12" long x full width panel, showing proposed metal gauge, finish and seam profile.

   b. Submit sample of panel clip and gable clip.

5. TestReports:

   a. Submit copies of design test reports for each of the performance testing standards listed in Section 1.3 of this specification.

b. Test reports shall be performed by an independent, accredited testing laboratory, and shall bear the seal of a registered professional engineer.

6. Calculations:

   a. Submit engineering calculations defining cladding loads for all roof areas based on design criteria listed in section 1.5 of this specification.

   b. Calculation shall clearly indicate clip type, spacing of clips by roof zones, and fastener requirements.

   c. Uplift load capacity of roof panel system shall be determined by ASTM E-1592 testing. Extrapolation of uplift capacities is not acceptable. Uplift capacity calculation by “section property” method is not acceptable.

   d. Compute uplift loads on clip fasteners with recognition of prying forces and eccentric clip loading.

   e. Calculate pullout / shear strength of fasteners in accordance with test data published by the fastener manufacturer, utilizing applicable material safety factors.

   f. Compute thermal calculation for expansion / contraction forces due to total temperature differential of 150 degrees F.

   g. Compute panel fixed point attachment forces and required fasteners. Compute in-plane clip forces and indicate required attachment fasteners.

   h. Confirm hydraulic design of rainwater drainage system. Provide written confirmation of gutter sizes, locations and capacities based on regional rainwater and snowfall volumes.

7. Certification

   a. Submit manufacturer’s certification that materials and finishes meet specification requirements.

   b. Submit applicator’s certification that installer of products meets specified qualifications.

1.7 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:
.1 Ten years minimum experience in fabrication of standing seam roofs.

B. Applicator’sQualifications:
.1 Three years minimum experience in application of structural field-formed concealed clip roofing systems.
.2 Applicator must be an approved installer, certified by the manufacturer prior to beginning installation of the standing seam roof.

C. Product Substitution:

1. Products listed in this specification section are as manufactured by Corus Building Systems
2. Alternate standing seam roof panels will only be accepted with prior written approval from the Consultant.
3. Substitution request must be submitted in writing minimum ten days prior to bid date accompanied by product literature, technical information, and product sample. Approved substitutions will be set forth in an Addendum.
4. No substitutions will be permitted after bid date.

D. Pre-Installation Meeting:

1. Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

1.8 QUALITY CRITERIA / INSTALLER QUALIFICATIONS

A. Engage an experienced metal roofing contractor (erector) to installer standing seam system who has a minimum of three (3) years' experience specializing in the installation of structural standing steam metal roof system.

B. Contractor must be certified by manufacturer specified as a supplier of standing seam system and obtain written certification from manufacturer that installer is approved for installation of the specified system.

C. Successful contractor must obtain all components of roof system from a single manufacturer. Any secondary products that are required which cannot be supplied by the specified manufacturer must be recommended and approved in writing by primary manufacturer prior to bidding.

D. Fabricator/installer shall submit work experience and evidence of adequate financial responsibility. Architect reserves the right to inspect fabrication facilities in determining qualifications.

1.9 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver metal roof system to jobsite properly packaged to provide protection against transportation damage.
2. Handling:

    a. Exercise extreme care in unloading, storing, and erecting metal roof system to prevent bending, warping, twisting, and surface damage.

3. Storage and Protection:

    a. Store sheet bundles above ground with one end elevated and allow for air circulation and drainage.

    b. Store sheet bundles under tarpaulin cover to protect from rain and prevent accumulation of dirt and condensation.

    c. When storing on roof, ensure that the load bearing capacity of the substructure is sufficient. Secure sheets and package against wind uplift and sliding.

    d. Prolonged storage of bundled sheets is not recommended.

    e. ALWAYS avoid direct contact with alkali-bearing material such as lime based cement, concrete / mortar.

1.10 WARRANTY

A. Furnish manufacturer's standard 20-year weathertight warranty (jointly signed by installer and manufacturer) stating panel material will not fail due to:

1. Corrosion

2. Rupture

3. Perforation

B. Furnish written warranty signed by applicator for five (5) year period from date of Substantial Performance of the Work for the building covering repairs required to maintain roof and flashings in watertight conditions

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

A. Basis of Design: IMETCO Series 300 (S300) roof panel system as manufactured by innovative Metals Company Inc. (IMETCO), Norcross, Georgia, telephone: 1-800-646-3826. Refer to architectural assembly for details.

B. Substitutions, provide alternate Price:

1. KalzipTM 65/400 by CORUS Building Systems Kalzip, or approved equivalent. Kalzip Liner Roof System. (Not including structural steel deck.)

2. Vicwest Standing Seam Wall Panel Tradition 150-4, or approved equivalent.

2.2 PANEL MATERIALS

A. **Provide alternate price for Aluminum System**

B. Roof & Wall

1. Acceptable Standing Seam Systems

    a. IMETCO Series 300 Roof System by IMETCO (Not including structural steel deck.) Refer to architectural assembly for details on assembly components.

    b. Alternative Price for KalzipTM 65/400 by CORUS Building Systems Kalzip, or approved equivalent. Kalzip Liner Roof System. (Not including structural steel deck.) Refer to architectural assembly for details on assembly components.

2. Painted, metallic-coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and repainted by the coil-coating process to comply with ASTM A755/A755M.

    a. Recycled Content: Provide steel sheet with average recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content is at least 70%.

    b. 24 gauge, Zinc-Coated (Galvanized) Steel Sheet, as per ASTM A653: G90 (Z275) coating designation; structural quality, grade 40 ski (275 MPa).

3. Painted Aluminum Sheet

    a. Recycle Content: Provide steel sheet with average recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content is at least 45 %.

    b. 0.040” (1.0mm) aluminum alloy 3003, 3005, or 3105 with H14 or H24 heat treatment, as per ASTM B209/209M.

4. Texture: Smooth

5. Colour shall be IMETCO’s Epic Bronze, Carbon Cost or Matte Black

6. Panel Sealants:

    a. Seam Cap Sealant: Factory applied hot melt, high viscosity, pressure sensitive adhesive with high heat resistance.

    b. Sealant Tape: Non-curing, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, nonstaining tape 1-inch (13mm) wide and 1/16=inch (3mm) thick.

c. Exposed Sealant: ASTM C 920; elastomeric tipolymer, polyurethane or other advanced polymer sealant; of type, grade, class and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.

d. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-coloured polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5mil (0.013mm).

C. Recladding of Existing Exterior Wall

1. Vicwest Standing Seam Wall Panel Tradition 150-4, or approved equivalent.

2. Metal Wall System:

a. Steel Cladding

1) Profile Fabricate from 275 galvanized sheet steel conforming to ASTM A653M Grade 230 or AZ150 Galvalume, sheet steel conforming to ASTM A792M Grade 230. Having a nominal core thickness of 0.61m.

b. Panel Finishes

1) Cladding Coating: Prepainted with WeatherX on exterior face.

c. Colour

1) Colour: To be selected by Consultant from stock range. Colour to match standing seam metal roofing by Kalzip. Submit full range of coloured metal samples. Barrier coating thickness shall be 6mil on exterior exposed surface of the finished profile and 6mil on the reverse.

d. Accessories

1) Closures: Metal closures to suit profiles selected, to manufacturer's recommendations.

2) Sealants:

a) Concealed: tape or compound, non-skinning, non-drying, butyl rubber.

Flashing: In accordance with Section 07 62 00 Flashing. Material to match cladding in exposed locations, galvanized material in concealed locations. Custom fabricated to suit

architectural details, as required. Use performed corner pieces only. Double back exposed edges.

b) Exposed: acrylic co-polymer to CGSB 19GP-5M

3. Fabrication:

   a. Fabricate roof components to comply with dimensions, profiles, garages, and details as shown in the shop drawings, including fascia and soffit panels and all companion flashing.

   b. Fabricate all components of the system in the factory, ready for field insulation.

   c. Provide metal liner and cladding and all accessories in longest practicable length to minimize field lapping of joints.

2.3 STANDING-SEAM METAL ROOF PANELS

A. Provide alternate price for both Galvanized Steel & Aluminum systems

B. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to support using concealed clips in side laps. Include clips, cleats and accessories required for weathertight installation.

   1. Steel Panel Systems: Unless more straight requirements are indicated, comply with ASTM E 1514.

   2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637

C. Vertical-Rib, Standing-Seam Metal Roof Panels with separate mechanically field crimped batten seam cap: Formed with vertical ribs at panel edges, pencil beads and an intermediate stiffening rib symmetrically spaced between ribs; designed for 2-direction installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, attaching a separate batten seam cap and mechanically seaming panels together.

D. Characteristics:

   1. The same panel profile from a single manufacturer shall be used for ALL standing seam roof areas.

   2. Configuration: Standing seams incorporating mechanically interlocked, concealed anchor clips which allow unlimited thermal movement.

a. Profile of panel shall have two stiffening beads positioned 1-1/2" (38mm) from the vertical seam and one raised stiffening rib centred in the panel.

b. Exposed fasteners, screws and/or roof mastic are unacceptable and will be rejected. System configuration only allows for exposed fasteners at panel overlap (if required and approved by Consultant) and trim details (as per manufacturer's guidelines).

c. Panels must be finished in continuous lengths from ridge to eave with no overlaps unless approved by Consultant.

d. Tapered Panels: Tapered panels shall be factory formed from a single piece of metal. Tapered panels formed from multiple pieces of joint metal are unacceptable.

3. Seam must be 60mm minimum height for added strength for negative pressures and must have symmetrical design. Integral, asymmetrical seams are not acceptable.

4. Standing Seam Panel Width: 400 (16") (nominal)

5. Site Formed Panels: Bidder will not be allowed to supply panels formed at the job-site on portable rollformers; metal panels must be factory pre-manufactured and engineered for this project.

6. Concealed Standard Anchor Clips: Clips must be 16 gauge (1.4mm) Galvanized steel (Steel Panel System) or Stainless Steel alloy 410 (for Aluminum Panel System) ONE (1) piece clip with projecting legs for additional panel alignment and provision for unlimited thermal movement in each direction along the longitudinal dimension.

   a. Two-piece clips are NOT acceptable

   b. Clip design must isolate sealant in panel cap from clip to insure that no sealant damage occurs from the clip during expansion and contraption.

   c. Clip must maintain a clearance of a minimum of 9.5mm between panel and substrate for proper ventilation to help prevent condensation on underside of panel and eliminate the contact of panel fastener head to panel.

7. Seam Cap: Snap-pn cap shall be a minimum 25-mm wide "T" shape of continuous length up to 11.4m according to job conditions and field seamed by means of manufacturer's standard seaming machine.

   a. Cap shall be designed to receive two (2) beads of hot applied, high viscosity, pressure sensitive adhesive with high heat resistance during manufacturing which will not come in contact with the anchor clip.

b. In all cases, seam caps shall be factory formed in insure quality and precision in the process of sealant application.

8. Stiffening ribs: Located in flat of panels to minimize oil canning and telegraphing of structural manners.

9. Panel ends shall be folded up 90 degrees at ridge, headwall, and hip conditions, where applicable. No metal shall be cut or otherwise perforated at the folded end.

2.4 FIELD INSTALLED THERMAL INSULATION

A. Rigid Insulation: Extruded Polystyrene (XPS), Type IV Owens Corning Formular 350. ASTM C 578, Type IV, 1.60-lc/bu. ft. (26-kg/cu. m.) minimum density unless otherwise indicated; with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively.

2.5 ACCESSORIES

A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.

2. Closure Strips: Closed-cell, expanded, cellular, rubber or cross linked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch (25mm) thick, flexible closure strips meeting ASTM D1056 and/or D3575; cut or premoulded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

3. Gable anchor clips: 16 gauge (1.4mm) Galvanized Steel, Stainless Steel allow 410.

B. Flashing and Trim: Formed from same material and gauge as roof panels, repainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, frames openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

C. Gutters: Formed from same material roof panels: Match profile of gable trim, complete with end pieces, outlet tubes and other special pieces as required. Fabricate in minimum 10-ft (3m) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced per SMACNA's recommendations based on gauge and stretch-out, fabricated from same metal as gutters. Provide wire ball stainers of compatible

metal at outlets. Finish gutters to match (metal roof panels) [roof fascia and rake trim].

1. Gutter Hangers: External gutter supports shall be 2-inch (50m) wide x 1/4-inch (6mm) thick formed aluminum, and shall be spaced at no greater than 36” (0.9m) on centre. External supports shall be post-painted with a matching full-strength 70% PVDF finish and warranted by the panel manufacturer for same term as specified for material finishes.

2. Gutter Straps: Internal gutter straps shall be 1-inch (25mm) wide x 1/8-inch (3mm) thick formed aluminum, and shall be spaced at no greater than 36” (0.9mm) on centre. Internal straps shall be post-painted with a matching full-strength 70% PVDF finish and warranted by the panel manufacturer for same term as specified for material finishes.

3. Roof Curbs: Fabricated from same materials as roof panels, minimum and welded top box and integral full-length cricket. Fabricate curb sub framing of minimum 0.0598-inch (1.5mm) thick, angle-, C, or Z-shaped steel sheet. Fabricate curb and sub framing to withstand indicated loads, of size and heigh indicated. Finish roof curbs to match metal roof panels.

2.6 ROOFING BOARD

A. Glass-mat Gypsum Sheathing Board: Dens-Dek Prime, ASTM C 1177 / C1177M.

1. Type and Thickness: Type X, 16mm

2. The top surface of the substrate board shall be pre-primed to provide for adhesion of the self-adhering underlayment material.

3. Product: Subject to complain with requirements, provide Dens-Dek Prime by Georgia-Pacific Corporation .

2.7 UNDERLAYMENT MATERIALS

A. Self-Adhering with reinforcing scrim, High-Temperature Sheet: 50 mills (1.3mm) thick minimum, consisting of slip-resisting top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied.

1. Thermal Stability: Stable after testing at 121*C, ASTM D 1970

2. Low-Temperature Flexibility: Passes after testing at minus 29*C; ASTM D 1970

3. Seams shall be lapped in accordance with manufacturer’s recommendations

4. Underlayment shall be approved for 90 days (minimum) of exposure to UV and weather penetrations.

5. Products: Subject to compliance with requirements, provide one of the following:

    a. Aqua block 50 by IMETCO of Norcross, GA.

2.8 MISCELLANEOUS METAL FRAMING

A. Provide cold-formed steel as required.

B. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.9 MISCELLANEIOUS MATERIALS

A. Concealed fasteners: Corrosion resistant steel screws, #10 minimum diameter x length appropriate for substrate, hex washer head or pancake head. Use self-drilling, self-tapping for metal substrate or A-point for plywood substrate.

B. Exposed fasteners: 3xx series stainless steel screws (cadmium or zinc coatings are not acceptable) with neoprene sealing washer, or 1/8-inch (3mm) diameter stainless steel rivets.

2.10 SNOW GUARDS

A. Snow Guards: prefabricated, noncorrosive units designed to be installed without penetrating metal roof panels, and complete with predrilled holes, clamps or hooks for anchoring. Snow guards shall be illustrated with the panel manufacturer's installation drawings and shall be designed to resist the sliding force of snow in accordance with the requirements of ASCE-7. Confirming calculations shall be provided by the panel manufacturer.

2.11 FABRICATION

A. Fabricate and finish the metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and precesses and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal roof batten seam cap with factory-installed hot melt, high viscosity, pressure sensitive adhesive with high heat resistance, in a manner that will seal weathertight.

D. Form flashing components from full single width sheet in minimum 10'-0" (3m) sections. Provide metered corners, joined using closed end pop rivets and butyl-based, solvent release one-part sealant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the alignment and placement of the building structure and substrate. Correct any objectionable warp, waves or buckles in the substrate before proceeding with installation of the pre-formed metal roofing. The installed roof panels will follow the contour of the structure and may appear irregular if not corrected.

B. Do not proceed with installation until discrepancies have been resolved.

3.2 INSTALLATION

A. Install roofing and flashings in accordance with approved shop drawings and manufacturer's product data, within specified erection tolerances.

B. Install metal roof system so that it is weathertight, so that it is without waves, warps, buckles, fastener stresses or distortion.

C. Install metal roof system with allowance for thermal expansion and contraction.

D. Anchor roof panels securely in place using clips and fasteners spaced in accordance with manufacturer's recommendations.

E. Do not allow panels or trim to come in contact with dissimilar materials such as copper, fire retardant treated timber, concrete / mortar. Water runoff from dissimilar materials is also prohibited.

F. Connect composite gutter sections by hot-air welding 180mm x 75mm TPO jointing membrane over gutter panel butt joints.

G. Provide continuous welded joints, on site, for transitions (folds) between roof and wall panels, as shown on exterior elevation drawings. Touch up finishing of welds on site to provided continuity of specified panel finish.

H. Install thermal insulation, roofing board, as per manufacturer's instructions.

I. Install snow guards as per manufacturer's recommendations and instructions.

J. Install roof gutters as per manufacturer's recommendations and instructions.

3.3 CLEANING

A. Clean exposed surfaces of excess material and debris promptly after completion of installation.

B. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

3.4 PROTECTION

A. Protect work as required to ensure roofing will be without damage at time of final completion.

B. Repair products having minor damage to finish in accordance with panel manufacturer's recommendations, or replace damaged products.

3.5 FIELD QUALITY

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 07 40 00

SECTION 07 42 55 — FIBRE REINFORCED CEMENT PANELS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 SUMMARY

A. This Section includes requirements for supply and installation of the following, as required for complete and proper installation:

1. Material Textured High Density Fibre Reinforced Cement Panels
2. Support Systems and Accessories
3. Breathable Sheathing Membranes.

1.3 RELATED REQUIREMENTS

A. Section 06 10 00 — Rough Carpentry

B. Section 07 21 00 — Thermal and Acoustic Insulation

C. Section 07 27 00 — Air Barriers

1.4 REFERENCES

A. Specification American Society for Testing and Materials (ASTM):

1. ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process
2. ASTM B209-14, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate
3. ASTM B211-12e1, Standard Specification for Aluminum and Aluminum Alloy Rolled or Cold Finished Bar, Rod, and Wire
4. ASTM B221-14, Standard for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
5. ASTM C1166-06(2016), Standard Test Method for Flame Propagation of Dense and Cellular Elastomeric Gaskets and Accessories
6. ASTM C1185-08(2016), Standard Test Methods for Sampling and Testing Non Asbestos Fibre Reinforced Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards

7. ASTM C1186-08(2016), Standard Specification for Flat Fibre Reinforced Cement Sheets
8. ASTM D395-03(2008), Standard Test Methods for Rubber Property Compression Set
9. ASTM D412-16e1, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension
10. ASTM D624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
11. ASTM D746-14, Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
12. ASTM D1149-16, Standard Test Methods for Rubber Deterioration Cracking in an Ozone Controlled Environment
13. ASTM D2240-15, Standard Test Method for Rubber Property Durometer Hardness
14. ASTM E96/E96M-16, Standard Test Methods for Water Vapour Transmission of Materials
15. ASTM E2178-13, Standard Test Method for Air Permeance of Building Materials

B. Underwater Lavatories of Canada (ULC):

1. CAN/ULC-S102-10, Surface Burning Characteristics of Building Materials and Assemblies
2. CAN/ULC-S114-05, Standard Method of Test for Determination of Non-combustibility in Building Materials
3. CAN/ULC-S134-13, Fire Test for Exterior Wall Assemblies
4. CAN/ULC-S135-04, Standard Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter), Includes Amendment 1

C. Canadian Construction Materials Centre (CCMC):

1. CCMC 13549-R, Technical Guide 07 193 Sheathing Membrane - Breather Type

D. European Committee for Standardization (CEN):

1. EN 12467:2012, Fibre-Cement Flat Sheets. Product Specifications and Test Methods.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the Work of this Section with the installation of gypsum sheathing board and air barrier; Sequencing work so that installation of fibre-cement panels and support framing coincides with installation of substrate preparation without causing delay to the Work.

B. Pre-Construction Conference: Arrange a site meeting attended by the Contractor, the Subcontractor, the Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section.

1. Review methods and procedures related to installation, including manufacturer's written instructions;

2. Examine substrate conditions for compliance with manufacturers installation requirements;

3. Review temporary protection measures required during and after installation.

1.6 SUBMITTALS

A. Provide requested information in accordance with Section 01 33 00 - Submittals.

B. Action Submittals: Provide the following submittals before starting any work of this Section:

1. Product Data: Submit manufacturer's data sheets covering the care and recommended maintenance procedures for incorporation into maintenance manuals.

2. Shop Drawings: Submit shop drawings of panel systems, components, facade material, panel layout and accessories to the Consultant for review.

   a. Drafting and engineering to be performed by Engineered Assemblies

3. Samples:

   a. Submit for approval 100mm x 150mm (4" x 6") sample of proposed colour and texture for Consultant's approval.

   b. Submit full size samples of accessories as requested by Consultant.

4. Manufacturers Warranties: Submit copies of manufacturers warranties.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit manufacturer's written instructions for cleaning solutions, materials and procedures, include name of original installer and contact information in accordance with Section 01 78 23 Operations and Maintenance Data.

1. Provide specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

1.8 QUALITY ASSURANCE

A. Qualifications: Provide proof of qualifications when requested by Consultant:

1. Manufacturer / Supplier: Obtain materials from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties.

2. Installers: Execute Work of this Section using qualified personnel skilled in installation of work of this Section, having a minimum of five (5) years proven experience of installation similar in material, design and extent to that indicated for this Project.

1.9 MOCK-UPS

A. Mock-ups: Construct mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution in accordance with Section 01 45 00 - Quality Control for mock-ups and as follows:

1. Build mock-ups of typical wall section, incorporating the panel and finish, support framing and anchoring, breathable membrane, substrate materials, and adjacent materials including flashing, doors, windows and trim.

2. Notify Consultant a minimum seven (7) days prior to mock-up construction.

3. Review and acceptance of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Consultant specifically notes such deviations in writing.

4. Once reviewed by Consultant, acceptable mock-up can form a permanent part of the Work, and will form the basis for acceptance for the remainder of the project.

5. Remove and replace materials found not acceptable at no cost to Owner or Consultant.

1.10 DELIVERY, STORAGE AND HANDLING

A. Delivery: At the time of delivery, visually inspect all materials for damage. Note any damage to materials on the receiving ticket and immediately report to the shipping company and the material manufacturer.

1. Remove damaged materials from the site immediately.

B. Storage: Store materials in accordance with manufacturer's written instructions, raised off the ground and cover with a weather proof flame resistant sheeting or tarpaulin.

C. Handling: Material shall be handled in accordance with sound material handling practices and in accordance with manufacturer's written instructions.

1.11 SITE CONDITIONS

A. Site Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings where fibre-cement panels are indicated to fit walls and other construction.

B. Establish dimensions and proceed with fabricating fibre-cement panels where field measurements cannot be made without delaying the work; allow for site trimming and fitting.

C. Ambient Conditions: Install materials outlined in this Section after completion of work by other Section is complete, and all penetrations are watertight; to provide adequate dry, clean, level and plumb surfaces for installation and adhesion.

1.12 WARRANTY

A. Warrant the work of this section in accordance with manufacturer's warranty for a period of ten (10) years from date of delivery of material and agree to repair or replace faulty materials or work which becomes evident during the warranty period without cost to the Owner and at the Owner's convenience.

1. Warranty includes but is not limited to the following:

    a. Maintain the mechanical qualities, water tightness and frost resistance, providing the panels are correctly installed on a ventilated construction in accordance to the installation procedures outlined in this Section.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials and accessories specified herein are distributed by:

1. Engineered Assemblies.
   76 - 6535 Millcreek Drive, Mississauga, Ontario, Canada, L5N 2M2
   Phone: (905) 816 2218 or (866) 591-7021
   Email: info@engineeredassemblies.com
   Website: www.engineeredassemblies.com

B. Product:

1. Tectiva Fibre Cement Rainscreen Facade System by Equitone

2.2 PERFORMANCE REQUIREMENTS

A. Air space at top and bottom of building, or each wall termination, for buildings less than 18m (60'), shall be 25mm (1") to facilitate airflow from behind the panels. Do not block vertical airflow at windows, doors, eaves, or at the base of the building. Airflow shall be continuous from bottom to top so there is air movement behind each panel. For walls over 18m (60') in height, increase the ventilated cavity between rear of panels and exterior sheathing to 32mm (1 - 1/4"). Air flow behind the panels is critical to the performance of the Rear Ventilated Rain Screen design.

B. Perforated aluminum bird screen to allow minimum 50% free airflow.

C. Opening at small windows may be reduced according to Engineered Assemblies Standard System Design Guidelines.

D. Fasteners shall accommodate thermal expansion/contraction without excessive stress to the panel. Each panel shall have central lock points to support gravity loads.

E. Design and install cladding systems to allow for thermal movement of local climate with at least 60 degrees C ambient or panel temperature fluctuations, without causing undue stress on fasteners or panel or other detrimental effects.

F. Design to accommodate, by means of control joints, movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to in fills or racking of joints.

G. Design members and suspension system to withstand gravity load, live loads, including negative loads, as calculated in accordance with the building code.

H. Structural panel supports shall provide the minimum L/300 deflection stiffness required by the panel manufacturer. Panels themselves shall not deflect more than L/180 maximum at serviceability limit states.

2.3 MATERIALS

A. Material Textured High Density Fibre-Cement Panels:

1. Full compressed, air-cured Fibre Reinforced Cement sheet. Media blasted for texture.

2. Application:

    a. Exterior Facades

    b. Fascias

    c. Soffits

d. Interior Cladding

3. Thickness:

   a. 8mm (5/16”)

4. Dimensions:

   a. 150mm x 3000mm (6” x 10’)

5. Physical Characteristics: ASTM C1185, ATM C1186, and EN 12467.

6. Panel Weight:

   a. 1250mm x 3100mm x 8mm (4’ x 10’ x 5/16”): 60kg

7. Density Dry: 1650 kg/m³

8. Bending strength at ambient, perpendicular: 24.0 N/mm2

9. Bending strength at ambient, parallel: 17.0 N/mm2

10. Modulus of elasticity: 15.000 N/mm2

11. Maximum water absorption: 20%

12. Moisture movement (30 - 90%), mean): 1.0mm/m

13. Thermal expansion coefficient: 10 x 10-6 m/mK

14. Thermal conductivity coefficient: 0.6 W/mK

15. Fire reaction: (CAN/ULC-S135) Suitable for non-combustible construction in Canada.

16. Finishes: Equitone [tectiva] TEOO

B. Substructure:

1. Vertical Girts:

   a. Vertical girts supporting panels are 1.2mm (18 gauge) thick, galvanized zinc-coated steel to ASTM A653 with Grade A coating Z275. Painted black.

      1) Shop Primers: Provide primers that are compatible with paint systems specified in Section 09 91 00.

   b. Preformed galvanized metal sheet, 1.2mm (18 gauge) thick, minimum base steel nominal thickness, notched or perforated for drainage.

c. Girt locations as determined and approved by structural engineer, to align with modular panel fasteners spaced based on manufacturer's panel load data.

d. Front fasteners systems:

   1) Girts behind panels to be vertical to allow vertical ventilation. Preformed black galvanized steel girts to be used at inside and outside corners to ensure corners are straight and closed visually, and used at intermediary panel locations and where panels come together.

   2) Girts provided by Engineered Assemblies.

e. Cavity behind panel: Minimum 25mm (1") of unrestricted space.

f. Gap between panels: Minimum of 8mm (5/6") to allow for expansion and contraction (Max 12mm)

g. EPDM Rubber Separation Strip: Designed and supplied by Engineered Assemblies to be installed between the panel and the vertical girt to allow movement between panel and support system, meeting the following:

   1) Shore "A" Hardness: ASTM D2240

   2) Compression Set, 22h at 212°F (100°C): ASTM D395.

   3) Ozone Resistance, 100 mPa 100h @ 104°F (40°C) 20%

   4) Elongation: ASTM D1149.

   5) Tensile Strength: ASTM D412.

   6) Elongation at Rupture: ASTM D412.

   7) Tear Strength: ASTM D624

   8) Brittleness Temperature at -40°F (-40°C): ASTM D746.

   9) Flame Propagation, Option II; ASTM C1166.

h. Substructure to account for control joints of building to ensure a girt is not connected across the control joint.

i. Install panels across one set of vertical girts to ensure that expansion and contraction of the substrate is controlled within framing members.

2. Horizontal Clip System: 38mm (1-1/2") wide, die cut aluminum extruded clip, adjustable to plumb structure, minimum 1/2mm (18 gauge) thick galvanized zinc-coated steel to ASTM A653. System to provide compliance to ASHRAE

90.1 and thermally broken facade requirements of the building code. Effective R Value to be _____ or that provided on drawings.

a. Adaptable horizontal framing members

b. Clip Depth:

1) 100mm (4”)

2) 125mm (5”)

3) 150mm (6”)

c. Vertical Clip Spacing:

1) 610mm (24”)

2) 914mm (36")

3) 1220mm (48”)

d. Basis of Design Product: EA RVRS TClip and Girt, Model [T100] [T125] [T150], by Engineered Assemblies; info@engineeredassemblies.com or (905) 816-2218.

3. Fasteners:

a. Colour matched stainless steel rivets, as per Engineered Assemblies recommendations. No dissimilar materials allowed, in selection of fasteners.

b. All holes are pre-drilled at same diameter.

c. Fixed holes include a stainless steel grommet on the rivet stem.

d. Floating holes have rivet only.

4. Bird and Vent Screen:

a. Continuous bird and vent screen located at top and bottom of panel system, where opening in minimum 25mm (1”), with minimum 50% free air flow, manufactured be Engineered Assemblies from perforated aluminum, painted black.

5. Flashings: Prefinished steel as specified in Section 07 62 00.

C. Breathable Sheathing Membrane:

1. Sheathing Membrane: Triple layer, spun bonded polypropylene, breathable membrane with a nominal weight of 120 g/m², water vapour transmission of 150 perms minimum, as per ASTM E96; Colour: Black.

2. UV Resistant Underlayment: Coated, black, spun bonded polyester, breathable membrane with a nominal weight of 270g/m².

    a. Basis of Design Product: AirOutshield UV Resistant Underlayment by SRP Canada, and distributed by Engineered Assemblies; info@engineeredassemblies.com or (905) 816-2218.

3. Seam Tape: 25mm (1") double sided tape, 30 mil. thick, to seal vertical and horizontal seams between layers of AirOutshield.

    a. Basis of Design Product: Eternabond 1" D.S Seam Tape by SRP Canada and distributed by Engineered Assemblies; info@engineeredassemblies.com or (905) 816-2218.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Examine substrates to receive work and surrounding adjacent surfaces for conditions affecting installation. Coordinate with related sections to ensure proper dimensions are maintained.

2. Verify site dimensions by accurate field measurements so that work will be accurately designed, fabricated and fitted to the structure.

3. All penetrations through the facade for the work of other trades shall be fitted with a watertight sleeve. Verify flashings are in place, sealed with waterproof membrane and covered with building membranes.

4. Maintain sheathing membrane integrity.

B. Notify Contractor in writing of any conditions that are not acceptable.

C. Proceed with installation after verification and correction of surface conditions acceptable for manufacturer.

3.2 INSTALLATION

A. Erect fibre-cement panel system in accordance with manufacturer’s instructions.

B. Erect cementitious siding in straight lines, true, level and plumb. Maintain dimensions required by manufacturer for minimum distances from edge for holes and penetrations.

C. Space at top and bottom of each wall minimum 25mm (1”), as per manufacturer’s details.

D. Installation to allow for thermal expansion of the panel.

E. Holes are pre-drilled as per manufacturer’s written instructions.

F. Size of rivets as per manufacturer’s written instructions. No other types of fasteners are approved.

G. Install panels with joints centered over framing. Install all fasteners straight to the panel and in a consistent manner.

H. Do not install using damaged, warped or misaligned material.

I. Where panels fit into accessories, allow room for expansion.

J. Finished installation shall be properly secured, free of rattles, distortions, waviness, and protrusions, damaged or chipped components.

K. Cut and flash wall penetrations with metal flashing.

L. Install breathable sheathing membrane in accordance to manufacturer’s instructions. No penetrations are to be left in installed membrane.

3.3 CLEANING

A. Progress Cleaning: Leave work area clean at the end of each work day, ensuring safe movement of passing pedestrians.

B. Final Cleaning: At completion of installation, clean all surfaces so they are free of foreign matter using cleaners recommended by material manufacturer.

C. Restore panels and accessory components damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by the Constant, remove and replace damaged systems with new at no additional cost to the Owner.

D. Waste Management: Co-ordinate recycling of waste materials and packaging at appropriate facility, diverting waste from landfill. Certified installer shall be responsible for ensuring waste management efforts are practiced.

END OF SECTION 07 42 55

SECTION 07 46 23 — WOOD SIDING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1

1.2 RELATED WORK

A. Section 01 33 00 Submittals

B. Section 01 74 19 Cleaning

C. Section 06 10 00 — Rough Carpentry

D. Section 07 27 00 — Air Barriers

E. Section 07 62 00 — Sheet Metal Flashing and Trims

F. Section 07 92 00 — Joint Sealants

1.3 SUBMITTALS

A. Submit detailed product data for each product required.

B. Submit triplicate full size, minimum 20” long samples of each wood siding profile required. Provide samples with required coloured stain finish (factory finish).

C. Submit manufacturer’s cleaning and maintenance directions.

1.4 MOCK-UPS

A. At location directed by Consultant, provide mock-up of each type of wood siding and soffit cladding required.

B. Each mock-up shall be of size directed and shall include, flashings, sealants and required finish (shop applied).

1.5 DELIVERY, HANDLING AND STORAGE

A. Delivery products to site in manufacturer’s original packaging with identifying labels intact and legible.

B. Store products in a dry, well-ventilated but unheated space until required for installation. Do not place siding directly on the ground.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wood Siding: 6” horizontal wood siding with finish by Maibec, meeting the following requirements:

   1. Solid wood SPF, kiln dried to 12% - 16%

   2. Exposed siding surface: 4-3/4”

   3. Siding overlap: 5/8”

   4. Finish:

      a. Colour: Maibec 201, Sand Dune

      b. Brushed Modern Finish: EM+ +1X6, 2 coats

      c. Profile: Modern

B. Exposed trim, closures, cap pieces: to profiles shown, matching finish and appearance of siding.

C. Strapping (nailing strips): to CAN/CSA-0141.91, S-P-F, straight, dressed all sides kiln dried: NLGA 122c. “Standard”, 1 x 3, unless otherwise shown, free of rot, loose knots, spills, cracks and other defects.

D. Metal starter strip: perforated J-profile Maibec.

E. Metal flashings: minimum 22 ga hot dip galvanized steel top coated with 2 coat system: Perspectre by Boycott; colour selected by Consultant.

F. Fasteners:

   1. 2” siding nails to CSA B111-1974, hot dip galvanized steel or stainless steel, textured flat heat, ring shank nails; colour matched siding.

   2. Strapping: corrosion resistant self tapping self drilling screws.

G. Sealant: acrylic latex type to CAN/CGSB-19, 17-M90.

H. Accessories

   1. Ventilated Starter Strip

PART 3 EXECUTION

3.1 INSTALLATION

A. Install wood siding in accordance with material manufacturer’s current installation instructions.

B. Install strapping strips as required for support of wood siding, at maximum 16" o.c.: fasten strapping through sheathing to studs.

C. Install metal starter strip at bottom of walls. Install metal flashings above wall openings, at other locations shown and wherever required to achieve effective drainage conditions.

D. Prior to installation of siting, install mouldings, trims at inside and outside corners, below window sills, at top of walls and where shown.

E. Prior to installation of mouldings and siding touch up bare wood surfaces caused by cutting, planning and other reason, whether exposed in finished work or not. Apply touch-up stain in careful and controlled manner, coating bare surfaces only, never on top of undamaged factory finish.

F. Install wood siding in straight aligned length, unless otherwise shown. Where intermediate joint locations are not shown, stagger butt joints not less than 30" and distribute evenly over wall face; cut butt joints 45* unless otherwise shown Paint cut ends prior to installation to match factory applied finish, alternate between shorter and longer boards to minimize shrinkage at intermediate joints. Check boards for plumbness/levelness frequently but not more than every 4th board.

G. Fasten wood siding boards to each nailing strip at 3/4" to 1" from lower edge of board; drive nails flush without damaging board finish. Predrill holes before nailing to prevent splitting of board ends.

H. Locate intermediate joints over nailers or provide additional blocking.

I. Exposed nails shall be uniformly spaced and aligned in straight rows.

J. Evenly distribute boards with lighter and darker shades for a balanced overall appearance.

K. Place joints over nailing strips. Slope cut butt joints.

L. Where required install sealants in accordance with requirements specified in Section 07 92 00. Paint sealants to match wood siding boards.

END OF SECTION 07 46 50

SECTION 07 52 00 — MODIFIED BITUMINOUS ROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Section 07 21 00 - Thermal and Acoustic Insulation

B. Section 07 26 00 - Vapour Retarders

C. Section 07 27 00 - Air Barriers

D. Section 07 62 00 - Sheet Metal Flashing and Trims

E. Section 07 84 00 - Fire Stopping and Smoke Seals

F. Section 07 92 00 - Joint Sealants

G. Section 08 62 00 - Unit Skylights

H. DIVISION 22 - Plumbing

I. DIVISION 26 - Heating, Ventilation and Air Conditioning

J. Reserved

1.3 REFERENCE STANDARDS

A. ASTM C1177/C1177M, Standard specification for Glass mat gypsum substrate for use as sheathing

B. CSA A123.4-M, Bitumen for use in construction of built up roof coverings and dampprofing and waterproofing systems

C. CSAA231.1/A231.2, Precast Concrete Paving Slabs/Precast Concrete Pavers

D. CGSB 37-GP- 9Ma, Primer, Asphalt, Unfilled, for asphalt roofing, dampproofing and waterproofing.

E. CGSB 37-GP- 15M, Application of Asphalt primier for asphalt roofing, dampproofing and waterproofing.

F. CGSB 37-GP- 56M, Membrane, Modified, bituminous, Prefabricated, and Reinforced for Roofing

G. CAN/ULC S107, Fire test for roof coverings

H. CAN/ULC S704, Standard for thermal insulation, polyurethane and Polyisocyanurate, Boards, Faced.

I. CAN/ULC S706, Standard for Fibreboard uses

J. CSA B-111, Wire Nails, Spikes and Staples

K. Reserved

1.4 PERFORMANCE REQUIREMENTS

A. Compatibility between components of roofing system is essential. Provide written declaration stating that materials and components, as assembled in system, meet this requirement.

1.5 SUBMITTALS

A. Refer also to Section 01 33 00 — Submittals

B. Submit 2 copies of most recent technical roofing components data sheets describing materials' physical properties.

C. Submit WHMIS MSDS - Material Safety Data Sheets indicating VOC content for:

1. Primers
2. Asphalt
3. Sealers
4. Filter Fabric

D. Submit shop drawings for roof joint details including, but not limited to:

1. Flashings
2. Control joints
3. Tapered Insulation

E. Provide layout drawings for tapered insulation

F. Submit manufacturer’s installation instructions: indicate special precautions required for seaming the membrane

1. Submit cold weather construction procedures and methods of protection which will be initiated, installed and maintained when ambient temperature falls below 0ºC.

G. Submit manufacturer’s warranty certification

H. Submit manufacturer's field report in accordance with Section 01 45 00 — Quality Assurance

1. Include reports indicating procedures followed, ambient temperatures and wind velocity during application.

I. Samples:

1. If requested by the Consultant, supply a sample of any or all of the following materials:

a. Substrate board and adhesive

b. Vapour retarder and adhesive

c. Insulation boards

d. Tapered insulation

e. Insulation overlay

f. Roofing membranes

g. Roof accessories

1.6 QUALITY ASSURANCE

A. If requested, submit laboratory test reports certifying compliance of bitumens , roofing felts and membrane with specification requirements

B. Convene pre-installation meeting 1 week prior to beginning roofing Work, with roofing contractor's representative, Contractor and Consultant to:

1. Verify project requirements.

2. Review installation and substrate conditions.

3. Co-ordinate with other building subtrades.

4. Review manufacturer's installation instructions and warranty requirements.

C. Perform roofing work in accordance with the CRCA Roofing Specifications Manual and in accordance with membrane manufacturer's printed installation instructions.

1.7 STORAGE AND HANDLING

A. 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 product has not expired.

1. Handle roofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.

B. Protect products from inclement weather. Keep insulation, insulation overlay, and roofing membranes absolutely dry. Do not install products which are damp at time of installation or showing evidence of having been damp or exposed to moisture.

1. Remove only in quantities required for same day use.

2. Store sealants at +5 degrees C minimum

C. Distribute weight of products stored on roof to prevent structural overloading.

D. Place plywood runways over completed Work to enable movement of material and other traffic.

1.8 PROTECTION

A. Fire Extinguishers: maintain one cartridge operated type or stored pressure rechargeable type with [shut-off nozzle, ULC labeled for A, B and C class protection. Size as indicated on roof per torch applicator, within 6m of torch applicator.

B. Maintain fire watch for 1 hour after each day's roofing operations cease. Maintain fire watch for 2 hours where torch has been used.

1.9 ENVIRONMENTAL PROTECTION

A. Do not install roofing when temperature remains below -18 degrees C for torch application, or to manufacturers' recommendations for mop application.

B. Unless otherwise specified in manufacturer’s literature, minimum temperature for solvent-based adhesive is -5 degrees C.

C. Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.10 PROJECT CLOSE-OUT AND CLOSE-OUT SUBMITTALS

A. At completion of this work, provide signed warranty from the roofing system manufacturer to the owner covering defects in workmanship and materials for a period for 20 years commencing from Substantial Performance. Warranty shall include vapour retarder, 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 elements, manufacturing defect, and the workmanship used to install these materials.

PART 2 PRODUCTS

2.1 MATERIALS

A. All materials under Work of this Section, including but not limited to, adhesives and primers are to have low VOC content limits.

B. Soprema Roofing System described as follows. Platinum system with 20-year warranty. Refer to Consultant Assembly Schedule for description of desired roof composition, coordinate work of all trades to ensure water-tight high quality assembly system:

1. Adhesive

    a. Low-rise two-art urethane adhesive with no solvents. Allows a complete cure in a few minutes, with no temperature restrictions.

    b. Specified Product: Duotack Insulation Adhesive by Soprema or approved equivalent

2. Fasteners:

    a. Roof fasteners to steel decking: Use #12, FM approved, with 3” round metal plates

    b. Insulation fasteners to steel decking: Screws and plates in conformance with Factory Mutual’s standard No. 4470 on corrosion and wind uplift factors.

    c. Roofing nails: spiral nails with steel round-top cap 25mm in diameter and 3mm diameter shank; long enough to penetrate solid wood supports by at least 38mm and plywood substrates by at least 20mm

3. Gypsum Sheathing:

    a. Sheathing board to ASTM C1177. Minimum 13mm thick, glass mat faces, exterior grade gypsum board. Primed finish.

    b. Specified Product: Densdeck Prime by Georgia Pacific or approved equivalent.

4. Vapour Retarder:

    a. Self-adhesive air/vapour barrier membranes composed of SBS modified bitumen modified and high-density polyethylene film. The width of the membrane is 1,14 meters to allow the membrane to fit on the top flute of most structural steel decks. Self-adhesive under face covered with a silicone release sheet. Water vapour permeability: 0.92 ng/Pa*s*m2 (0.016 Perm).

    b. Specified Product: Sopravap’r, by Soprema or approved equivalent.

5. Insulation:

    a. Closed-cell, polyisocyanurate foam core integrally laminated to heavy-coated glass facers, meeting requirements of CAN/ULC-S107-M87, ASTM E119, ASTM C1289-95 and FM Standard 4450/4470. Conforming to CAN/ULC-S770

    b. Specified Product: SopraISO by Soprema or approved equivalent.

6. Tapered Insulation:

    a. Polyisocyanurate Factory pre-engineered tapered high density fibreboard insulation in thickness sufficient for slopes indicated on Consultant drawings.

    b. Factory pre-engineered tapered high density fibreboard insulation in thickness sufficient for slopes indicated on Consultant drawings.

7. Insulation Overlay Board:

    a. Multi-ply, semi-rigid asphaltic roofing substrate board composed of a mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners. Length 1200mm x width 1500 mm x thickness 6.4mm.

    b. Specified Product: Sopraboard by Soprema or approved equivalent.

8. Membranes

    a. Roof membrane Base Sheet

        1) CGSB 27-GP-56M, Type 2 for covered roofing application, Class C, Plain surfaced, Grade 2

        2) Roofing membrane with glass and polyester composite reinforcement and SBS modified bitumen. Both sides covered with thermofusible plastic film. Top far marked with three (3) distinctive blue chalk lines to ensure proper roll alignment.

        3) Specified Product: Sopraply 520, torched on, by Soprema or approved equivalent

    b. Roof membrane base sheet flashing:

        1) CGSB 37-GP-56M, Type 2 for covered roofing application, Class C, Plain surfaces, Grade 2

        2) Roofing membrane with glass and polyester composite reinforcement and SBS modified bitumen. Top face covered with thermofusible plastic film, underside self-adhesive. Top face marked with three (3) distinctive blue chalk lines to ensure proper roll alignment.

3) Specified product: Sopralene Flam Stick , self-adhesive, by Soprema or approved equivalent.

c. Roofing membrane cap sheet and cap sheet flashing

1) CGSB 37-GP-56M, Type 1 for exposed roofing application, Class A, Granule surfaced, Grade 2

2) Roofing and flashing cap and sheet membrane with a heavy duty composite reinforcement and SBS modified bitumen. Top face covered with ceramic granules, under face with a thermofusible plastic film. The membrane minimum thickness is 3.5mm and is applied by torching.

3) Specified Product: Sopraply 560 by Soprema or approved equivalent.

9. Waterproofing Mastics

a. Soprema Sopramastic Block System

b. Polyester-made precast blocks of various sizes. A single component, polyether-based mastic and a single component polyether based sealant and adhesive.

10. Sleeve Flashings

a. Use appropriate Thaler Sleeve Flashing based on requirements of each specific locations.

11. Insulation fasteners and plates: Conforming to manufacturers recommended layout for wind uplift and corrosion resistance, furnish fasteners of length required by insulation thickness plus 25 max.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

B. The patching and repairing of the existing roof is to be completed to match the existing roofing assembly, using the similar materials and ensuring all seams are weather tight.

C. Prior to commencement of Work ensure:

1. Environmental and site conditions are suitable for material installation in accordance with manufacturer’s recommendations.

2. Roof structure is 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.

3.2 METHOD OF INSTALLATION

A. Complete waterproofing work in conformance with manufacturer's requirements

B. Complete installation in a continuous fashion as surfaces are prepared and weather conditions permit.

C. Ensure watertight conditions for roofs at all times, including protection during installation work by other trades and progressive protection as work is completed (e.g. vents, drains, etc.)

3.3 GYPSUM SHEATHING INSTALLATION

A. Install sheathing in straight parallel rows, with long dimension perpendicular to structural members, and with short dimension edges centred on and supported by structural members in both directions.

B. Place sheathing in moderately tight contact at joints between boards and abutting surfaces with gaps between boards not exceeding 3mm. Under no circumstances shall the roofing membrane be left unsupported over a space greater than 3mm.

C. Mechanically fasten sheathing to deck with self-tapping, non-corroding screws, spaced evenly to each board and to only top flutes. Use 8 fasteners per 4' x 8' panels and 12 fasteners per corner panels.

D. Ensure sheathing is immediately protected with membrane.

3.4 VAPOUR RETARDER INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Side laps must be a minimum of 75mm (3 in) and end laps must be a minimum of 150mm (6 in).

C. All end laps on steel deck shall be supported by a metal plate 15cm x 106cm (6 in x 42 in).

D. Cut and fit vapour retarded as required for passage of protrusions, ensuring continuous adherence to substrate.

E. 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 5mm.

F. Once installed, pressure must be applied over the whole surface using a roller to ensure a perfect adhesion.

3.5 INSULATION INSTALLATION

A. Prior to installation of insulation, examine vapour retarder and make good any damage.

B. Use full size insulation boards wherever possible, and minimum half boards abutting vertical surfaces.

C. Install insulation promptly to avoid possibility of condensation beneath vapour retarder.

D. 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%.

E. Place insulation boards in moderately tight contact at joints between boards and abutting surfaces with gaps between boards not exceeding 1.5mm. Under no circumstances shall the roofing membrane be left unsupported over a space greater than 3mm.

F. 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.

G. When installing multiple layers of insulation, all joints between layers shall be staggered at least 300mm.

H. Do not lay more insulation than can be completely covered as finished roofing system on the same day.

I. Do not cut off insulation in straight lines at the end of a Work period, allow stepped boars for toothing-in.

J. Install Polyisocyanurate insulation in a minimum of two layers.

K. Install fasteners in accordance with manufacturer’s installation instructions.

L. Install subsequent layers of insulation, in full moppings of asphalt, in straight parallel rows, with long dimension parallel to long dimensions of insulation.

M. Install tapered insulation in accordance with manufacturer’s details and instructions. Miter roof insulation edges at ridge, valley and other similar non-planar conditions.

3.6 OVERLAY BOARD INSTALLATION

A. Apply insulation overlay to insulation with adhesive in conformance with manufacturer’s written recommendations.

B. Firmly set the insulation boards, long joints continuous and short joints staggered. All boards must be evenly and tightly butted together.

C. Stager vertical joints between boards and insulation. Install only as many boards as can be covered with base sheet in the same day.

D. At parapets and curbs mechanically fasten overlay board to substrate before installation of self-adhesive base flashings. Use 6.4mm overlay boards at these locations.

3.7 BASE SHEET INSTALLATION

A. Unroll base sheet flashing at drain level with first side lap lined up with drain centre (parallel to roof edge).

B. Torch base sheet entirely onto prepared substrate. Overlap side laps by 75mm along lines provided to this end, and overlap end laps by 150mm. Stagger end joints by a minimum of 300 mm.

C. Torch sufficiently and continuously to avoid wrinkles, air pockets or fish mouths. In cold weather, adjust welding time to obtain homogenous seam (it may be necessary to slow down in certain cases or in colder weather).

3.8 BASE-SHEET FLASHING INSTALLATION

A. Apply primer to the substrate at a rate of .25 L/m2. Primer should be dry before installation of Base Sheet.

B. Install base sheet flashing in one-(1) metre widths to cover roofing substrate over 100mm. Overlap side laps by 75mm. Stagger side laps by at least 100mm from base sheet overlaps on roof to avoid excessive layering.

C. Apply base sheet flashing directly onto substrate by removing silicone paper cover sheet. Proceed from top to bottom. Once in place, apply pressure manually in a uniform fashion to obtain homogenous adherence over entire surface. Preferably seal seams with rubber roller. Nail outside edge of 300mm o/c. Burn off plastic film of base sheet before adhering base sheet flashing over it.

D. Avoid forming wrinkles, air pockets or fish mouths.

E. Always seal overlaps at the end of the workday.

3.9 ROOFING CAP SHEET INSTALLATION

A. Once base sheet in applied and no defects are apparent, proceed with cap sheet installation.

B. Begin with double-selvage starter roll. If starter roll is not used, side laps covered in granules must be degranulated by embedding side laps in torch-heated bitumen over a 75-100 mm width.

C. Unroll cap sheet at drain. Carefully align first side lap (parallel to roof edge).

D. Weld cap sheet onto base sheet with torch recommended by membrane manufacturer. During application, simultaneously melt both designated contact surfaces so a bead of bitumen is apparent as cap sheet unrolls.

E. Avoid overheating.

F. Make sure joints between the two layers are staggered by at least 300mm.

3.10 CAP SHEET FLASHING INSTALLATION

A. This cap sheet must be installed in one-metre-wide strips. The side joints must overlap by 75-100mm and must be staggered by at least 100mm with respect to the joints of the cap on the field surface to avoid areas of excessive membrane thickness. The overlaps on the field surface must be 50mm wider than those of the base sheet membrane on the upstands and parapets. At end laps, angle-cut the corners that will be covered by the following unit.

B. Use a chalk line to draw a straight line on the field surface 150mm from the up stands and parapets.

C. Use a propane torch and round-nose trowel to embed the surface granules in the layer of hot bitumen [starting from the chalk line on the field surface to the bottom edge of the upstand or parapet as well as] on the granulated vertical surfaces that are to be overlapped.

D. This cap sheet will be heat-welded directly to the base sheet membrane proceeding from bottom to top. This technique softens both membranes in order to obtain even, continuous weld.

E. During installation, be careful not to overheat the membrane or to create excessive bitumen bleeding at the joints.

F. Once cap sheet is installed, carefully inspect all joints and surfaces. Take great care to ensure asphalt does not spread out over exposed past of cap sheet.

G. If there are marks of asphalt inspect all joints and surfaces. Take great care to ensure asphalt does not spread out over exposed part of cap sheet.

H. If there are marks of asphalt or excessive asphalt seepage, reheat these areas with a torch and apply matching factory provided granules before bitumen cools to provide clean appearance. Press granules in place with a damp sponge.

3.11 WATERPROOFING OF PENETRATIONS

A. Ensure substrate is clear of loose granules and all foreign substances that can impair adhesion.

B. Apply a base coat of liquid waterproofing

C. Trim reinforcing material to conform to shape of penetrations and embed in base coat.

D. Apply a second coat fully saturating the reinforcement

E. To add colour or match existing granules, apply a thin coat of liquid waterproofing and embed granules before it dries.

3.12 FIELD QUALITY CONTROL

A. Check completed membrane welds for continuity after cooling, showing uninterrupted extrusion of melted asphalt material.

B. 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.

3.13 ROOF MAINTENANCE AND CLEANING DURING EXECUTION

A. Clean off drips and smears of bitumen immediately.

B. Clean roofing, metal, masonry and similar items of dirt, cuttings, stains and foreign matter upon completion of work.

C. Dispose of rain water off roof and away from face of building until roof drainage system has been installed and connected.

D. At end of each day's work or when stoppage occurs due to inclement weather, protect completed work and products.

END OF SECTION 07 52 00

SECTION 07 62 00 — SHEET METAL FLASHINGS AND TRIMS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Reserved

B. Section 07 52 00 - Modified Bituminous Roofing

C. Section 07 92 00 - Joint Sealants.

D. Section 08 11 13 - Hollow Metal Doors and Frames.

E. Section 08 51 13 - Aluminum Windows

F. Section 08 44 00 - Glazed Curtain Wall

1.3 REREFERENCES

A. Reserved

B. The Aluminum Association Inc (AA)

1. Aluminum Sheet Metal Work in Building Conetruction-[2000]

2. AA DAF 45-[97], Designation System for Aluminum Finishes

C. American Society for Testing and Materials (ASTM)

1. ASTM A167-[99], Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

2. ASTM A240/A240M-[02], Standard Specification for Chromium and Chromium-Nickel Stailess Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications

3. ASTM A591/A591M-[98], Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating [Mass] Applications

4. ASTM A606-[01], Standard Specification for Steel, Sheet and Strip, High Strength, Low Alloy, Hot Rolled, and Cold Rolled with Improved Atmospheric Corrosion Resistance

5. ASTM A653/A653M-[01a], Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron, Alloy Coated (Galvannealed), by the Hot Dip Process
6. ASTM A792/A79sM-[02], Standard Specification for Steel Sheet, 55% Aluminum-Zinc, Alloy Coated by the Hot Dip Process
7. ASTM B32-[00], Standard Specification for Solder Metal
8. ASTM B370-[98], Standard Specification for Copper Sheet and Strip for Building Construction
9. ASTM D523-[89(1999)], Standard Test Method for Specular Gloss
10. ASTM D822-[01], Standard Practice for Filtered Open Flame Carbon Arc Exposures of Paint and Related Coatings.

D. Canadian Roofing Contractors Association (CRCA)

1. Roofing Specifications Manual (latest edition)

E. Canadian General Standards Board (CGSB)

1. CAN/CGSB-37.5-[M89], Cutback Asphalt Plastic Cement
2. CAN/CGSB-51.32-[M77], Sheathing, Membrane, Breather Type
3. CAN/CGSB-93.1-[M85], Sheet Aluminum Alloy

F. Canadian Standards Association (CSA)

1. CSA A 123.3-[98], Asphalt Saturated Organic Roofing Felt
2. CSA-A440-[00]/A440.1-[00], Windows Special Publication/ User Selection Guide to CSA Standard A440.1-[00]
3. CSA B111-[1974(R1998)], Wire Nails, Spikes and Staples.

1.4 SUBMITTALS

A. Submit shop drawings for Consultant review.

B. Upon Consultant request, submit one 150 mm length of each profile of fabricated flashings, showing end connection detail, seams and corners, for approval (major flashings only).

1.5 DELIVERY, HANDLING, AND STORAGE

A. Store materials off ground and under cover in a dry, well ventilated enclosure.

B. Stack preformed material in manner to prevent twisting, bending and rubbing.

C. Provide protection for galvanized and pre-painted surfaces.

D. Prevent contact of dissimilar metals during storage and protect from acids, flux, and other corrosive materials and elements.

PART 2 PRODUCTS

2.1 MATERIAL

A. Prefinished Aluminum Sheet: Factory applied coating to CAN/CGSB-93.1 supplemented and amended as follows:

1. Type 1
2. Class F1S
3. Roof flashing Colour to match Standing Seam metal roofing. Refer to Section 07 40 00 Roofing and Siding Panels.
4. Window flashing Colour to match individual window and curtain wall frame. Refer to Section 08 44 00 Glazed Curtain Wall and Door and 08 51 13 Aluminum Windows
5. Flashing at base of wall:
    a. Fibre Cement Panels: Clear anodized flashing.
    b. Standing Seam Cladding: Match cladding finish and colour.
6. Specular gloss: medium
7. Minimum Thickness: 22 Gauge

B. Aluminum: 6063 T54 alloy and temper and AA 1100, anodizing quality, for sheet.

C. Galvanized Steel Sheet: commercial quality sheet to ASTM A653-M96, with Z275 designation zinc coating.

D. Prepainted Galvanized Steel: commercial quality to ASTM A653-M96 with Z275 zinc coating prepainted with baked on enamel with colours of proven durability for exterior exposure, factory precoated with a silicone polyester based 8000 series paint finish, 2 coat system dry paint minimum film thickness of 0.025 mm.

1. Colour to be selected by Consultant.

E. Solder: 50% pig lead and 50% block tin.

F. Flux: commercial quality as recommended by sheet metal manufacturer.

G. Flashing Nails: #12 hot dipped zinc coated, annular ringed.

H. Sheet Metal Screws: Cadmium plated, self tapping, pan head.

I. Bituminous Paint: solvent type, to CAN/CGSB-1.108-M89, type II.

J. Plastic Cement: cutback asphalt type, to CAN/CGSB-37.5-M89.

K. Sealing Compound: to Section 07 92 00 – Joint Sealants.

L. Sealant: one component, elastomeric, chemical curing, ASTM C920.

M. Recessed Reglet: preformed 0.70 mm thick galvanized steel channel with face and ends covered with plastic tape.

N. Flashing Anchor Clips: 0.80 mm thick galvanized steel.

2.2 FABRICATION

A. Form flashings, copings, pans, eaves troughs, scuppers, downspouts and fascias to profiles as detailed. Ensure sections are square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

B. Form pans to receive roofing plastic from sheet metal with minimum upstaged of 75mm above finished roof, and 100mm continuous flanges with no open corners, solder joints. Make pans a min 50mm wider than member passing through roofing membrane.

C. Form eaves troughs, scuppers and down spouts from prefinished sheet metal or from material as otherwise indicated in Consultants drawings

1. Provide goose necks, outlets, strainer baskets and necessary fastenings as indicated.

D. Back-paint sheet metal with bituminous paint on surface in contact with concrete, masonry, cementitious materials or dissimilar metal.

E. Maximum Joint Spacing:

1. Parapet Face Flashings: 4’-0” (1200 mm).

2. Cap Flashing 12” (300 mm) and Greater in Width: 4’-0” (1200 mm).

3. All Other Flashings: 8’-0” (2400 mm).

F. Construct flashing joints to allow for flashing movement, using flat "S" lock seams.

G. Maintain minimum of 1” (25 mm) lap at all joints. Provide 1” (25 mm) anchor projection of "S" locks.

H. At inside and outside corners, mitre the joint, and use upstanding seams, 1” (25 mm) minimum height and 1” (25 mm) minimum lap.

I. Maintain minimum 1:5 slope on horizontal surfaces of flashings, parapets and control joints.

J. Hem exposed edges on underside of all flashings.

K. Unless otherwise indicated in drawings or specifications, fabricate cap flashing to have a drip leg minimum 4” (100 mm) high.

L. Fabricate cap and counter flashings to lap 4” (100 mm) over base flashings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive flashings. Notify the Consultant of surfaces which are considered unacceptable to receive the work of this Section.

B. The commencement of flashing work will imply unconditional acceptance of the surfaces and substrates to which the flashing is to be fastened.

C. Verify that the following are located and installed as detailed on drawings:

1. Plywood and lumber nailer plates to walls and parapets.

2. Control joints.

3.2 INSTALLATION

A. Install sheet metal work as detailed. Consult Prime Consultant if unsure of how to proceed.

B. Use 0.80 mm thick x 6” (150 mm) long anchor clips on fascia faces, and screws or annular ringed nails on the opposite face.

C. Use exposed fastenings in approved locations. Install anchors using annular ringed nails.

D. Fasten flashings of 4’-0” (1.2 m) length and shorter, through the extended "S" locks. Fasten flashings over 4’-0” (1.2 m) length, through the extended "s" locks, and at mid-length with a 6” (150 mm) long, 0.80 mm thick galvanized steel clip.

E. Where possible, do not set base flashing screws less than 8” (200 mm) from top of roof membrane.

F. Fit flashings together so that one end of each section is free to move in the joint. Do not use sealant at joints.

G. Install surface mounted reglets true and level, and caulk top of reglet with sealant.

H. Insert metal flashing into reglets and under cap flashings to form weather tight junction.

I. Install eaves troughs and secure back to building at 750mm on centre with eaves trough gutter brackets through spacer ferrules. Slope eaves thoughts to downspouts as indicated. Solder joints watertight

J. Install downspouts, secure to wall with straps at 1800mm on centre, minimum two straps per down pipe.

K. Wipe and wash clean, any soldered joints to remove traces of flux, immediately after soldering.

3.3 PROTECTION OF EXISTING WORK

A. Protect the work of other Sections from damage by the work of this Section.

B. Place protection to the requirements and satisfaction of this Section before performing the work of other Sections.

END OF SECTION 07 62 00

SECTION 07 84 00 — FIRE STOPPING AND SMOKE SEALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED WORKS

A. Section 04 05 12 — Masonry, Mortar and Grout

B. Section 92 00 — Joint Sealants

C. Division 23 — Firestopping within penetrating mechanical assemblies (e.g. ducts)

D. Division 26 — Firestopping within penetrating electrical assemblies (e.g. bus duct)

1.3 DESCRIPTION

A. Include in work of this Section all firestopping required except for firestopping and smoke seals within mechanical assemblies (i.e. inside ducts, dampers) and electrical assemblies (i.e. inside bus ducts) which shall be provided as part of work of Divisions 15 and 16 respectively. Firestopping and smoke seals around the outside of such mechanical and electrical assemblies, where they penetrate fire rated separations, shall be part of work of this Section.

B. Firestop and seal (draft-tight) gaps, control joints, expansion joints and penetrations in fire rated assemblies, including assemblies with a zero rating, against passage of fire, smoke, gasses, firefighter's hose stream and, where designated, passage of liquids. Smoke seals at angle support at fire dampers.

1.4 QUALITY ASSURANCE

A. Work of this Section shall be carried out by a firm specialized in the type of work specified herein. Use competent installers, experienced, trained and approved by material or system manufacturer for application of materials and systems being used. Installers shall have minimum 5 years experience in installation of firestopping materials.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site in manufacturer's sealed and labelled containers.

B. Store materials in protected location prior to use, in accordance with manufacturer's directions.

1.6 ENVIRONMENTAL CONDITIONS

A. Conform to manufacturer's recommended temperatures, relative humidity and substrate moisture content for storage, mixing, application and curing of firestopping materials.

1.7 SUBMITTALS

A. Prior to start of work submit list of proposed fires tipping and smoke seal materials together with suitable documentation to verify that specified requirements will be met. Provide the following information as applicable to this Project:

1. ULC assembly number certification.
2. Required temperature rise and flame rating.
3. Hose stream rating (where applicable).
4. Thickness.
5. Proposed installation methods.
6. Material of firestopping and smoke seals, primers, reinforcements, damming materials, reinforcements and anchorages/fastenings.
7. Size of opening.
8. Adjacent materials.

B. Upon Consultant's required submit samples of materials.

C. Upon completion of work submit written certification that work of this Section has been carried out in accordance with specified requirements.

PART 2 PRODUCTS

2.1 SYSTEMS

A. Firestopping and smoke seal systems shall be:

1. Tested in accordance with CAN/ULC-S115-11.
2. Listed by ULC or other fire testing agency approved by jurisdictional authorities.
3. Capable of providing fire resistance rating not less than that required by surrounding assembly.
4. Comply with F, FT, or FTH rating in accordance with OBC.

B. Firestopping and smoke seals for vertical fire separations shall meet ULC Designation PJ, JF and HW as required for respective location.

2.2 MATERIALS

A. Firestopping and smoke seals materials:

1. Provide materials which are:

a. PCB and asbestos-free

b. Of easily identifiable colour, except where used in exposed location

c. Suitable for intended application

d. Compatible with adjacent materials

2. Provide elastomeric type materials at locations requiring future re-entry (such as capable) and at penetrations for ducts and other mechanical items requiring sound and vibration control.

3. Sealant type materials shall be non-sagging for vertical surfaces and self-levelling for level floors.

B. Primer: as recommended by firestopping materials manufacturer for specific substrate for use.

C. Damming and back-up materials, support and anchoring devices: non-combustible, in accordance with tested assembly and as recommended by manufacturer.

2.3 MIXING

A. Mix materials at correct temperature and in accordance with manufacturer's directions.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove combustible materials and loose material detrimental to bond from edges of penetration. Clean, prime or otherwise prepare substrate material to manufacturer's recommendation.

B. Do not apply firestop material to surfaces previously painted or treated with sealer, curing compound, water repellant to other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

C. Verify openings, dimensions and surfaces conform to fire and smoke seal assembly.

D. Protect adjacent surfaces from marring or damage.

E. Prime surfaces in accordance with manufacturer's directions.

F. Remove insulation from area of insulated pipe and duct where such pipes or ducts penetrate fire separation unless ULC certified assembly permits such insulation to remain within assembly.

G. Provide temporary damming, forming, packing and bracing materials necessary to contain firestopping. Upon completion, remove forming and damming materials not required to remain as part of system.

H. Examine sizes, anticipated movement and conditions of opening and penetration to establish correct system and depth of backup materials and of firestopping material required.

3.2 INSTALLATION

A. Seal penetrations through and gaps in fire rated separations in accordance with ULC listing for tested system selected.

B. Apply firestopping materials in accordance with manufacturer's instructions and tested designs. Apply with sufficient pressure to properly fill and seal openings to ensure continuity and integrity of fire separation. Tool or trowel exposed surfaces as required.

C. Remove excess compound promptly as work progresses and upon completion.

D. Unless otherwise indicated or permitted by Consultant recess firestopping and smoke seals in exposed locations to permit installation of decorative sealant by Section 07 92 00.

E. Do not cover materials until full cure has taken place.

F. Provide firestopping and smoke seal systems at following locations, without being limited to:

1. At all openings, voids and penetrations through all floor slabs except openings within shafts constructed with a fire resistance rating and slabs on granular fill.

2. At all openings, voids, control joints and penetrations through fire rated masonry, concrete and gypsum board walls, partitions and shaft walls.

3. At all openings, voids and penetrations installed for future use through fire rated masonry, concrete and gypsum board walls, partitions and shaft walls.

4. Around mechanical and electrical assemblies penetrating fire rated assemblies.

5. Between perimeter of all floor and roof slabs and exterior wall construction.

6. Between tops of all fire rated walls and partitions and underside of floor or roof slabs.
7. At building expansion joints.

G. Curing: cure materials in accordance with manufacturer's directions.

3.3 FIELD QUALITY CONTROL

A. Upon Consultant's request, manufacturer's representatives shall inspect work of this Section and confirm in writing that it complies with specified requirements.

B. Request Consultant's review of installed systems before they are covered by other work.

C. Owner may arrange and pay out of cash allowance included in Section 01 21 00 for inspection and testing of work of this Section by independent agency as directed by Consultant.

SECTION 07 92 00 — JOINT SEALANTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED WORK

A. Section 07 62 00 — Sheet Metal Flashing and Trims

B. Section 08 51 13 — Aluminum Windows

C. Section 09 29 00 — Gypsum Board

1.3 DEFINITION

A. Caulking = Sealant

1.4 QUALITY ASSURANCE

A. Sealants must be installed by qualified caulking contractor with minimum five years experience and proven record of being able to produce good quality work.

B. Upon Consultant's request arrange for sealant manufacturer's technical representative to visit the site, investigate conditions and make recommendations in connection with work of this Section.

1.5 PRODUCT HANDLING

A. Delivery sealants to site in sealed containers bearing manufacturer's name, brand name of sealants and reference standard to which sealant complies.

B. Store materials in a dry area having an ambient temperature within limitations recommended by material manufacturer.

1.6 JOB CONDITIONS

A. Unless otherwise specified, apply sealants when air temperature is between 10*C and 25*C. When air temperature is above 25*C or below 10*C, follow sealant manufacturer's recommendations regarding application.

B. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Where necessary, do not proceed with installations of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 WARRANTY

A. At no cost to Owner remedy any defects in work, including work of this and other Sections, due to faults in materials and workmanship provided under this Section appearing within a period of 2 years from date of Substantial Performance.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sealants:

1. Joints at exterior vertical surfaces: one component, low modulus polyurethane sealant with joint movement capability of +/- 35%; colour selected by Consultant; ASTM C920, Type S, Grade NS, Class 35, uses NT, M, A, O; standard of acceptance; Dymonic FC by Tremco.

2. Joints at interior vertical surface one part acrylic latex with joint movement capability of +/- 7.5% paintable; ASTM C834 Type OP, Grade -18*C, standard of acceptance; Tremflex 834.

3. Joints at interior and exterior horizontal surfaces: multi-component, self levelling, chemically curing polyurethane: ASTM C920, Type M, Grade P, Class 25: Standard of acceptance: Tremco THC-900

4. Joints at interior wet locations: mildew-resistant silicone formulated with fungicide: ASTM C920, Type S, Grade NS, Class 25, Uses NT, G, A: Standard of acceptance: Dow Coming 876 Mildew Resistant Silicone Sealant.

5. Sealant colours: selected by Consultant from manufacturer's standard colours.

B. Primers, thinners, cleaners: as recommended by sealant manufacturer, non-staining type.

C. Remoulded backup for sealant: non-gassing closed cell foam rope, compressed 25% when in joint: Sof-rod by Tremco, or Cera-Rod by W.R. Meadows.

D. Bond breaker: closed-cell polyethylene or vinyl foam tape, self-adhering one side.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine joints to be caulked and report in writing to the Consultant any defects in work of other Sections which would impair installation, performance and warranty of sealants.

B. Do not commence installation of sealants until conditions are acceptable.

C. Start of work implies acceptance of conditions.

3.2 PREPARATION

A. Clean and prepare joints to be caulked to produce clean sound surfaces for sealant adhesion.

B. Remove dust, oil, grease, water, frost, loose mortar and other foreign matter. Remove loose particles by blowing joint out with compressed air.

C. Chemically clean non-porous surfaces such as metal and glass, taking care to wipe solvents dry with a clean cloth. Use solvents recommended by sealant manufacturer.

D. Clean porous surfaces such as masonry, concrete and stone by mechanical abrading.

E. Surfaces adjacent to joints to be primed and which may be stained by primer shall be masked with tape before primer is applied.

F. Prime joints in accordance with sealant manufacturer's recommendations. Apply primer before installing remoulded backup.

G. Install remoulded backup in joints 6mm and more in width. Roll rope type backup into joint, do not stretch or braid. Install bond breaker in joints less than 6mm in width.

H. Protect adjacent surfaces from stains and contamination. Make good any damage caused.

3.3 APPLICATION

A. Apply sealants under pressure using suitable equipment. Gun nozzle shall be of proper size to fit, and seal joint.

B. Force sealant into joints in full bead, making certain that void free contact is made with sides of joint. Tool joints to product a slightly concave surface.

C. Caulking must appear as a concave recessed joint, free of ridges, wrinkles and embedded foreign matter. Caulking shall not spread or bulge beyond surfaces on each of joint.

END OF SECTION 07 92 00

SECTION 07 95 00 — EXPANSION JOINT

PART 1 GENERAL

1.1 GENERAL REQUIRMENTS

A. Comply with requirements of Division 1.

1.2 RELATED WORK

A. Firestopping: Section 07 84 00

B. Sealants: Section 07 92 00

1.3 SUBMITTALS

A. Submit detailed shop drawings of each component specified showing fabrication and installation requirements.

B. Submit samples and accurate colour charts for selection of colour for resilient filler strip.

PART 2 PRODUCTS

2.1 MATERIALS AND FABRICATION

A. Expansion joint covers of the same materials and finishes, similar in function to those specified manufactured by the following are considered equal subject to the approval of the Consultant.

1. Construction Specialists Ltd.
2. Migua by Emseal Corporation
3. MM Systems Corporation by M.W. McGill & Associates Ltd.

B. Fabricate components in longest practicable lengths

C. Prefabricate transition pieces.

D. Resilient filler strip shall be keylocked or bonded to aluminum retainers.

E. Select width of covers to suit joint size.

F. System: Construction Specialties C/S:

1. Floor to floor: Model RFC-300, with 3” RFX two-hour fire barrier. Recess cover into floor.
2. Flat wall / ceiling: Model FWF-300M, with 3” RFX two-hour fire barrier

3. Exterior Expansion Joint: HS-300. Colour to be selected by Consultant
4. Floor to wall: Model GFTW
5. Corner wall / ceiling: Model FWFC

2.2 FINISHES AND COLOURS

A. Aluminum surfaces in contact with cementitious materials: apply shop coat of zinc chromate primer.

B. Aluminum surfaces exposed to view: mill finish.

C. Resilient filler stip colour: selected by Consultant from manufacturer's full range of standard colours.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install expansion joint covers in accordance with manufacturer's printed directions.

B. Provide all items required for installation of joint covers and fire stops.

C. Install floor joint covers flush with adjacent finished surfaces.

3.2 SCHEDULE

A. Provide floor expansion joint covers where joints are exposed to traffic and/or view.

B. Provide wall expansion joint covers where joints are exposed to view, except where detailed otherwise.

C. Provide ceiling expansion joint covers where joints are exposed to view, except where detailed otherwise.

END OF SECTION 07 95 00

SECTION 08 11 00 — STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED WORK

A. Section 06 10 00 — Rough Carpentry

B. Section 06 20 00 — Finish Carpentry

C. Section 07 92 00 — Joint Sealants

D. Section 08 14 00 — Wood Doors

E. Section 08 34 73 — Sound Control Door Assemblies

F. Section 08 71 00 — Door Hardware

G. Section 08 80 00 — Glass and Glazing

H. Section 09 91 00 — Painting

1.3 QUALITY ASSURANCE

A. Acceptable manufacturers: one of the following

1. Artek
2. Daybar
3. Metal Door Ltd.
4. Fleming
5. Allegion
6. Curries

B. Reference standards: unless otherwise specified, meet requirements of "Canadian Manufacturing Specification for Steel Doors and Frames" and "Recommended Dimensional Standards for Commercial Steel Doors and Frames" published by the Canadian Steel Door Manufacturers' Association.

1. Fire protection requirements: fire rated doors and frames shall bear ULC or WHI label for required rating and shall be installed with NFPA 80 - Fire Doors

and Windows, current edition. Provide temperature rise rated assemblies where required.

1.4 WORK SUPPLIED BUT NOT INSTALLED

A. Supply frames and anchors to other Sections where it is necessary to build frames into work of other Sections.

B. Supply instructions required for accurate positioning and proper installation of components supplied to other Sections.

1.5 SUBMITTALS

A. Prepare and submit detailed shop drawings. Include door and frame schedules, materials and finishes, hardware preparations and frame anchorage details. Include adjacent construction and finishes as detailed on drawings. Provide engineered shop drawing for oversized door frame and track support.

1.6 DELIVERY, STORAGE AND HANDLING

A. Tag doors and frames at shop with identification marks indicating proper location for installation.

B. Deliver, store and handle components so as to prevent damage, distortion and corrosion. Store components off the ground and under cover in a dry protected area. Stack doors and frames to prevent twisting. Do not enclose components in plastic covers without venting.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet steel: hot dip galvanized (wipe coated) cold rolled steel with stretcher level degree of flatness meeting requirements of ASTM A924 or ASTM A653; minimum zinc coating designation ZF120.

B. Core Material:

1. Fire rated doors: in accordance with fire test requirements.

2. Interior doors, except fire rated doors: honeycomb core of rigid, pre-expanded resin impregnated paper with maximum 1” hexagonal shaped cells.

C. Reinforcing steel: CAN/CSA G40.21 13 Grade 300W, hot dip galvanized to CAN/CSA-G164 M92.

D. Finishing Materials:

1. Touch up paint: zinc rich paint CAN/CGSB-1.181-99.

2. Metal filler: two component epoxy type.

2.2 HARDWARE PREPARATION

A. Prepare for mortised and cylindrical hardware in accordance with ANSI A115 Series standards, except where specified otherwise. Provide mortise lock preparation to ANSI A115.1, including integral reinforcement channel, mounting tabs, and lock support. Provide cylindrical lock preparation to ANSI A115.2, including integral latch case support.

B. Blank, reinforce, drill and tap doors and frames in shop for concealed and mortised hardware. Reinforce doors and frames for surface mounted hardware. Provide door closer reinforcement at all steel doors and frames whether closer is required by hardware list or not. Provide exterior doors and frames to receive alarm system contact switches.

C. Coordinate with Section 08 71 00 — Door Hardware and Division 26 - Electrical to accommodate room access and security system components

2.3 DOORS

A. Construct fire rated doors in accordance with Reinforce doors and frames for surface mounted hardware. Provide door closer reinforcement at all steel doors and frames whether closer is required by hardware list or not. Provide exterior doors and frames to receive alarm system contact switches.

B. Provide all doors of seamless construction with no visible seams or joints on faces.

C. Exterior doors to be of hollow steel construction with all spaces filled with insulation; interior high traffic doors shall be of honeycomb core construction. Skins shall be 16 ga thick. Join door faces at vertical door edges by continuous weld, extending full height of door; grind, fill and dress smooth.

D. Interior doors shall be of honeycomb core construction except fire rated doors. Skins shall be minimum 18 ga thick. Join door faces at vertical door edges by tackwelding, filling and grinding smooth.

E. Provide flush end closures made of steel at top edge of exterior doors and where required for attachment of hardware.

F. Hardware reinforcements shall be minimum 10 ga thick exclusive of door skin thickness. Provide hardware reinforcement at all hardware fastening points.

G. Surround openings in flush doors with minimum 18 ga thick steel edge channels, welded to both face sheets.

H. Provide removable glazing stops of zinc coated steel channels mitred at corners, accurately fitted into position and fastened with oval head screws.

I. Construct oversized doors to sizes indicated; frame and reinforce doors as required to maintain shape.

2.4 WELDED FRAMES

A. Narrow 1" (25mm) face frames. Allegion FN Series 1" Flush Face, Curries CURRISeal Frame WM 1" face, or Fleming F Series 1" Narrow Face.

B. Provide welded frames of 16 ga thick sheet steel to profiles shown, and as required to suit wall conditions. Form glass and door stops integrally with frame; do not add as a separate profile.

C. Assemble components with accurately cut joints. Mitre outside corner joints of frames continuously. Weld joints on inside of profile; grind welds, flush and sand to smooth uniform surface; tabbed and spotwelded construction is not acceptable.

D. Fit and assemble work in the shop wherever possible, eliminating field joints.

E. Glazing stops shall be minimum 20 ga thick steel, mitred at corners, drilled and secured with oval head screws.

F. Side light and transom framing shall be of same thickness metal as adjacent door frame.

G. Drill interior door frames for rubber bumpers. Drill strike jamb of each single door frame for 3 bumpers. Drill head member of double door frames for 2 bumpers.

H. Provide angle or channel door head reinforcement for doors wider than 36".

I. Tack weld two removable Drill strike jamb of each single door frame for 3 bumpers. Drill head member of double door frames for 2 bumpers.

J. Provide adjustable base clips for anchorage to floor at bottom of each door jamb.

K. Protect hardware reinforcements at frames located in masonry elements with 0.9 mm thick guard boxes.

L. Hardware reinforcements shall be minimum 10 ga thick exclusive of frame thickness. Provide hardware reinforcement at all hardware fastening points.

M. Where indicated provide removable mullions.

N. Make provisions to accommodate automatic door openers where required. Coordinate with Division 26.

O. Provide welded on metal drip at head of exterior doors.

2.5 FINISHES

A. Fill seams, reinforcements at frames located in masonry elements with 0.9 mm thick guard boxes.

B. Clean and remove all traces of oil, grease and other foreign substances to ensure proper bond of touch up after fabrication.

C. Touch up damaged zinc coating with zinc rich paint.

D. Insulate, where necessary to prevent electrolysis, metal surfaces in contact with dissimilar metals or cementitious materials.

PART 3 EXECUTION

3.1 FRAME AND SCREEN INSTALLATION

A. Allowable limit of distortion shall be 1/16” out of plumb at each jamb, measured on face of frame, resulting in maximum twist of frame of 1/8” measured from upper corner to lower diagonal corner.

B. Generally, anchorage of frames shall be by means of standard anchors. Where standard anchors cannot be used, provide special anchors to ensure proper installation. Method of anchorage shall not be visible when frames are installed.

C. Provide minimum 3 anchors at each jamb. At frames exceeding 7’0” in height provide one additional anchor for each additional 24”, or part thereof.

D. Anchor intermediate vertical frame members to structure above as required to ensure stability. Where required, provide steel frame extensions. Provide flexible connection at structure to allow for deflection.

E. Remove steel shipping spreaders at welded frames; install wood installation spreaders at sill and at third points of frame rabbet height to maintain constant frame width. Remove wood spreaders only after frames are securely anchored in place.

3.2 DOORS

A. Install steel doors and panels.

B. Install hardware in accordance with hardware supplier’s instruction.

C. Adjust operable parts to ensure proper operation.

3.3 TOUCH UP

A. Patch damaged shop primer. Remove rust, sand damaged and abraded surfaces and touch-up with zinc rich paint.

END OF SECTION 08 11 00

SECTION 08 11 26 — GLAZED ALUMINUM VESTIBULE DOOR AND SCREEN

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED WORK

A. Section 08 14 16 - Wood doors

B. Section 08 71 00 - Door Hardware

C. Section 08 80 00 - Glass and Glazing

D. Section 09 29 00 - Gypsum Board

1.3 QUALITY ASSURANCE

A. Work of this Section shall be executed by fabricator and installer approved by system manufacturer and with a minimum of 5 years experience in the type of work specified herein, having adequate equipment and skill to expediently complete the work in an efficient manner. Only products from manufacturers listed will be accepted unless written approval is issued by the Consultant.

B. Glazing: comply with requirements of Section 08 81 00 except where specifically stated otherwise herein.

1.4 SUBMITTALS

A. Submit detailed and complete product data for each product required.

B. Submit detailed shop drawings showing fabrication, assembly and installation requirements.

C. Upon Consultant’s request, submit sample section and assemble corner of framing system used.

D. Submit 2 sets of samples minimum 2” x 4” of each type of metal finish specified.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver frames in manufacturer’s original packaging with identifying labels intake.

B. Store frames at project site under cover and as near as possible to final installation location. Do not use covering material that will cause discolouration of aluminum finish.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not begin installation of aluminum frames until area of work has been completely enclosed and interior is protected from outside elements.

B. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy standards. If necessary, provide artificial heating, cooling and ventilation to maintain required environmental conditions.

PART 2 PRODUCTS

2.1 VESTIBULE INTERIOR GLAZED ENTRANCE

A. Framing system: Kawneer FG623, or equal acceptable to Consultant, with the following characteristics:

1. Profile: rectilinear
2. Face width: 2 1/4”
3. Throat size: as shown
4. Glazing: single glazed

B. Doors: Kawneer 190 Narrow Stile Swing Doors (non-thermally broken) or equal acceptable to Consultant.

1. Stile width: 2 1/8”
2. Top rail height: 2 1/4”
3. Bottom rail height: 3 7/8”
4. Glazing: single glazed

C. For exterior vestibule glazed entrance, refer to Section 08 44 00 Glazed Curtainwall and Door

2.2 MATERIALS

A. Framing Components:

1. Aluminum extrusions: A 6063-T5 alloy/temper.
2. Aluminum plate and sheet: AA 1100 alloy
3. Screws, bolts, nuts, washers, rivets, and other fasteners incorporated into aluminum sections: aluminum or ANSI Series 300 stainless steel.

B. Glass and Glazing Materials:

1. Setting blocks: Neoprene, Shore “A” Durometer hardness of 70 to 90 points; spacer shims, 40 to 50 points, as recommended by glass manufacturers.
2. Glazing wedges and splines: solid extruded neoprene of EPDM having Shore “A” Durometer hardness of 50 to 70 points as recommended by window manufacturer.
3. Floats glass: CAN/CGSB-12.3-M91, clear, Glazing Quality.
4. Tempered glass: CAN/CGSB-12.1-M90, clear; minimum 1/4” thick unless otherwise shown.

2.3 FRAMING

A. Aluminum components shall be extruded sections and shapes unless otherwise specified.

B. Pre-machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required and fastened within frame with concealed screws.

C. Provide corner reinforcements and alignment clips for precise butt or mitred connections.

D. Fabricate all components to allow secure installation without exposed fasteners.

E. Mechanically jointed sections shall have hairline joints.

F. Fastenings shall be concealed.

2.4 DOORS

A. Rails and stiles shall be extruded aluminum sections of AA 6063-T5 aluminum, minimum 1/8” thick; 3/16” thick internal webs.

B. Door construction shall consist of butt joined corners with reinforcing at top and bottom corners consisting of an aluminum bracket not less than 3/16” thick with a 5/16” bolt and an aluminium retaining bracket on the inside section of the side rails.

C. The bracket shall be welded to the top and bottom of the door stile through an access hold. All butt joints shall be welded on the concealed corners to form a true and square corner. Welds shall be of maximum penetrations without weld holes or discolouration.

D. Door glass stops shall be square for 1/4” glass and be dry glazed with santoprene glazing spline. Application of door stops by compression fit, wedged and hooked into rails and stiles by means of mechanical fit.

E. Factory prepare doors and frames for door hardware supplied be Section 08 71 00. Provide heavy duty reinforcing at hardware fastening points.

2.5 FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Factory Finishing:

1. Kawneer Permanodic™ AA-M10C21A31, AAMA 611, Architectural Class II Clear Anodic Coating
2. Kawneer Permanodic™ AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating.
3. Kawneer Permanodic™ AA-M10C21A41 / AA-M45C22A41, AAMA 611, Architectural Class I Clear Anodic Coating
4. Kawneer Permafluor™ (70% PVDF), AAMA 2605, Fluoropolymer Coating
5. Kawneer Permadize™ (50% PVDF), AAMA 2604, Fluoropolymer Coating
6. Kawneer Permacoat™ AAMA 2604, Powder Coating

C. Colour: to be selected by Consultant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine project conditions and verify that the work of this section may properly commerce. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify wall thickness does not exceed standard tolerances allowed by specified frame throat sizes.

3.2 INSTALLATION

A. Comply with door and frame manufacturer’s printed installation instructions and approved shop drawings. Strictly adhere to maintaining specified wall thickness to ensure dimension does not exceed frame throat size specified.

B. Install frames plumb and square, securely anchored to substrates with fasteners recommended by manufacturer.

C. Install drywall or partition components in the longest possible lengths, with no component less than 4’0” long. Fasten to suspended ceiling grid at 4’0” on centre maximum, using #6 sheet metal screws or other fasteners approved by frame manufacturer.

D. Use concealed installation clips to assure that splices and connections are tightly butted and properly aligned.

E. Secure clips to main structural components and not to snap-in or trim members.

F. Do not use screws or other fasteners that will be exposed to view when installation is complete.

G. Install doors.

H. Install door hardware in accordance with hardware supplier's directions.

I. Provide extruded or formed aluminum trim at corners and where required. Trim shall be minimum 1/8" thick.

3.3 GLAZING

A. Glaze openings in accordance with frame and glass manufacturer's recommendation, using dry-dry glazing method.

B. Provide the following: 1/4" single glazed, tempered.

3.4 ADJUSTING AND CLEANING

A. Check if necessary, adjust hardware to ensure doors are functioning properly.

B. Clean exposed surfaces promptly after installation, using cleaning methods recommended by manufacturer.

C. Touch up marred areas so that touch-up is not visible from a distance of 4'0". Remove and replace work that cannot be satisfactorily touched up or adjusted.

3.5 PROTECTION

A. Provide protection required to assure that work will be without damage or deterioration upon substantial completion of the project.

END OF SECTION 08 11 26

SECTION 08 12 00 — FIRE RATED INTERIOR ALUMINUM DOORS AND GLAZING FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 SUMMARY

A. This section pertains to:

1. Fire rated door frames for interior use.

2. Fire rated window frames for interior use.

1.3 RELATED SECTIONS

A. Section 08 14 16 — Wood Doors

B. Section 08 71 00 — Door Hardware

C. Section 08 80 00 — Glass and Glazing

1.4 REFERENCES

A. AAMA 603.8 – Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.

B. AA-M12-C22-A21 – Voluntary Guide Specification and Inspection Methods for Clear Anodize Finished for Architectural Aluminum.

C. AA-M12-C22-A44 – Voluntary Guide Specification and Inspections Methods for Electrostatic Deposited Colour Anodic Finished for Architectural Aluminum.

D. CAN-S101 Fire Endurance Tests of Building Construction Materials

E. CAN4-S104 Fire Tests of Door Assemblies

F. CAN4-S106 Standard Method for Fire Tests of Window and Glass Block Assemblies

G. NFPA 80: Standard for Fire Doors and Fire Windows

H. NFPA 251: Standard Methods of Tests of Fire Endurance of Building Construction Materials

I. NFPA 252: Standard Methods of Fire Tests of Door Assemblies

J. NFPA 257: Standard on Fire Test for Window and Glass Block Assemblies

K. UL 9: Fire Tests of Window Assemblies

L. UL 10B: Fire Tests of Door Assemblies

M. UL 10C: Positive Pressure Fire Tests of Door Assemblies

1.5 SUBMITTALS

A. Product Data: Manufacturer's fabrication and installation instructions

B. Shop Drawings:

1. Provide standard installation details for typical architectural conditions

2. Provide details on connections to special construction and other custom features.

C. Selection Samples: Provide aluminum chips in full range manufacturer's standard finishes for Consultant's colour selection.

D. Verification Samples: Provide two samples of each type of framing member and glass required, not less than 12 inches long, in selected finish.

1.6 QUALITY ASSURANCE

A. Guarantee all materials and workmanship furnished and installed o be free from defects for a minimum period of 12 months from the date of final acceptance or from date of substantial completion, whichever may be earlier. Repair or replace, any materials or workmanship found to be defective under conditions of normal use during this period.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver frames with sufficient packaging to provide protection during transit and storage at project site.

B. Inspect frames upon delivery for damage.

1. Repair minor damage to finished frames by using air drying spray enamel of matching colour. Replace frames that cannot be satisfactorily repaired.

C. Store Frames at project site under cover and as near as possible to final inspection location. Do not use covering material that will cause discolouration of aluminum finish.

1.8 ENVIRONMENTAL CONDITIONS

A. Do not begin installation of aluminum frames until area of work has been completely enclosed and interior is protected from outside elements.

B. Maintain temperature and humidity in areas of installation within reasonable limits, as close as possible to final occupancy standards. If necessary, provide artificial heating, cooling and ventilation to maintain required environmental conditions.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Requests for substitution shall be made in accordance with Section 01 25 00 — Substitution Procedures

2.2 MATERIALS

A. Prefinished Aluminum Interior Doors and Window Frames:

1. Basis of Design: Elite Glazing System by PC350
2. Aluminum: Controlled alloy billets of 6063 T5, to assure compliance with tight dimensional tolerances and maintain colour uniformity
3. Provide Extruded Aluminum Frames with the following characteristics:
    a. Rectilinear design.
    b. 1 3/4 inch face profile.
    c. Snap on Trim: 1 1/4” Aluminum or 1 3/4” Aluminum
    d. Other trim options as selected from manufacturer’s catalogue.
    e. 0.070 inch rabbet wall thickness
    f. Throat sizes 3 1/2” up to 7 1/4”

B. Specialty Frames for Interior Use:

1. Basis of Design: "Historic Industrial" Series Aluminum Windows and Doors by Bliss Nor-am Windows and Doors
2. Provide Extruded Aluminum Frames with the following characteristics
    a. Description: Historic Industrial aluminum sections manufactured from solid extruded 6063-T5 shapes. Perimeter frames and ventilator sections shall have glazing rebates providing an unobstructed glazing surface of at least 11/32" in height. Sections to have a minimum thickness of 1/8" and a depth of 1 3/8".

b. Muntins shall be solid extruded 6063-T5 shapes and shall have glazing rebates providing an unobstructed glazing surface of at least 11/32" in height

c. Mullions:

1) Vertical mullions shall be adjustable type channel and flat bar for window over 5'-5" in height, and bar mullions for windows 5'-5" and under.

2) Standard anchors, clips, mullions and bolts shall be furnished with the windows.

C. Fire Rated Metal Window Frames and Door

1. Basis of Design: TGP Fireframes Designer Series

a. Fire Rating Requirements:

1) Window: 45 minute fire resistance rating

2) Door: 45 minute fire resistance rating

3) Design Requirements:

a) Dimensions - Door and Framing:

1. Door framing face dimensions: 1 15/16"

2. Depth of door framing: 1 15/16"

3. Door style face dimension: 3 1/8"

4. Door cross rail face: 3 9/16" on the face

5. Depth of stile, header, sill, and cross rail: 1 15/16"

6. Frame to receive 3/4" thick Pilkington Pyrostop glass, and include all required glazing accessories.

b) Dimensions - Window Assembly:

1. Perimeter framing face dimensions: 2 3/4" at head

2. Horizontal and vertical mullions: 3 9/16" on the face

3. Depth of perimeter and mullion: 1 15/16"

c) Construction: Narrow-Profile, roll-formed steel architectural grade specialty fire doors. Conventional break-shape type hollow

metal steel fire rated door will not be considered an acceptable substitute for Wireframes Designer Series doors specified in this section as they do not conform to the project design intent and/or aesthetic and quality standards.

d) Knock down frames are not permitted

b. Frame: steel profiled formed tubing.

c. Fasteners: As recommended by manufacturer

d. Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instruction for surface preparation including pretreatment, application and minimum dry film thickness.

e. Colour: As selected by architect from manufacturers's full range. Submit full range of samples for selection.

f. Glass, Glazing Accessories and Glazing Compounds: refer to Section 08 80 00 Glass and Glazing.

2.3 FABRICATION

A. Pre-machine jambs and prepare for hardware, with concealed reinforcement plates, drilled and tapped as required and fastened within frame with concealed screws.

B. Provide corner reinforcements and alignment clips for precise butt or mitered connections.

C. Fabricate all components to allow secure installation without exposed fasteners.

D. Finishes:

1. Factory finish extruded frame components so that any part exposed to view upon completion of installation will be uniform in finish and color.

2. For each type of interior system, colour shall be selected by architect from Manufacturer's catalogue of standard finishes.

2.4 DOOR HARDWARE

A. Furnish hardware with 45 minute fire door by the manufacturer.

B. Refer to Section 08 71 00 Door Hardware for details.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and members to which the work of this section attaches or adjoins prior to frame installation.

B. Provide openings plumb, square and within allowable tolerances.

1. Provide 3/8” shim space at all walls.

C. Notify architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.

3.2 INSTALLATION

A. For each system, specified products shall be installed by experienced personnel, in strict accordance with approved shop drawings

B. Comply with frame manufacturer’s printed installation instructions and approved shop drawings. Strictly adhere to maintaining specified wall thickness to insure dimension does not exceed frame throat size specified.

C. Install frames plumb and square, securely anchored to substrates with fasteners recommended by frame manufacturer.

D. Install drywall or partition components in the longest possible lengths, with no component less than 4 feet. Fasten to suspended ceiling grid at 48 inches on center maximum, using #6 sheet metal screws or other fasteners approved by frame manufacturer.

E. Use concealed installation clips to assure that splices and connections are tightly butted and properly aligned.

F. Secure clips to main structural components and not to snap-in or trim members.

G. Do not use screws or other fasteners that will be exposed to view when installation is complete.

3.3 ADJUSTING AND CLEANING

A. Clean exposed frames promptly after installation, using cleaning methods recommended by frame manufacturer.

B. Touch up marred areas so that touch-up is not visible from a distance of 4 feet. Remove and replace frames that cannot be satisfactorily adjusted.

3.4 PROTECTION

A. Provide protection required to assure that frames will be without damage or deterioration upon substantial completion of the project.

END OF SECTION 08 12 00

SECTION 08 14 16 — WOOD DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Section 06 20 00 — Finish Carpentry

B. Section 08 11 00 — Metal Doors and Frames

C. Section 08 34 73 — Sound Control Door Assemblies

D. Section 08 71 00 — Door Hardware

E. Section 08 80 00 — Glass and Glazing

F. Section 09 91 23 — Interior Painting

1.3 REFERENCE STANDARDS

A. Architectural Woodwork Manufacturers Association of Canada (AWMAC):

1. AWMAC/AWI Architectural Woodwork Standards, 1st Edition 2009.

1.4 QUALITY ASSURANCE

A. Meet requirements of CAN/CSA-0132.2 Series-90 and AWMAC Quality Standards for Architectural Woodwork except where specified.

B. Fire rated doors shall bear ULC label.

C. Doors to be supplied by a door manufacturer specializing in products specified in this Section and with a minimum of 5 years documented experience. Manufacturer must also be a member in good standing of the Architectural Woodwork Manufacturers Association of Canada (AWMAC). Acceptable wood door manufacturers are as follows:

1. Algoma

2. Baillargeon

3. Lambton

4. V.T. Industries

1.5 SUBMITTALS

A. Submit product data indicating door core materials and construction.

B. Submit detailed shop drawings. Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special blocking and preparation for hardware, cut outs for louvers, glazing and other openings.

C. Submit duplicate, minimum 12” x 12” samples of selected factory finished wood door facing.

D. Submit minimum 8” long sample of each type of glazing stop.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect doors from dampness. Arrange for delivery after work causing high humidity has been completed.

B. Protect doors from scratches, handling marks and other damage. Individually package doors in scuff and water resistant wrappings.

C. Label each door with manufacturer’s name, product identification, door size and type.

D. Doors are not to be delivered to the site until all gypsum board, concrete work and any other wet work is dry and the building is closed to the weather.

E. Stack doors flat on carefully levelled supports consisting of three 2” x 4” boards placed the full width of the doors, one across the centre and the other two 305mm (12”) in from each end, covered with a sheet of plywood or heavy cardboard to protect the face of the bottom door. Cover the top door in a similar manner to protect from dust and exposure to sunlight.

F. Storage space where doors are to be stored until ready for installation is to be dry and well ventilated. Doors are not to be subject to rapid humidity and temperature changes. Humidity over 50% or under 17% may cause permanent damage and will void manufacturer’s warranty.

G. Keep doors a minimum of 1220mm (4’) away from heating sources or direct sunlight. Keep doors entirely covered as partially covered doors may be “sunburned” (stained) by the light or warped.

H. Condition all doors to the average temperature and humidity of the site for a minimum period of 72 hours prior to starting installation. While the doors are being conditioned they are to remain strapped or banded on the skids on which they were delivered until the conditioning is complete.

I. When moving doors, ensure that all doors are lifted straight up, do not drag them one across another.

1.7 WARRANTY

A. At no cost to Owner remedy any defects in work, including work of this and other Sections, due to defects in doors provided under this Section, appearing within a period of 3 years from the date of Substantial Performance.

B. Defects covered under warranty shall include warp exceeding 1/4”.

C. Warranty shall cover all costs for replacement of defective doors including hanging, fitting, finishing, changing of hardware and removal of defective door.

PART 2 PRODUCTS

2.1 SOLID CORE DOORS

A. Fire resistance rating: refer to door schedule for rating required of each individual door. Rated door to be tested in accordance with CAN4 S104.

B. Flush door: 5 ply, solid core, 1 3/4” thick.

C. Construct fire rated doors in accordance with fire test requirements.

D. Core: solid particleboard, to ANSI A208.1. For fire rated doors, provide core in accordance with fire test requirements.

E. Crossbanding, both faces of core: 1/16” thick hardwood or composite veneer.

F. Door facing:

1. Wood veneer:

    a. Rift cut red oak veneer.

    b. AWI/AWMAC Grade AA, factory finished with stains and catalyzed lacquer, meeting AWI Quality Standard Section 1500, System #3. COLOUR AND FINISH TO MATCH ADJACENT PLYWOOD WALL PANELING.

G. Edge bands: Laminated to core with adhesive:

1. Stiles: Laminated softwood and 5/8” thick hardwood edge; total width minimum approximately 1 5/8”.

2. Rails: approximately 1 5/8” softwood.

H. Glazing openings: prepare openings where indicated to receive glazing. Provide hardwood glazing stops as per details, installed to project slightly over door face, mitred at corners. Provide glazing stops for fire rated doors, in accordance with fire test requirements.

I. Factory prepare doors for finish hardware in accordance with directions by Section 08 71 10.

2.2 FABRICATION

A. Provide factory made cut-outs for glass as indicated in door schedule, with matching stops pre-cut to fit.

B. No cut-outs permitted within 127mm (5”) of sides and top of door or 254mm (10”) from bottom of door. All cut-outs must also meet applicable fire rating requirements and must not interfere with finish hardware requirements on all fire rated doors.

C. Doors shall be properly sized to fit the opening, bevelled and machined at the factory.

D. All rated pairs of doors to be manufactured so that openings will not require either an overlapping metal edge or astragal or metal meeting edges.

E. Door edges for single acting swing doors to be bevelled 3mm (1/8”) in 50mm (2”) on both sides. All double acting doors to have radius edges. All barn doors, bifold doors and bypass doors to have book edges.

2.3 FACTORY MACHINING

A. All doors to be machined at the factory for finish hardware as detailed in Section 08 71 00 — Door Hardware and as per approved finish hardware schedule and templates as provided by the finish hardware supplier.

B. Provide lock blocks, as necessary, for all finish hardware that is to be surface applied, through bolting of hardware will not be permitted.

C. Pilot holes for hinges to be pre-drilled at the factory.

D. Locations of and preparation for finish hardware must meet applicable fire rating requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install labelled fire rated doors to NFPA 80

B. All doors shall be inspected thoroughly by the installer before installation.

C. Accurately fit doors into frames to ensure smooth operation without binding. Doors shall have 1/16” clearance at head and jambs and 6 mm over finished floor surfaces unless otherwise indicated.

D. Undercut doors where shown.

E. Prepare doors and install door grilles where required.

F. Install hardware in accordance with hardware supplier's instructions Pilot drill all holes required to mount finish hardware using templates provided by finish hardware supplier.

G. Do not impair the structural strength of the doors during the application of hardware, cutting and altering the door for lights, louvres or other special details.

H. Adjust operable parts to ensure proper door operation.

3.2 ADJUSTING AND CLEANING

A. Readjust doors and hardware just prior to completion of building to function freely and properly.

END OF SECTION 08 14 16

SECTION 08 42 10 — ALL GLASS PARTITIONS AND DOORS

PART 1 GENERAL

1.1 GENERAL INSTRUCTIONS

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

1.2 SECTION INCLUDES

A. Partition system and pivot doors

1.3 RELATED SECTIONS

A. 08 80 00 Glass and Glazing

B. 08 71 10 Door Hardware

1.4 REFERENCES

A. NFPA 80: Fire Doors and Windows

B. NFPA 251: Standard of Methods of Fire Tests of Building Construction & Materials

C. NFPA 252: Standard of Methods of Fire Tests of Door Assemblies

D. NFPA 257: Standard for Fire Test of Window Assemblies

E. UL 9: Fire Tests of Door Assemblies

F. UL 10B: Fire Tests of Door Assemblies

G. UL 10C: Positive Pressure Fire Tests of Window & Door Assemblies

H. UL 263: Fire tests of Building Construction Materials

1.5 QUALITY ASSURANCE

A. Qualification of Installers: Provide work of this section, executed by competent installers with a minimum 5 years experience in application of Products, systems and assemblies specified and with training of Product manufacturers.

B. Foreperson experience: Minimum 10 years experience as glazers.

1.6 SUBMITTALS

A. Product data sheets:

1. Submit manufacturer’s Product data sheets for Products proposed for use in the work of this section.

B. Shop drawings:

1. Submit engineered shop drawings, with seal and signature of engineers licensed to practice in the Province of Ontario.
2. Shop drawings shall include, but not be limited to: complete details illustrating construction of the various parts of the work of this section, metal and glass thicknesses, methods of joining, details of field connections and anchorage, interacting with other work, fastening and sealing materials and methods.
3. Submit catalogue cuts of manufacturing items.
4. Samples
    a. Unless otherwise indicated, submit 3 samples for each of the following:
        1) 305mm x 305mm (12” x 12”) sample of glass showing edge chamfer and polishing.
        2) 150mm x 150mm (6” x 6”) sample of each metal type and finish.
5. Closeout submittals:
    a. Submit closeout submittals in accordance with Section 01770.
    b. Operation and maintenance instructions:
6. Performance Requirements
    a. Design, fabricate, and install in accordance with CR Laurence ‘SPS Structal Engineering Design Guide’.
    b. Install track before measuring for glass.
7. Delivery, Storage, and Handling
    a. Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off-the-ground, under cover storage locations. Do not load any areas beyond design limits.
    b. Adequately protect and crate components against damage, dirt, disfigurement and weather.
    c. Deliver glass to the Place of the Project in properly packed crates for protection and properly marked for ease of handling.
    d. Protect finishes with strippable coating that will not mar, nor deface finish on removal, or a similar method designed to afford an equivalent amount of protection Leave protected coating intact until damage risk is past or immediately prior to final cleaning.

e. Mark or flag each pane of glass installed immediately following glass installation. Use temporary coloured tapes or flags suspended near, but not in contact with glass.

f. Replace scratched or broken glass damaged due to faulty setting, careless handling or storage at no additional cost of the Owner. Additionally, glass which, in opinion of Consultant, is seriously distorted shall be replaced at no additional cost to the Owner.

8. Warranty

a. Warrant work of this section for a period of 2 years, in accordance with Section 01780.

PART 2 PRODUCTS

2.1 PARTITION AND DOOR SYSTEMS

A. All Glass Partition and Door Systems:

1. Aluminum Channels: CRL 1/2” U Channel for top and bottom.

a. Extruded aluminum 6063-T5 alloy to ANSI H35.1 with a minimum yield of 138 MPa, free from defects impairing appearance, strength and durability. Tracks susceptible to wear shall be extruded from aluminum 6061-T6 alloy to ANSI H35.1.

B. All Glass Fire Rated Glass Channels:

1. Frame System: TGP Clearview with Steel L angle frames with 45 minutes fire resistance rating. Frame to receive 3/4” Pilkington Pyrostop glass.

a. Fire Rating Requirements:

1) 45 minutes fire resistance rating.

2) Steel Angle Size: 0.4”x5/8”x5/8” continuous steel angle.

3) Colour of Angles: Paint angles to match adjacent walls. Refer to Room Finish Schedule.

C. Refer to Section 08 80 00 Glass and Glazing for glass and fire-rated glass.

2.2 HARDWARE

A. Furnish hardware necessary for complete and trouble free operation of doors and panels.

B. Acceptable products:

1. Door 132, 139 and 140
    a. Glass Partitions
        1) Top and Bottom Channels: CRL D604BL. 1/2”.
        2) Finish: flat black aluminum channel
    b. Door Handles:
        1) CRL LP24MBL, 24”, 1/14” diameter. Both sides of door.
        2) Finish: mate black.
    c. Door Patch Set
        1) CRL PHA1DU for 1/2” glass.
        2) Finish: Black bronze anodized.
    d. Door Stops
        1) Header Stop: CRL 1NT307DU, Bronze
        2) Floor Stop: CRL DL2501DU, Bronze
2. CEO Office Door 115
    a. Glass Partition Channels
        1) Top and Bottom Channels: CRL D604A. 1/2”.
        2) Finish: clear anodized aluminum channel
    b. Door Patch Set
        1) CRL PHA5A for 1/2” glass. Patch kit for fixed transom and two sidelites.
        2) Finish: stain anodized.
    c. Door Stops
        1) Header Stop: CRL 1NT307A, aluminum
        2) Floor Stop: CRL DL2501A, satin chrome
    d. Lock and Strike Housing with Office Function
        1) Lock Housing: CRL DL610L0SC

2) Strike Housing: CRL DL610ESC

3) Finish: stain anodized

4) Cylinder: refer to door hardware schedule

5) Complete with lever handle from CRL.

2.3 FABRICATION

A. Fabricate sections to accommodate and interface with work of other sections by means of rabbets, interlocks, miscellaneous angles, trim and filler sections, as required.

B. Component fastenings, concealed throughout, adequate strength, stainless steel and fusion welds.

C. Jointing and intersection of metals shall be accurately cut, fitted to a tolerance of 0.076mm in true planes with adequate concealed fastenings.

D. Perform fitting and assembly of component parts in shop, insofar as practicable. Work of this section that cannot be permanently shop assembled shall be fitted, assembled, marked and dismantled to assure proper fitting in field. Identify shop assembled components on shop drawings for location and erection at Place of the Project.

E. Pre-drill glass panels to accept hardware and hangers to templates of hardware manufacturer.

F. Polish glass edges prior to tempering.

G. Door edge clearances:

1. Between doors and frame at head and jambs: 3mm (1/8”)

2. At sills with thresholds: 6 mm (1.4”)

3. At sills without thresholds: 13 mm (1/2”)

4. At meeting edges of pairs of doors (1/8”)

2.4 EXECUTION

A. Examination

1. Make thorough examination of Contract Documents, check anchorage, structural deflections, interacting with work of other sections and other factors influencing design and performance and be fully cognizant of requirements.

2. Notify Contractor if preparations are required to be made in the work of other sections for proper attachment, securing or executing of the work on this section.

3. Check structural elements and adjoining framing on which the work of this section is dependent, verify governing dimensions. Confirm conditions satisfactory before proceeding.

4. Examine glass surfaces to receive new film and verify that they are free from defects and imperfections which will affect the final appearance. Correct such deficiencies before starting film application.

B. Preparation for Glass Film

1. Window and window framing shall be cleaned throughly with a neutral cleaning solution. Inside surface of the window glass shall be bladed with industrial razors to ensure the removal of any foreign contaminants.

2. Towelling or other absorbent material shall be placed on the window sill or sash to absorb moisture accumulation generated by the film application.

C. Installation

1. Allow for dimensional tolerances and deviation from true plane permissible in structural support frame. Erect plumb and true, and in correct relationship to the work of other sections.

2. Backpaint aluminium surfaces between dissimilar metals, one coat of bituminous paint.

3. Upon completion of glazing, check units for squareness, alignment and smooth operation, adjust as required. Clean and polish glass and remove soiling from exposed metal.

4. Hardware: Adjust, test and make operational without binding or other interference likely to affect movement of panels.

5. Apply films in accordance with manufacturer’s written specifications.

D. Cleaning

1. At completion of the work of this section, remove labels from glass and clean inner and outer faces of glass and exposed finished metal surfaces. Replace scratched or broken glass and make good any damaged materials.

END OF SECTION 08 42 10

SECTION 08 44 00 — GLAZED CURTAIN WALL AND DOOR

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Section 07 27 00 — Air Barriers

B. Section 07 92 00 — Joint sealants

C. Section 08 11 00 — Steel Doors and Frames

D. Section 08 42 10 — All Glass Partitions and Doors

E. Section 08 44 00 — Glazed Curtain Wall and Door

F. Section 08 80 00 — Glass and Glazing

1.3 DEFINITIONS

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufactures Association (AAMA) – AAMA Glossary (AAMA AG).

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. Window Classifications: CAN/CSA-A440.2-14/A440.3-14

B. Design systems to withstand, without any detrimental effects to appearance and performance, wind loads and temperature range expected in geographical area of this project, (OBC climatic information, 50 year probability), unless specified otherwise.

C. Design systems to perform as an effective air and vapour barrier.

D. Design systems to accommodate without detrimental effects on appearance and performance system.

1. Thermal expansion and contraction of systems components.

2. Movement and deflection and creep of building structural frame.

E. Limit deflection of component parts under maximum design load to 1/200 of span or less if required by glass manufacturer.

F. Design system based on rain screen principles, having all cavities outboard of the air seal, pressure equalized and drained to the exterior.

G. Prevent water infiltration through curtainwall systems, when tested in accordance with ASTM E331, with static pressure different across system of 500 Pa.

H. Limit air infiltration and exfiltration through curtainwall systems of maximum 0.0003 m3/s.m2 under a static pressure of 75 Pa when tested in accordance with ASTM E283.

I. Assembly to meet OBC SB10 Requirements:

1. Fixed: Max U0.38
2. Operable: Max U0.45
3. Entrance Door: U0.69
4. SHGC: 0.4

J. Structural Glazing:

1. Carry out design of structural silicone joints by rational analysis including all movements specified herein. Maximum stress shall not exceed 138 kPa 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 or the limit imposed by sealant manufacturer, whichever is less.
2. The joint shall be essentially rectangular in shape and shall include no internal corners which could precipitate tearing or create local stresses.
3. Use tempered glass where recommended by system manufacturer.
4. Ensure and verify compatibility of all materials used in structural glazing systems

K. Appearance:

1. Fasteners and anchors: concealed
2. Joints between components: hairline, with adjacent surfaces accurately aligned.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work with seal and signature of structural engineer licensed to practice in Ontario.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:

1. Joinery

2. Glazing

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer who has had successful experience with installation of the same or similar systems required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed performance requirements.

C. Source Limitations: Obtain aluminum curtain wall system through one source from a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups for type(s) of curtain wall elevation(s) indicated, in location(s) shown on Drawings.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 and Section 01 45 00 — Quality Control.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings

1.8 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.

1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

PART 2 PRODUCT

2.1 DESCRIPTION

A. Request for substitution shall be made in accordance with Section 01 25 00 — Substitution Procedures.

B. Curtain Wall Type: Outside Glazed Pressure Plate System & SSG

1. Basis of Design Product: Clearwall Curtain Wall System SS, Profile 2-1/2" x 5-1/8" (63.5mm x 130.2mm), outside glazed with recessed glass edge spacer by qualified IGU manufacturer.

   a. Glass: Clearwall (SS)/(SB): Outside glazed with 1-1/8" insulating glass with 5/8" (15.9) recessed glass edge spacer supplied by qualified glass supplier.

   b. Review appended construction information pertaining to existing conditions, and review existing systems installed on site to provide matching finished.

   c. System shall match in finished appearance, existing and adjacent CW. Review appended information pertaining to existing conditions and systems.

2. Kawneer 1600 System 2, Profile 2-1/2" x 6" (63.5mm x 152.4mm)

   a. Glass: 1" (25.4mm) and 1-5/16" (33.3mm) insulating glass option. 1/4" (6.3mm) for Spandrel glazing.

b. Review appended construction information pertaining to existing conditions, and review existing systems installed on site to provide matching finishes

c. System shall match in finished appearance, existing and adjacent CW. Review appended information pertaining to existing conditions and systems.

d. Tested to AAMA 501, ASTM E 1886, E 1996 and TAS 201, 202, 203.

3. Kawneer AA250 Thermal Entrances, Narrow Stile Door System

   a. The door stile and rail face dimensions of the system will be as follows:

      1) Vertical Stile: 2-1/2” (64mm)

      2) Top Rail: 2-1/2” (64mm)

      3) Bottom Rail: 3-7/8” (100mm)

4. Manufacturer to determine wind load and confirm appropriate depth of frames. All frames to be of same depth.

5. Finish:

   a. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

   b. Factory Finishing:

      1) Kawneer Permanodic™ AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating (black) and

      2) Kawneer Permanodic™ AA-M10C21A41 / AA-M45C22A41, AAMA 611, Architectural Class I Clear Anodic Coating

6. Colour: Refer to window schedule for colour and finishes of mullion and cap.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required and not less than 0.070" (1.78) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

B. Aluminum sheet alloy: Shall meet the requirements of ASTM B209.

C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.

D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Pressure Plate: Pressure plate shall be aluminum and fastened to the mullion with stainless steel screws.

F. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

G. Sealant: For sealants required within fabricated curtain wall system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

H. Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides a minimum 1/4" (6.3) separation.

I. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall members are nominal and in compliance with AA Aluminum Standards and Data

2.3 CURTAIN WALLS

A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Glazing System: 4 sided captured

2. Glazing System: Structural silicone glazed (SSG)

3. Glazing Pane: Front.

B. Glass: 1” (25.4) and 1-5/16” (33.3) insulating glass options. 1/4" (6.3) or 1" (25.4) for Spandrel applications.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Framing Sealants: Shall be suitable for glazed aluminum curtain wall as recommended by sealant manufacturer.

E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.

F. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

G. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

H. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle curtain wall material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after installation.

2.4 GLAZING

A. Comply with Division 08 Section “Glazing”

B. Glazing Gaskets: Gaskets to meet the requirements of ASTM C864

C. Spacers and Setting Blocks: Manufacturer’s standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer’s standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: As recommended by manufacturer for joint type.

2.5 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or metered.

3. Physical and thermal isolation of glazing from framing members.

4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

5. Provisions for field replacement of glazing from exterior.

6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

7. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

8. Double barrier design with primary air and vapour barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

C. Curtain Wall Framing: Fabricate components for assembly using shear block system following manufacturer's standard installation instructions.

D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine Fabricate components for assembly using shear block system following manufacturer's standard installation instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 INSTALLATION

A. General: Install curtain wall systems plumb, level, and true to line, without warp or rack of frames with manufacturer’s prescribed tolerances and installation instructions. Provide support and anchor in place.

B. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.

C. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9" (228.6) on center.

D. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building

3.3 AIR/VAPOUR BARRIER CONTINUITY WITH BUILDING ENVELOPE

A. Provide continuous air/vapour barrier transition between work of this section where work interfaces with building envelope air barrier materials.

B. Seal air barrier membrane at aluminum framed glazing framing with weather barrier sealants as indicated and in accordance with manufacturer’s written instructions.

3.4 FIELD QUALITY CONTROL

A. Field Tests: Consultant may select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked

and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount

B. Testing: Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements

   1. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft2, which ever is greater

   2. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa)

C. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative

3.5 CLEANING AND PROTECTION

A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants

B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove non-permanent labels

C. Remove construction debris from project site and legally dispose of debris

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period

END OF SECTION 08 44 00

SECTION 08 51 13 — ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SUMMARY OF WORK

A. This Section specifies thermally broken, non-operable aluminum framed windows and accessories.

1.2 RELATED SECTIONS

A. Section 07 92 00 — Joint Sealants

B. Section 08 80 00 — Glass and Glazing

1.3 REFERENCES STANDARDS

A. Aluminum Association (AA)

1. DAF 45 [2003], Designation System For Aluminum Finishes.

B. American Architectural Manufacturers Association (AAMA)

1. AAMA-2603-[2013], Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

2. AAMA-2604-[2013], Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.

3. AAMA-2605-[2013], Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

4. AAMA CW-10-[2012], Care and Handling of Architectural Aluminum From Shop to Site.

C. ASTM International (ASTM).

1. ASTM B209-[2010], Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

2. ASTM B221-[2013], Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

3. ASTM D2240 – [2010], Standard Test Method for Rubber Property— Durometer Hardness.

D. Canada Green Building Council (CaGBC)

1. LEED® Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations including Addendum 2007.

E. Canadian General Standards Board (CGSB).

1. CAN/CGSB-12.8-[97], Insulating Glass Units.
2. CAN/CGSB-12.20-[M89], Structural Design of Glass for Buildings.
3. CAN/CGSB-19.13-[M87], Sealing Compound, One-Component, Elastomeric, Chemical Curing.

F. CSA International (CSA)

1. CAN/CSA-A440
2. CAN/CSA-S157-[2005], Strength Design in Aluminum.
3. CAN/CSA W59.2-[M1991(R2003)], Welded Aluminum Construction

G. Environmental Choice Program (ECP)

1. CCD-45-[1995], Sealants and Caulking Compounds.

H. Underwriter's Laboratories of Canada (ULC)

1. CAN/ULC-S710.1 [2005], Standard for Thermal Insulation - Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Materials Standard for Thermal Insulation - Bead - Applied One Component Polyurethane Air Sealant Foam, Part 1: Materials

1.4 ADMINISTRATIVE REQUIRMENTS

A. Coordination:

1. Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.

B. Pre-installation Meeting:

1. Convene pre-installation meeting after Award of Contract and one week prior to commencing work of this Section to verify project requirements, substrate conditions and coordination with other building sub-trades, and to review manufacturer's written installation instructions.
    a. Comply with Section 01 31 00 - Project Coordination and coordinate with other similar pre-installation meetings.

b. Notify attendees 2 weeks prior to meeting and ensure meeting attendees include at minimum:

1) Owner

2) Consultant

3) Glazing subcontractor

4) Manufacturer's Technical Representative

2. Ensure meeting agenda includes review of methods and procedures related to aluminum window installation including co-ordination with related work.

3. Record meeting proceedings including corrective measures and other actions required to ensure successful completion of work and disturb to each attendee within 1 week of meeting.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

A. Make submittals in accordance with Contract Conditions and Section 01 33 00 - Submittal Procedures.

B. Product Data: Submit product data including manufacturer's literature for aluminum window frames, glazing, components and accessories, indicating compliance with specified requirements and material characteristics.

1. Submit list on window manufacturer's letterhead of materials, components and accessories to be incorporated into Work.

2. Include product names, types and series numbers.

3. Include contact information for manufacturer and their representative for this Project.

C. Shop Drawings: Submit drawings stamped and signed by Professional Engineer registered or licensed in Province of Ontario, Canada.

1. Indicate materials and details in full size scale for head, jamb and sill, profiles of components, interior and exterior trim, junction between combination units, elevations of unit, anchorage details, description of related components and exposed finishes, fasteners, and caulking.

2. Indicate location of manufacturer's nameplates.

D. Samples:

1. Submit duplicate 300 x 300 mm (12 x 12") sample sections showing prefinished aluminum surface, finish, colour and texture, and including frame corner details.

2. Submit duplicate 300 x 300 mm (12 x 12") sample sections of insulating glass unit showing glazing materials and edge and corner details.

E. Installer Qualifications:

1. Submit letter verifying installer's experience with work similar to work on this Section.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Supply maintenance data for windows for incorporation into manual specified in Section 01 77 00 - Project Closeout

B. Record Documentation: In accordance with Section 01 77 00 - Project Closeout.

1. List materials used in windows work.

2. Warranty: Submit warranty documents specified.

1.7 DELIVERY STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:

1. Deliver aluminum windows in manufacturer's original packaging with identification labels intact and in sizes to suit project.

2. Brace frames to maintain squareness and rigidity during shipment.

B. Material Handling: To AAMA CW-10

C. Storage and Handling Requirements: Store materials off ground and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1. Material storage: To AAMA CW-10

D. Packaging Waste Management:

1. Separate and recycle waste packaging materials in accordance with Section 01 74 19 - Construction Waste Management and Disposal

2. Remove waste packaging materials from site and dispose of packaging materials at appropriate recycling facilities.

3. Collect and separate for disposal paper and plastic material in appropriate on-site storage containers for recycling in accordance with Waste Management Plan

1.8 WARRANTY

A. Project Warranty: Refer to Contract Conditions for project warranty provisions:

B. Manufacturer's warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions.

C. Warranty period: 5 years commencing on Date of Substantial Performance of Work.

D. Insulating glass units: 10 years, on Date of Substantial Performance of Work.

PART 2 PRODUCTS

2.1 DESCRIPTION

A. Thermally broken, aluminum framed, windows with double glazed insulating glass units with concealed tamperproof fasteners.

B. Main Frame: Extruded aluminum: To ASTM B221, 6063 allows with T5 or T6 temper.

C. Interior and Exterior Sills: Extruded aluminum to ASTM B209, of type and size to suit project conditions; minimum 3 mm thick, complete with joint covers, jamb drip deflectors, chairs, anchors and anchoring devices.

D. Basis of Design:

1. Kawneer FG623 Window Wall, Thermally Broken, Profile 623207

2. Manufacturer to determine wind load and size depth of windows in accordance of windows size. All frames to be of same depth.

3. Finish:

    a. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

    b. Factory Finishing:

        1) Kawneer Permanodic™ AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class I Color Anodic Coating (black) and

        2) Kawneer Permanodic™ AA-M10C21A41 / AA-M45C22A41, AAMA 611, Architectural Class I Clear Anodic Coating

4. Colour: Refer to window schedule for colour and finishes of mullion and cap.

2.2 DESIGN CRITERIA

A. Design aluminum components to CAN/CSA S157

B. Design members to withstand, within acceptable deflection limitations, their own weight, the weight of glass, and the minimum design loads due to the pressure and suction of wind as calculated in accordance with Ontario Building Code.

C. Make provisions to drain, to the exterior, any water entering at joints and/or condensation occurring within the wall construction.

D. Design assembly to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to +75°C.

E. Deflection limit for mullions shall be governed by flexure limit of glass unit to permissible maximum by glass manufacturer and calculated with a safety factor of 2.5 with full recovery of glazing compounds or 1/175 maximum deflection of unsupported length; whichever is less.

F. Window Classification: To CAN/CSA A440/A440.1.

1. Air tightness: A3.
2. Water tightness: B7
3. Wind load resistance: C5.
4. Condensation resistance: Temperature Index, I-58 minimum.

G. Provide system to accommodate, without damage to components or deterioration of seals:

1. Movement within system
2. Movement between system and perimeter framing components
3. Dynamic lading and release of loads
4. Deflection of structural support framing
5. Shortening of building concrete structural columns
6. Creep of concrete structural members
7. A mid-span slab edge deflection of 6mm

H. Assembly to meet OBC SB10 Requirements

1. Fixed: Max U0.38
2. Operable: Max U0.45

3. Entrance Door: U0.69

4. SHGC: 0.4

2.3 WINDOW FABRICATION

A. Fabricate windows to CAN/CSA A440/A440.1.

B. Construct units square, plumb and free from distortion, waves, twists, buckles or other defects detrimental to performance or appearance.

1. Brace frames to maintain squareness and rigidity during installation.

C. Fabricate units square and true with tolerance of plus or minus 1.5mm (0.06 inches) maximum for units with diagonal measurement of 1800mm (6 feet) maximum and plus or minus 3 mm (0.125 inches) maximum of units with diagonal measurements greater than 1800 mm (6 feet).

D. Accurately fit and secure joints and corners

1. Ensure joints are flush, hairline, [and weatherproof].

E. Face dimensions detailed are maximum permissible sizes.

F. Use only concealed tamperproof fasteners

1. Where fasteners cannot be concealed, countersunk screws finished to match adjacent material may be used upon receipt of written approval from Consultant.

G. Visible manufacturer's labels are not permitted.

2.4 ACCESSORIES

A. Sealant Bond Breaker: Open cell foam backer rod sized to suit project requirements.

B. Liquid Foam Insulation: Single component, moisture cure, low expansion rate spray-in-place polyurethane liquid foam insulation to ULC-S710.1 and in accordance with manufacturer's written recommendations.

C. Fasteners: Tamperproof, cadmium plated stainless steel 300 or 400 series to meet window requirements and as recommended by manufacturer.

D. Refer to Section 08 80 00 Glass and Glazing for glazing and sealants

2.5 PRODUCT SUBSTITUTIONS

A. Substitutions: In accordance with Section 01 25 00 - Substitution Procedures.

B. Ensure components come from one manufacturer.

PART 3 EXECUTION

3.1 INSTALLERS

A. Use only installers with 2 years minimum experience in work similar to work of this Section.

3.2 EXAMINATION

A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for window installation in accordance with manufacturer's written instructions.

1. Visually inspect substrate in presence of Consultant

B. Inform Consultant of unacceptable conditions immediately upon discovery.

C. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.3 WINDOW INSTALLATION

A. Install windows in accordance with manufacturer's written instructions and to CAN/CSA A440/A440.1.

B. Arrange components to prevent abrupt variation in colour.

3.5 AIR/VAPOUR BARRIER CONTINUITY WITH BUILDING ENVELOPE

A. Provide continuous air/vapour barrier transition between work of this section where work interfaces with building envelope air barrier materials.

B. Seal air barrier membrane at aluminum framed glazing framing with weather barrier sealants as indicated and in accordance with manufacturer's written instructions.

3.6 CAULKING

A. Apply sealant in accordance with Section 07 92 19. Conceal sealant within window units except where exposed use is approved in writing by Consultant.

B. Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drop deflectors in bedding compound.

1. Caulk between sill up stand and window frame. Caulk butt joints in continuous sills.

3.7 FIELD QUALITY CONTROL

A. Field inspection: Coordinate field inspection in accordance with Section 01 45 00 - Quality Control

B. Site Installation Tolerances: Install windows square and true with tolerance of plus or minus 1.5 mm (0.06 inches) maximum for units with diagonal measurement of 1800 mm (6 feet) maximum and plus of minus 3 mm (0.125 inches) maximum for units with diagonal measurement greater than 1800 mm (6 feet).

C. Manufacturer's Services:

1. Coordinate manufacturer's services with Section 01 45 00 Quality Control

2. Submit to Consultant a written agreement from the manufacturer to perform the manufacturer's services.

3. Schedule manufacturer's review of work procedures at stages listed:

   a. Product Application: 1 off site review

   b. Fabrication and Handling: 1 review at authorized installers fabrication facilities.

   c. Installation: 3 site reviews at commencement of Work, 50% completion of Work, Upon completion of Work.

4. Submit manufacturer's written reports to Consultant describing:

   a. The scope of work requested.

   b. Date, time and location.

   c. Procedures performed.

   d. Observed or detected non-compliance or inconsistencies with manufacturer's recommended instructions.

   e. Limitations or disclaimers regarding the procedures performed.

   f. Obtain reports within seven days of review and submit immediately to Consultant.

3.8 CLEANING

A. Progress Cleaning: Perform cleanup as work progresses in accordance with Section 01 74 00 - Cleaning.

1. Remove sealant and caulking drippings as work progresses.

2. Leave work area clean end of each day.

B. Final cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

C. Waste Management

1. Coordinate recycling of waste management with Section 01 74 00 - Cleaning.

2. Collect recyclable waste and dispose of or recycle field generated construction waste created during construction or final cleaning related to work of this Section.

3. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

A. Protect installed windows and components from damage during construction.

B. Repair damage to adjacent materials caused by aluminum window installation.

END OF SECTION 08 51 13

SECTION 08 71 10 — FINISH HARDWARE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1

1.2 WORK INCLUDED

A. Furnish, delivery and install finish hardware

B. It is intended that the following list of hardware will cover finish hardware to complete the project. Bring to the Architect's attention any omissions, discrepancies that will affect work in the section during the bidding period.

1.3 RELATED SECTIONS

A. Division 1 — General Requirements

B. Section 06 20 00 — Finish Carpentry

C. Section 06 40 00 — Architectural Woodwork

D. Section 08 14 00 — Wood Doors

E. Section 08 42 10 — All Glass Partitions and Doors

F. Divison 26 — Electrical

1.4 PRODUCTS SUPPLIED BUT NOT INSTALLED IN THIS SECTION

A. Power supplies, compressor/control boxes, junction boxes installed by Division 26.

1.5 REFERENCES

A. Door and Hardware Institute - Recommended locations for Architectural Hardware for Standard Steel Doors and Frames

B. Door and Hardware Institue - Recommended locations for Architectural Hardware for Flush Wood Doors

C. NFPA 80-Standard for Fire Doors and Windows, 1999 Edition

D. Door and Hardware Institute — Sequence Format for Hardware Schedule

E. Door and Hardware Institute — Key Systems and Nomenclature

F. Door and Hardware Institute — Abbreviations and Symbols used in Architectural Door and Hardware Schedules and Specifications

G. Door and Hardware Institute — Installation Guide for Doors and Hardware

H. Ontario Building Code

1.6 SUBMITTALS

A. Update Finish Hardware Schedule: Submit Submittals in accordance with Section 01 33 00 — Submittals. Prepare detailed hardware schedules in Door and Hardware (DHI) vertical format as directed in Reference 1.4.4.

B. LEED Submittals

1. Submit documentation to verify compliance with LEED objectives and requirements, where required.

C. Product Data

1. Submit in a three ring binder six (6) copies of product data sheets with the finish hardware schedule showing items of hardware to be used on the project.

D. Samples

1. When requested in writing, provide (to the Consultant) one sample of each hardware item complete with fasteners, within thirty (30) calendar days of award of a purchasing order.

2. Samples to be clearly labelled with their hardware schedule designation and manufacturer’s name and model number. Samples will be incorporated into the work.

E. Templates

1. Submit templates within to related trades when requested.

F. Key Schedule

1. After a keying meeting between representatives of the Owner, Consultant and hardware supplier furnish a keying schedule listing the levels of keying as well as an explanation of the key system's function, the key symbols used and the door numbers controlled. Utilize “Door and Hardware Institute - Key Systems and Nomenclature” as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key

cuts and key system schematic directly to Owner, by means as directed by Owner.

G. Wiring Diagrams

1. Coordiante with related trades, meet with the owner and security provider and submit a written description of the functional use (mode of operation) of electrical hardware products specified. Include operation for ingress, egress, fire alarm, and after hours use where applicable. Include door and frame elevations showing the location of each item of electrical hardware to be installed, mode of operation including a diagram showing number and size of conductors. Indicate on elevation drawing items provided by related trades, include for back boxes, and 120V power sources. Provide point to point drawings showing terminal connections necessary for a complete installation.

H. Operating and Maintenance Data

1. Prior to Substantial Completion, furnish to the owner, two (2) copies of an owner's operation and maintenance manuals in a three ring binder with the following information:

   a. Name of hardware distributor, address and contact name

   b. Copy of final "as-built" finish hardware schedule

   c. Wiring diagrams, elevations, risers, point to point

   d. Copy of final keying schedule

   e. Copies of floor plans with keying nomenclature assigned to door numbers as per the approved keying schedule

   f. Catalogue cut sheets and products specifications for each product

   g. Parts list for each product

   h. Installation instructions and templates for each product

1.7 QUALITY ASSURANCE

A. Review installation procedures with the Contractor's Designated Installers. Hold instruction meetings with installers prior to installation and subsequent review meetings during the installation period. Submit minutes of meetings to the Consultant.

B. Alternates: Only approved products specified are accepted. Make alternate requests in accordance with Division 1. Include product data and indicate benefit to the project.

C. Supplier Qualifications: Successful hardware distributor to have a minimum of five (5) years' experience in the door and hardware industry. Distributor to have on staff an Architectural Hardware Consultant (A.H.C.) whose name will be listed on the hardware schedule title page submittal and will be responsible for scheduling, detailing, (see Reference 1.5.4) ordering and co-ordination of the finishing hardware for this project. If so requested by the Architect and or installer this individual will be required to visit the jobsite for any installation problems that may occur.

D. Designated Installers: Hardware Installers must have a minimum of five (5) years' experience in installation of hardware. Provide verification of installer's qualification to Consultant for approval. Installers to attend review meetings with the Hardware Distributor.

1.8 DELIVERY, STORAGE AND HANDLING

A. Marking and Packaging: Mark cartons with heading number, door number, and key-set symbol where applicable in original packaging provided by the manufacturer. Pack packaged hardware in suitable wrappings and containers to protect it from damage during shipping and storage. Enclose accessories, fastening devices and other loose items with each applicable item of hardware.

B. Delivery: Deliver hardware to related trades.

C. Storage: Store in a clean, dry room with lockable man door and adequate shelving to permit organization so item numbers are readily visible.

1.9 WARRANTY

A. Provide warranties by the accepted manufacturers:

1. Hardware Items:

a. Mortise Hinges, 1 year warranty

b. Continuous Hinges, Lifetime warranty

c. Locks (Mortise), 3 year warranty

d. Exit Devices, 3 year warranty

e. Door Closers — Mechanical 4040P series, 30 year warranty

f. Door Closers — Mechanical 1460 series, 30 year warranty

g. Door Operators — Electro Mechanical, 2 year warranty

h. Overhead Stops/Holders, 1 year warrant

i. Wall/Floor Stops, 1 year warranty

j. Electric Strikes, 5 year warranty

1.10 MAINTENANCE

A. Maintenance Service: After the building is occupied arrange an appointment with the maintenance staff from Clearview Library, Stayner, for instruction of proper use, servicing, , adjusting and lubrication of hardware furnished. Submit to the consultant a list of attendees and meeting date.

B. Extra Materials: Provide the following items in proper manufacturer's cartons once the job has been completed:

1. 5 of each installation tool used for locks/passage/privacy, type of door closers, and exit devices

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products listed in the hardware groups are from the manufacturers listed below:

1. Full Mortise Hinges, Ives
2. Continuous Hinges, Ives
3. Locksets, Latchsets/Deadbolts, Schlage
4. Cylinders, Schlage
5. Exit Devices, Von Duprin
6. Surface/Flush Bolts, Ives
7. Door Closers, LCN
8. Overhead Door Holders/Stops, Glynn Johnson
9. Door Pulls/Flatware, Canadian Builder's Hardware
10. Wall/Floor Stops, Ives
11. Weather/Smoke/Sound Seals, KN Crowder
12. Door Sweeps/Thresholds, KN Crowder
13. Automatic Door Operators/Acutuators, LCN
14. Electric Strikes, Von Duprin

15. Power Supplies, Schlage Electronics, Von Kuprin

2.2 MATERIALS

A. Screws and Fasteners:

1. Screws and fasteners to be matching finish to their product and to be manufacturer's standard. Door closers, door holders and exit devices installed on fire rated wood doors and hollow metal doors to be attached with fasteners to meet code requirements.

B. Materials-Acceptable Manufacturers (Note: Supply products in a given category from the same manufacturer):

1. Mortise Hinges

a. Provide five knuckle bearing hinges with NRP option on reverse bevel doors with locking hardware. Hinge width to accommodate door closer projection, door trim and allow for 180-degree swing. Doors up to 2286mm in height, supply 3 hinges, doors greater than 2286mm in height add one hinge for every additional 760mm of door height. Doors 915mm wide and less furnish 114 mm high hinges, doors greater than 915mm wide furnish 127mm high hinges, heavy weight or standard weight as specified. Supply ferrous (steel), stainless steel material for all interior and/or fire-rated doors and stainless steel for exterior doors.

b. As Specified: Ives Hinges, 5BB1, 5BB1HW

2. Continuous Hinges

a. Continuous hinges to be Ives heavy duty edge mount/edge guard continuous gear type aluminum hinges. Ives aluminum hinges tested and approved to UL 10C (90 minutes). Material 6063-T6 aluminum, clear satin finish (628). Aluminum geared hinges certified to ANSI 156.26 Grade 1. Hinge length to suit door height. Hinge length 25mm (1") less door height.

b. Supply as Specified: Ives 112HD, 57HD series

3. Locksets/Deadlocks/Privacy Sets

a. Mortise:

1) Grade 1 Operational, Grade 1 Security, mortise lock for commercial and institutional buildings. Manufacture lock cases from fully wrapped, heavy 12 gage steel with a protected leading edge and screw configuration that limits access to operating parts. Lock components to be manufactured of zinc dichromate plated steel. Latch bolts to have a standard 2 ¾" backset with a full ¾" throw.

Latchbolts to be non-handed, field reversible without opening the lock case. Latchbolts to be 2 piece anti-friction, manufactured from stainless steel. Solid latchbolts and/or plastic anti-friction devices are not acceptable. Deadbolts to be 1 ¾" total length have standard 1" throw with a minimum ¾" internal engagement when fully retracted. Deadbolts to be constructed of stainless steel, incorporating a security roller pin with a minimum Rc60 rating for surface hardness. Lever assembly (external) to be one piece design attached by threaded bushing. Lever assembly (internal) to be attached by screw less shank. Lever attachments by common tools (allen nuts and/or set screws) are not acceptable. Thru bolt lever assemblies through the door for positive interlock. Levers to have independent rotation in both directions. Lever operation to be freewheeling (clutch) when in the locked mode. Spring cages are to be incorporated into the lever assemblies. Hub blocking plate to be solid, cast stainless steel. Manufacturers utilizing open hub designs are not acceptable. Spindles to be independent, designed to "break away" at a maximum of 75psi torque. Mounting tabs are to be automatic self-adjusting, vertically and horizontally for door bevel and strike alignment. Cylinders to be secured by a cast stainless steel, dual retainer. Manufacturers utilizing screws and/or stamped retainers are not acceptable.

2) Supply as Specified: Schlage "L" series

b. Strike Plates:

1) Provide lockset and latchset strike plates with lip centre dimensions sized to minimally clear trim. Where strike lip extends beyond the projection of the casing or other trim, provide curved lip strikes. Strike plates applied to inactive leaf of paired openings to have flat lip sized to fit flush with the face of the door skin.

4. Exit Devices/Device Trims/Mullions:

a. Narrow Style

1) Exit device to be cUL listed for panic hardware and fire exit hardware. Supply exit devices and fire exit devices featuring coil compression springs on device mechanism subassemblies and dead latching mechanisms for active latch bolts. Supply exit devices with smooth mechanism case and "the quiet one" fluid dampener to eliminate noise associated with exit device operations. Non-handed device with touchpad assemblies with no exposed fasteners and cast end caps, reinforced aluminum with stainless steel touchpad and raised edge to minimize pinching. Doors greater than 950mm wide supply

long bar exit devices, doors greater than 2134mm high supply extension rods were required. Fits door stiles as narrow as 1 ¾".

2) Supply as Specified: Von Duprin 35A series

b. Heavy Duty

1) Exit device to be cUL listed for panic hardware and fire exit hardware. Supply panic hardware and fire exit devices featuring coil compression springs on device mechanism subassemblies and dead latching mechanisms for active latch bolts. Supply exit devices with smooth mechanism case and "the quiet one" fluid dampener to eliminate noise associated with exit device operations. Non-handed device with touchpad assemblies with no exposed fasteners and cast end caps, reinforced aluminum with stainless steel touchpad and raised edge to minimize pinching. Roller strikes to be standard on rim and surface vertical rod devices, mortise exit devices (626) complete with strikes that match the same finish as the device. Doors greater than 950mm wide supply long bar exit devices, doors greater than 2134mm high supply extension rods for surface vertical rod series. 1,000,000cycle testing independently certified by ETL.

2) Supply as Specified: Von Duprin 98 series

c. Exit Device Trim

1) Supply device trim featuring recessed cylinder mounting and coil compression spring design with shear pin protection for lever designs. Similar lever designs for exits as specified for locksets.

2) Supply as Specified: Von Duprin 996 series

5. Door Closers

a. Door closers to have the following features Fully hydraulic, rack and pinion action with high strength cast iron cylinders and one piece forged steel pistons.

1) Include high efficiency, low friction pinion bearings

2) Hydraulic fluid of a type requires no seasonal adjustments, ULTRA X TM fluid has constant temperature control from -35 degrees Celsius to +49 degrees Celsius.

3) Hydraulic regulation controlled by tamper-proof, non-critical screw valves, adjustable with a hex wrench.

4) Separate adjustments for backcheck, general speed and latch speed.

5) Door closers with special template (ST-) numbers include required associated product, information sheets and instructions

6) Size 1 manual door closers to provide less than 5 pounds opening force on a 900mm door leaf.

7) Door closer with Pressure Relief Valves are not accepted

8) Door closer bodies, arms, covers to be powder coated

9) Closers with powder coat finishes to exceed a minimum 100-hour salt spray test, as described in ANSI A156.18 and ASTM B117.

10) Closers detailed with plated finishes to include plated covers (or finish plates), arms and visible fasteners.

b. Medium Duty Mechanical (Interior/Exterior):

1) Non-sized (1-6) and non-handed cylinder body to have 1 ¼" (32mm) piston diameter with 5/8" (16mm) single heat-treated shaft. Track closer cylinder body non-sized (2-4) or (1-2). Closers to have stamped main arm and forearm (forged steel main arm and forearm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

2) Supply as Specified: LCN1460 HD series

c. Heavy Duty Mechanical (Multiple Applications):

1) Non-sized (1-6) and non-handed cast iron cylinder body to have 1 1/2" piston diameter with 11/16" journal double heat-treated pinion shaft with 5/8" full complement bearings and certified to exceed ten million (10,000,000) full load operating cycles by a recognized independent testing laboratory. Closer to have "FAST" Power Adjust speed dial to show spring size power. Track closers non-sized 1-4. Closers to have stamped main arm and forearm (forged steel main arm and forearm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever forged arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

2) Supply as Specified: LCN 4040 DEL series

d. Heavy Duty Mechanical (Multiple Applications):

1) Non-sized (1-6) and non-handed cast iron cylinder body to have 1 1/2" piston diameter with 3/4" journal double heat-treated pinion shaft with 5/8" full complement bearings. XP closer hydraulic regulation controlled by tamper-proof, non critical screw valves, abrasion resistant Vitron "O" ring, adjustable with a hex wrench. Closer to have "FAST" Power Adjust speed dial to show spring size power. Track closers non-sized 1-4. Closers to have forged steel main arm and forearm (forged steel main arm and forearm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever forged arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

2) Supply as Specified: LCN 4040XP series

e. Medium Duty Electric Operator

1) Provide non handed low energy automatic operator units that are electro-mechanical design. Tested to minimum of 3 million cycles. In the event of a power loss or failure, the control box will save the installation settings thru Non Volatile Memory. Operates between -34 deg. C and +71 deg. C. Powered by DC motor working through reduction gears. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening, closing and backcheck speeds, backcheck and latch position, and adjustable hold open delay from 2-30 seconds. Provide units with semi concealed on/off toggle switch, selectable push and go function to activate power operator, power assist closing, electric lock delay, LED illuminated power indicator and logic terminals to interface with accessories. Provide full length aluminum header, drop plates, brackets, or adapters for arms as to suit details.

2) Supply as Specified: LCN 9142 Series

f. Heavy Duty Electric Operator

1) Provide low energy automatic operator units that are electro-mechanical design.
Powered by DC motor working through reduction gears. Spring force closing.
Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and

sensors. Provide full length aluminum header, drop plates, angle brackets, or adapters for arms to suit details. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings, consult with owner.

2) Supply as Specified: LCN 9542, series c/w keyswitch or rocker 8310-806K

g. Actuators

1) Wall Type

a) Wall plate switch to be hard-wired actuator with round, stainless steel touch plate in either 4 ½" or 6" diameters. Engraved blue filled handicap symbol conforms to most accessibility codes. Units to include heavy grade components for vandal resistant mounting and weather resistant switch standard.

b) Supply as Specified: LCN 8310-852, 8310-876 (6") escutcheon

2) Overhead Door Stops/Holders:

a) Heavy Duty Surface Mounted:

Surface overhead stops/holders to be stainless steel base, non-handed for single-acting doors with a heavy-duty channel/ slide-arm design and offset jamb bracket to allow for simple field modifications of functions. Channel to be surface mounted to the door with thru bolts and the jamb bracket is surface mounted to the frame soffit.

Supply as Specified: Glynn-Johnson 90 series

3) Heavy Duty Concealed Mounting

a) Concealed overhead stops/holders to be stainless steel base, non-handed for single or double-acting doors with a low profile channel, mortised in the door and jamb bracket is mortised in the doorframe. Unit to be fully concealed when door is in the closed position. Units to be field adjustable for function changes if required.

b) Supply as Specified: Glynn-Johnson 100 series

h. Door Pulls/Flatware/Coat Hooks:

1) Door Pulls are to be 19mm, 25.4mm diameter

2) Flatware to be of stainless steel material, 0.050 gauge

3) Supply as Specified: CBH 6039

4) CBH 903 T304 B4E c/w tape mounting (Kickplates 40mm less door width single door and 25mm less door width double doors)

5) CBH 61 (Coat Hook)

i. Floor/Wall Stops;

1) Wall Stops (No Button on Locking Hardware):

a) Wall stops to be constructed of stainless steel base with special retainer cup that makes the rubber stop tamper resistant. Convex design of rubber bumper.

b) Supply as Specified: Ives WS407CVX

2) Wall Stops (Projecting Buttom on Locking Hardware):

a) Wall stops to be constructed of stainless steel base with special retainer cup that makes the rubber stop tamper resistant. Concave rubber bumper to avoid damage to locks with projecting buttons.

b) Supply as Specified: Ives WS407CCV

j. Weather/Smoke/Sound Seals:

1) Supply as Specified: KN Crowder W-21 (head/jamb seal)

k. Thresholds/Weatherstrips/Door Sweeps

1) Supply as Specified: KN Crowder W-24S (Door Sweep)

2) Supply as Specified: KN Crowder CT-10 (Threshold)

3) Electric Strikes

a) Grade 1, electric strikes to be cUL listed burglary-resistant and electric strike for fire doors and frames. A label for single doors and B label for double doors. Electric strikes to be stainless steel construction, non-handed available in 12V or 24V AC or DC with continuous duty solenoid and accept ¾" throw latchbolts. Strike box to be adjustable to compensate for any misalignment of the door or frame with two piece plug connector for ease of installation.

b) Supply as Specified: Von Duprin 6000 series

4) Power Supplies

   a) Power supplies to be tested and certified to meet UL294. Universal 120-240 VAC input, low voltage DC output, regulated and filtered. Power supplies to have 2A, 4A, 6A output, 12/24VDC field selectable with jumper. Provide emergency release terminals, where required, that allow the release of devices upon activation of the fire alarm system complete with fire alarm input for initiating “no delay” exiting mode. Power supply to be flat mounting design and polarized locking connections for additional option boards specified.

   b) Supply as Specified: Schlage Electronics PS-902

5) Molex Connectors

   a) Where scheduled in the hardware sets, provide each item of electrified hardware and
   wire harnesses with sufficient number and wire gauge with standardized Molex plug
   connectors to accommodate electric function of specified hardware. Provide Molex
   connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

6) Junction Box

   a) Provide high quality NEMA 1, junction box to provide convenient installation for electrified hardware. Units are surface mounted 254mm high, 254mm wide, 152mm deep and includes hinged door with twist turn lock, 20 position terminal strip to accept 24 to 12 gauge wire.

   b) Supply as Specified: Von Duprin JB7

7) Electric Washroom Accessories

   a) Provide electric washroom accessories to compete the installation of automatic door operators for universal and barrier free washroom requirements

   b) Supply as Specified: Camden - Push to lock, CM-400/8

   c) Supply as Specified: Camden – LED annunciator CM-AF500

d) Supply as Specified: Advanced Logic Relay CX-33

e) Supply as Specified: Emerg. Call Kit CX-WEC10

2.3 FINISHES

A. Unless otherwise specified, finishes to be brushed chrome (BHMA 626/652)

B. Finishes are to be specified as follows:

1. Hinges 630 satin stainless steel stainless steel
   Hinges 652 satin chrome plated steel
   Continuous Hinges 630 satin stainless steel stainless steel
   Lock Trim 626 satin chrome plated brass/bronze
   Exit Devices 626 satin chrome plated brass/bronze
   Door Closer 689 powder coat aluminum steel
   Door Pulls 630 satin stainless steel stainless steel
   Protective Plate 630 satin stainless steel stainless steel
   Door Stops/Holders
   Overhead 630 satin stainless steel stainless steel
   Wall/Floor 626 satin chrome plated brass/bronze
   Thresholds 628 anodized aluminum aluminum
   Weatherstrip 628 anodized aluminum aluminum
   Miscellaneous
   Electric Strikes 630 satin stainless steel stainless steel

2.4 KEYING - STANDARD KEYING WITH EXTERIOR PRIMUS CYLINDERS

A. Cylinders, Keying Systems and Key Control

1. Meet with the Owner to finalize keying requirements and obtain keying instructions in writing as outlined in Division 1. Interior locks and cylinders shall be furnished in a new Schlage masterkey system. Exterior locks and cylinders to be Schlage Primus High Security Removable Core Cylinders 20-700 series with unique Level Three side-bit milling to allow integration with existing standard Schlage key systems.

2. Provide temporary construction keying system during construction period. Permanent keys will be furnished to the Owner's Representative prior to occupancy. The Owner or Owner's Security Agent will void the operation of the construction keys.

3. Permanent cylinders to be keyed by factory, combinated in sets or subsets, master keyed or great grand master keyed, as directed by Owner. Permanent keys, keyblanks and cylinders are to be stamped with the keyset symbol for identification. Stamp cylinders with concealed visual keying for added

security. These visual key control marks or codes will not include the actual key cuts.

4. Deliver permanent key blanks and Primus High Security cylinders and other security keys direct to Owner's representative (address noted on authorized Primus Level Three facesheet) from factory by secure courier, return receipt requested. Failure to properly comply with these requirements may be cause to require replacement of cylinders and keys involved as deemed necessary at no additional cost to the Owner.

5. Provide complete cross-index system, place keys on markers and hooks in the cabinet as determined by the finial key schedule. Provide one each key cabinet, hinged panel type cabinet for wall mounting. See hardware groups for model number.

PART 3 EXECUTION

3.1 EXAMINATION

A. Ensure that doors and frames are prepared and reinforced to receive finish hardware prior to installation

B. Ensure that door frames and finished floor are plumb and level to permit proper engagement and operation of hardware.

C. Submit in writing a list of deficiencies determined as part of inspection required in 3.1.1. and 3.1.2. to supervising consulting prior to installation of finished hardware. Correct door frame installation before proceeding with finish hardware installation.

3.2 INSTALLATION

A. Hardware Installers must have a minimum of five (5) years' experience in installation of hardware. Provide verification of installer's qualification to Consultant for approval. Installers to attend review meetings conducted by the hardware distributor.

B. Install hardware at mounting heights as specified in the manufacturer's templates or specific references in approved hardware schedule or approved elevation drawings.

C. Where mounting height is not otherwise specified, install hardware at mounting heights as indicated in 1.5.1, 1.5.2.

D. Install hardware using only manufacturer supplied and approved fasteners in strict adherence with manufacturer's published installation instructions.

E. Ensure locksets/latchsets/deadlocks are of the correct hand before installation to ensure that the cylinder is in the correct position. Handing is part of installation procedure.

F. Ensure that exit devices are of the correct hand and adjust device cam/drive screw for proper outside trim function prior to installation. Handing is part of installation procedure.

G. Follow manufactures installation instructions. Adjustment of door closers is inclusive of spring power, closing speed, latching speed and back-check, valve screws to achieve backcheck (4040, 4040XP series) at the time of installation.

H. Adjust delayed action door closers to forty (40) second delay for barrier free accessibility and movement of materials. Time period to be approved by Owner.

I. Install head seal weatherstrip prior to installation of soffit mounted hardware. Trim, cut and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Install thresholds and saddles in a bed of caulking completely sealing the underside from water and air penetration.

J. Counter sink through bolt of door pull under push plate during installation.

K. Install blocking material of sufficient type and size in cavities of metal and wood stud walls and partitions. Located concave and convex type door bumpers at the appropriate height to properly contact protruding door trim.

3.3 FIELD QUALITY CONTROL

A. Verify each door leaf opens closes and latches. Inspect fire rated openings to ensure they are installed in compliance with NFPA 80 requirements. Test access control system and electrified hardware devices for proper operation, owner to sign off on verification of operation. Verify electric door release hardware operates properly upon activation of the fire alarm system.

B. Perform bi-monthly on-site inspections during hardware installation and provide inspection reports listing progress of work, unacceptable work and corrective measures. Repair or replace as directed by the Consultant.

C. Before completion of the work but after the hardware has been installed, submit a certificate to the architect stating that final inspection has been made and that hardware has been checked for installation and operation by a technician from the manufacturer and hardware consultant.

3.4 ADJUSTING AND CLEANING

A. Check and make final adjustments to each operating item of hardware on each door to ensure proper operation and function.

B. Adjust doors with self-closing devices or automatic closing devices for operation after the HVAC system is balanced and adjusted. Adjust spring power of non sized door closers to close and latch the door.

C. Hardware to be left clean and free of disfigurements.

D. Instruct owner personnel in the proper operation, adjustment and maintenance of hardware.

E. Check locked doors against approved keying schedule.

3.5 PROTECTION

A. Protect hardware from damage during construction. Wrap locks, panic hardware, and fire exit hardware, door pull trim with kraft paper or plastic bubble materials to protect finish from damage until date of substantial completion. Remove and reinstall or where necessary, use temporary hardware to maintain finish in new condition and maintain manufacturer's warranty.

3.6 HARDWARE GROUPS

A. See attached Hardware Group Lists

END OF SECTION 08 71 00

SECTION 08 80 00 — GLASS AND GLAZING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications

B. Section 06 20 00 - Finish Carpentry

C. Section 08 14 16 - Wood Doors

D. Section 08 87 36 - Window Film

E. Section 09 29 00 - Gypsum Board

F. Reserved

1.3 REFERENCES

A. American National Standards Institute (ANSI)

1. ANSI/ASTM E330-[02], Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

B. American Society for Testing and Materials International (ASMT)

1. ASTM C542 [94(1999)], Specification for Lock Strip Gaskets.

2. ASTM D790 [02], Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

3. ASTM D1003 [00], Test Method for Haze and Luminous Transmittance of Plastics.

4. ASTM D1929 [96(R2001)e1], Test Method for Determining Ignition Temperature of Plastics.

5. ASTM D2240 [02b], Test Method for Rubber Property Durometer Hardness.

6. ASTM E84 [01], Test Method for Surface Burning Characteristics of Building Materials.

7. ASTM F1233 [98], Test Method for Security Glazing Materials and Systems.

C. Canadian General Standards Board (CGSB).

1. CAN/CGSB 12.1 [M90], Tempered or Laminated Safety Glass.
2. CAN/CGSB 12.3 [M91], Flat, Clear Float Glass.
3. CAN/CGSB 12.5 [M86], Mirrors, Silvered.
4. CAN/CGSB 12.8 [97], Insulating Glass Units.
5. CAN/CGSB 12.10 [M76], Glass, Light and Heat Reflecting.

D. Canadian Standards Association (CSA International).

1. CSA A440.2 [98], Energy Performance Evaluation of Windows and Sliding Glass Doors.
2. CSA Certification Program for Windows and Doors [2000].

E. Standards Council of Canada

1. ULC Standard CAN4-S104: Fire Tests of Door Assemblies
2. ULC Standard CAA4-S106: Fire Tests of Window Assemblies

F. CAN/ULC-S101M: Standard Methods of Fire Endurance Tests

1. CCD 045 [95], Sealants and Caulking.

G. Flat Glass Manufacturers Association (FGMA).

1. FGMA Glazing Manual - [1997].

H. National Fire Protection (NFPA)

1. NFPA 80: Fire door and Windows
2. NFPA 257 - Fire Tests of Window Assemblies

I. Reserved

1.4 PERFORMANCE REQUIREMENTS

A. Provide continuity of building enclosure vapour and air barrier using glass and glazing materials utilizing inner light of multiple light sealed units for continuity of air and vapour seal.

B. Size glass to withstand wind loads, deck loads and positive and negative live loads acting normal to plane of glass to a design pressure of 75 kPa as measured in accordance with ANSI/ASTM E330.

C. Limit glass deflection to 1/200 with full recovery glazing materials.

D. Fire-rated, clear and wireless glazing material for use in locations such as doors, sidelites, transoms, borrowed lites, and wall applications with fire rating requirements ranging from 45 minutes to 2 hours with required hose stream test; for use in interior and exterior applications.

1.5 SUBMITTALS

A. Submit shop drawings, manufacturers printed literature, specifications, data sheets, and installation instructions

B. Upon request, supplier to submit 300mm x 300mm sample of each type of glass for Consultant approval, prior to fabrication.

C. Submit certified test reports showing compliance with specified performance characteristics and physical properties

1. Manufacturer to provide the results of thermal stress tests prior to fabricating the glazing units.

D. Fire Rated Glass and Frame Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged materials in their original containers with manufacturer's labels intact.

B. Store vertically, blocked off the floor in a weatherproof enclosure.

C. Pilkington Pyrostop must not be exposed outside the range of -40 degrees F to 120 degrees F (-40*C to +50*C) during storage and transportation.

D. Do not expose the non-PVB side of glass to UV light.

E. Store sheets of glass vertically. DO NOT lean.

F. Install glass as soon as possible after delivery to site.

G. Handle glass carefully to its place of installation. Prevent damage to glass, adjacent materials and surfaces.

1.7 SITE CONDITIONS

A. Coordinate the Work of this Section with the Installation of frames to ensure a continuous, uninterrupted sequence, and to prevent the undue exposure of unprotected frames to the weather.

B. Do not install any glass until all nearby welding is completed.

C. As each light of glass installed, mark it in a manner to make it visible and obvious to all persons. Do not use materials which may permanently mar, discolour or disfigure the glass.

1.8 WARRANTY

A. Provide manufacturer's guarantee for the following types of glass listed, against defects in materials and workmanship for the period indicated, commencing from the date of Substantial Performance of Work:

B. Sealed glass units against misting, dusting, seal failure, thermal shock breaks, or other impairments: 5 years.

1.9 COORDINATION

A. Confirm requirements for tolerances, clearance and bite and confirm with related sections.

B. Cut all glass to field measurement with proper clearances; cut to produce clean, straight edges with no chips, cracks or flaws

C. Confirm compatibility of glazing with adjacent sealants.

D. Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufactures warranty information/requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Refer also to Consultant's window schedule, and interior screen schedule, else the following characteristics shall supersede.

1. Flat Glass:

a. Float glass: to CAN/CGSB-12.3, glazing quality ¼" thick, unless otherwise specified in Consultant's drawings

b. Sheet glass: to CAN/CGSB-12.2, ¼" thick, unless otherwise specified in Consultant's drawings

c. Tempered glass: minimum ¼" thick fully tempered float glass to CAN/CGSB 12.1. Tempered glass identification must be sandblasted into glass and shall be visible after installation

d. Safety glass: fully tempered to CAN/CGSB-12.1, Type 2, Class A, thickness to be engineered by supplier.

e. Wired glass: to CAN/CGSB-12.11, Georgian wire mesh ¼" thick.

f. Spandrel glass: to CAN/CGSB-12.9, Type 2, Class A, thickness to be engineered by supplier, colour to be confirmed by Consultant

g. Laminated Glass: to CAN/CGSB-12.1-M90 clear, outer sheet of tempered glass, 0.75 mm interlayer lamination, inner sheet of clear float glass, final thickness to be determined by the glass supplier's, or glass system supplier's Professional Engineer, who is licensed to practice in the province of Ontario

h. Mirror glass: minimum ¼" thick, clear float glass (tempered where shown), silvered, mirror quality to CAN/CGSB-12.5-M86

1) Mirror adhesive and protective coating as recommended by mirror manufacturer

2. Sealed Insulating Units:

a. Basis of Design:

1) Guardian Glass SunGuard IS 20 on Clear for north facing windows and curtainwalls

a) Visual Light Transmittance:

b) Solar Heat Gain Coefficient:

2) Guardian Supernatural 54 for east, west and south facing windows and curtain walls.

a) Visual Light Transmittance:

b) Solar Heat Gain Coefficient:

b. Insulating Glass Units: Provide sealed insulating glass units in accordance with CAN/CGSB-12.8 in configurations indicated, and as specified herein.

1) Shop fabricate sealed glass units to CAN/CGSB. 12.8 and IGMAC certification as a minimum

2) Sealed units shall have a minimum of 12mm air space giving a total overall thickness of not less than 1". Edge spacer shall not bow in or out more than ¼" over full length of a side

3) Sealed units shall be assembled and air space sealed in a clean, dry environment, in a location with the same barometric air pressure as the job site

4) Sealed units having pressure-venting or equalizing holes in spacer for site sealing, will be rejected.

5) Edges of sealed units shall be clean and not have metal or tape binding or facings

6) Manufacture sealed insulating glass units without edge channels or tape, that is, with bare glass edges.

7) Use two stage seal method of manufacture, as follows:

   a) Primary Seal: Polyisobutylene sealing compound between glass and spacer/separator.

   b) Secondary Seal: Polyurethane, silicone or polysulphide base sealant, filling gap between the two lites of glass at the edge up to the spacer/separator and primary seal.

8) Spacer/separator to provide continuous vapour barrier between interior of sealed unit and secondary seal.

   a) Acceptable material: Fiberglass or PVC Spacer.

9) Sealants for Insulating Glass Units shall be silicone based, and as follows:

   a) Silicone Base Sealants: to CAN/CGSB-19.13-M87, one component, elastomeric, chemical curing.

   b) Rheological Properties: Class 2 – non-sag.

   c) Substrate Class: G-Glass.

   d) Glazing Suitability: Class A – resists ultraviolet through glass.

   e) Temperature Class: L – low temperature

   f) Movement Class: 40.

3. All Glass Partition:

   a. 1/2” glass, tempered.

4. Frameless Glass Door:

   a. 1/2” glass, tempered. To suit CRL channels. Refer to Section 08 42 10 All Glass Door and Partitions.

5. Fire Rated All Glass Partition and Framed Interior Window

   a. Basis of Design: Pilkington Pyrostop, Interior Glazing, 45 minutes Fire Resistance Rating

1) For both framed and all-glass applications.

2) Thickness: 3/4" [19 mm].

3) Weight: 9 to 22 lbs/ft2

4) Approximate Visible Transmission: 86 percent.

5) Fire-rating: 45 minutes minimum, up to 2 hours.

6) Impact Safety Resistance: Meets ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).

7) Positive Pressure Test: UL 10C; passes.

8) STC Rating: Approximately 40 dB

b. Maximum exposed sizes (45 minutes)

1) Max Exposed Glazing Area: 4500 sq.in

2) Max Width of Exposed Glazing: 95-1/4"

3) Max height of Exposed Glazing: 95-1/4"

c. Maximum exposed size for Door (45 minutes)

1) Max Exposed Glazing Area: 3724 sq.in

2) Max Width of Exposed Glazing: 41-5/8"

3) Max height of Exposed Glazing: 89-3/4"

6. Basic Exterior hermetically sealed double glazed units: to CAN/CGSB-12.8-97 with outer sheet of 6 mm heat strengthened clear glass and an inner sheet of 6 mm clear heat strengthened or clear tempered glass complete with Cardinal Glass Products (or approved equivalent) LoE 366 (Low E coating) on Surface #3, 13 mm air space between sheets, hermetically sealed. Total unit thickness 25mm.

7. Basic Exterior hermetically sealed triple glazed units: to CAN/CGSB-12.8-97 with outer sheet of 6 mm heat strengthened clear glass, a center sheet of 6 mm clear heat strengthened glass, inner sheet of 6 mm clear heat strengthened or clear tempered glass complete with Cardinal Glass Products (or approved equivalent) LoE 366 (Low E coating) on Surface #5, 13 mm air space between each sheet, hermetically sealed. Total unit thickness 44mm.

8. Substitution: equivalent product subject to architect's review

2.2 GLAZING AND SEALING COMPOUND MATERIALS

A. Non-fire rated application

1. Sealant compound: one component, silicone base, solvent curing to CGSB 19-GP-18M- 80. Colour to match adjacent materials, as directed by Consultant.
2. Glazing tape: preformed butyl tape, integral spacing device,10-15 durometer hardness, paper release.
3. Setting blocks: neoprene, Shore "A" durometer hardness 80, 4” long x ¼” high x width to suit glass thickness.
4. Spacer shims: neoprene, Shore "A" durometer hardness as recommended by window manufacturers.
5. Glazing splines: polyvinyl-chloride manufacturer's standard dry glazing splines to suit aluminum extrusions.
6. Glazing points and wire spring clips: corrosion resistant, manufacturer's standard.
7. Primer-sealers and cleaners: to glass and gasket manufacturer's standard.

B. Fire Rated Application

1. Glazing Tape: 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.
2. Glazing Compound: DAP 33 putty.
3. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
    1. Dow Corning 795 - Dow Corning Corp.
    2. Silglaze-II 2800 - General Electric Co.
    3. Spectrem 2 - Tremco Inc.
4. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness
5. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.
6. No substitute for fire rated glazing and sealing materials.

2.3 GLASS DOORS ASSEMBLY

A. Glass Doors: Clear Tempered Glass to CAN/CGSB-12.1-M90, Type 2, Class A, thickness to be engineered by supplier

B. Refer to Door schedule for locations.

C. See also Section 08 71 00 - Door Hardware for information on closers, pulls, hinges and other accessories required for operation.

PART 3 EXECUTION

3.1 MANUFACTURERS INSTRUCTIONS

A. Comply with Manufacturers written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions and data sheets

3.2 PREPARATION

A. Remove protective coatings and clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer

C. Prime surfaces scheduled to receive sealant

1. Ensure sealants to be installed are compatible with glazing tape compound.

3.3 EXAMINATION

A. Verify that openings for glass are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.4 INSTALLATION

A. Typically:

1. Perform work in accordance with FGMA Glazing Manual, IGMAC and Laminators Safety Glass Association Standards Manual

   a. Installation of glass shall be by workmen skilled in this trade in strict accordance with manufacturer’s directions, to produce a first-class installation.

   b. Mitre edge of glass for sheets meeting at corner. Seal with silicon joint.

2. Install in accordance with the manufacturer's written instructions and the contract documents, plumb, true, level and rigid.
3. Do not glaze when ambient or surface temperatures are less than 4°C. Glazing rebates, stops and glass shall be dry, free from ice, frost slick, grease, oil, dust, rust, or other matter detrimental to adhesion, of tape, glazing compounds and sealant.
4. Glass shall be free from contact with the frames and stops.
5. Apply sealant to uniform and level line, flush with sightline and tooled or wiped with solvent to smooth appearance.
6. Do not cut or abrade tempered, heat treated, or coated glass.
7. Install safety glass in interior doors and partitions.
8. Glaze interior doors with foam or cork tape on both sides. For wired glass, use glazing tape. Trim tape even with the sight line.
9. Supply glass with drawlines that will run horizontally when installed.
10. Leave labels on glass until final cleaning.
    a. Label each light to show manufacturer's name or trademark, quality and thickness.
11. Be responsible for any faulty glazing and sealing to windows and doors. Reseal and make good any damage attributed to faulty glazing
12. Use sealant at exterior doors, sealing water and weather tight.

B. Installation: Exterior Dry Method (Preformed Glazing)

1. Cut glazing tape and spline to length; install on glazing light. Seal corners by butting tape and spline and sealing junctions with sealant.
2. Place setting blocks per manufacturer's recommended instructions
3. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
4. Install removable stops without displacing glazing tape or spline. Exert pressure for full continuous contact.
5. Trim protruding tape edge.

C. Installation: Exterior Wet/Dry Method (Preformed Tape and Sealant)

1. Cut glazing tape to length and set against permanent stops, 1/4” below sight line. Seal corners by butting tape and dabbing with sealant.
2. Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.
3. Place setting blocks per manufacturer’s recommended instructions
4. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
5. Install removable stops with spacer strips inserted between glazing and applied stops 1/4” below sight line
6. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 3/8” below sight line.
7. Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

D. Installation: Interior Wet/Dry Method (Tape and Sealant)

1. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm above sight line.
2. Place setting blocks per manufacturer’s recommended instructions
3. Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.
4. Install removable stops with glazing centred in space by inserting spacer shims both sides at 16” min intervals, 1/4” below sight line
5. Fill gaps between light and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.
6. Trim protruding tape edge.

3.5 MIRRORS

A. Install mirrors at locations indicated, plumb and level

B. Bond mirrors to substrate with spot adhesive method in accordance with material manufacturer's recommendations

C. Prior to applying adhesive, coat back of mirror with protective coating and allow to dry.

D. Where mirror cannot be produced in one piece, provide two or more panels. Accurately cut, fit and polish panels at joints

3.6 FINISHING

A. Immediately remove sealant and compound droppings from finished surfaces.

B. Remove dirt, scum, plaster, paint spatter, and other harmful and deleterious matter from glass promptly and completely, before they establish tight adhesion.

C. Avoid using abrasives, steel wool, razor blades, solvents, alkaline or other harsh cleaning agents

D. Replace scratched or otherwise damaged glass

3.7 CLEANING

A. Perform cleaning after installation to remove construction and accumulated environmental dirt.

B. Remove traces of primer and caulking

C. Remove glazing materials from finish sirfaces

D. Remove labels after work is complete

E. Clean glass and mirrors using manufacturer approved, non-abrasive cleaner

3.8 PROTECTION OF WORK

A. After installation, mark light with an ‘x’ by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.

END OF SECTION 08 80 00

SECTION 08 87 36 — WINDOW FILM

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. 08 80 00 — Glass and Glazing

1.3 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

1. ASTM C1184 – Structural Silicone Sealants.
2. ASTM D882 – Tensile Properties of Thin Plastic Sheeting.
3. ASTM D3330-Peel-Adhesion at 180 Degree Angle.
4. ASTM C1184 – Surface Burning Characteristics of Building Materials.

1.4 QUALITY ASSURANCE

A. Installers qualifications: fully trained and certified/licensed by window film manufacturer.

B. All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience

C. Every pane of glass shall be factory labelled and label shall remain in place until final cleaning. Safety glass shall have permanent identification.

1.5 SUBMITTALS

A. Submit complete and detailed product data for each product required.

B. Submit installation instructions.

C. Submit duplicate, minimum 6” x 6” samples of window film.

D. Mock-up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Consultant.
2. Do not proceed with remaining work until workmanship, colour and sheen are approved by Architect.

3. Refinish mock-up areas as required to produce acceptable work.

E. Submit maintenance instruction for incorporation into maintenance manual.

1.6 DELIVERY STORAGE AND HANDLING

A. Store products in manufacturer’s unopened packaging until ready for installation.

1.7 SITE CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier.

1.8 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

1.9 EXTRA MATERIALS

A. Furnish 2% extra materials at time of installation. Deliver in protective packaging for storage.

PART 2 PRODUCTS

2.1 MATERIALS

A. Requests for substitution shall be made in accordance with Section 01 25 00 — Substitution Procedures.

B. Basis of Design: 3M™ CRYSTAL Glass Finishes Series 5525

1. General: Calendered (polymeric) vinyl glass finish field-applied application to glass or plastic material as visually translucent or decorative film, for interior and exterior applications

2. Design/Pattern: Haze

3. Finish: Matte

4. Adhesive: Solvent Acrylic, Pressure Sensitive, Permanent

    a. Colour: clear

b. Removable without heat and/or chemicals from supported substrates.

c. Adhesion to substrate: 12 N/25 mm

5. Silicone-coated Polyester
6. Thickness: 80 μm
7. Application Temperature: +10°C Minimum (air and substrate)
8. Service Temperature: -40°C to +80°C

PART 3 EXECUTION

3.1 EXAMINATION

A. Refer to architectural drawings for installation height and locations.

B. Examine substrate(s) for compliance. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Refer to manufacturer's technical data sheet to determine compatibility of finish to substrate.

D. Do not proceed with installation until unsatisfactory conditions have been corrected.

E. Responsibility for state of surfaces prior to installation to be pre-determined by installation specialist.

F. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation per the recommendations of the installation specialist.

G. Proceeding with installation implied installer's acceptance of substrate and conditions.

3.2 SURFACE PREPARATION

A. Comply with all manufacturer's instructions for surface preparation.

B. Thoroughly clean substrates of substances that could impair the overlay's bond, including told, mildew, oil, grease.

C. Re-clean surfaces with appropriate surface prep solvent and remove any haze or surface contamination.

3.3 APPLICATION

A. Application must be performed by qualified installer.

B. Do not proceed with installation until all finishing work has been completed in and around the work area.

C. Verify pattern prior to material acquisition.

D. Comply with manufacturer's installation instructions applicable to products and applications indicated, except where more stringent requirements apply. Wet application required.

E. Install substrates with no gaps or overlaps. Form smooth, wrinkle-free, bubble-free surface for finished installation.

F. Remove air bubbles, wrinkles, blisters and other defects. Use approved procedures to prevent the formation of air bubbles, wrinkles, blisters and other defects.

G. Refer to manufacturer's installation guide for additional details.

3.4 CLEANING AND PROTECTION

A. Use cleaning methods recommended by architectural surfacing manufacturer for applicable environment.

B. Protect completed glass finish during remainder of construction period.

C. Consult with authorized installation specialist for project specifics.

END OF SECTION 08 87 36

SECTION 09 22 00 — NON-LOAD BEARING METAL FRAMING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 SECTION INCLUDES

A. Work under this section shall include but shall not necessarily be limited to the supply and installation of the following:

1. Steel studs and tracks for interior gypsum wallboard partitions.

2. Steel stud furring at exterior walls and for interior gypsum wallboard finishes, including vertical and horizontal steel furring as indicated.

3. Steel stud blocking, furring, reinforcing channels and steel plate backing behind gypsum wallboard, for attachment of anchors and/or backing for wall hung cabinets, dryers, washroom and bathroom accessories, grab bars, handrails, wall stops, and other wall fixtures or accessories.

1.3 REFERENCES

A. Reserved

B. American Society for Testing and Materials International (ASTM)

1. ASTM C645-[00], Specification for Non-Structural Steel Framing Members

2. ASTM C754-[00], Specification for Installation of Steel Framing Members to Receive screw-Attached Gypsum Panel Products

C. Canadian General Standards Board (CGSB)

1. CAN/CGSB-1.40-[97], Primer, Structural Steel, Oil Alkyd Type

D. Environmental Choice Program (ECP)

1. CCD-047a-[98], Paints-Surface Coatings,

2. CCD-048-[98], Surface Coatings, Recycled Water-borne

1.4 SUBMITTALS

A. Make available upon request, certified test reports showing compliance with specified performance characteristics and physical properties

B. Provide product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

C. Conduct reinstallation meeting to verify project requirements, manufactures installation instructions and manufacturer's warranty requirements.

D. Submit detailed shop drawings for structural stud framing, bearing seal and signature of a professional engineer licensed to practice in location of project. Show design loads, materials, thicknesses, coatings, spacing o members, anchorage to building structure, fastening of members to each other, bracing, sliding track connections and other pertinent details.

1.5 DELIVERY, STORAGE AND HANDLING

A. Notify manufacturer of damaged materials received prior to installation

B. Deliver materials in manufacturers original, unopened, undamaged containers with identification labels intact

C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 PRODUCTS

2.1 MATERIALS

A. Unless otherwise specified, non-load bearing metal framing and furring shall be minimum 0.5 mm thick core steel, hot dip galvanized (wipe coat) to ASTM C645.

B. Studs, interior locations: Channel shaped screw on type: depth as indicated; Knurled supporting flanges at least 1 3/8" wide; with service pass through holes at 610 mm o.c. in web. Provide minimum 20 ga thick studs where stud depth exceeds 3 5/8" and/or where cementitious board and abuse resistant gypsum board is required.

C. Top and bottom runners: Channel sections, 1 3/8" legs. Depth to suit studs. Provide oversized top runner where required to accommodate deflection of structure.

D. Rough framing members: 1 ½" x ¾" x 18 ga and ¾" x ½" x 18 ga galvanized steel channels.

E. Furring and strapping members to receive gypsum board: ¾" deep channel shaped section with outstanding flanges and 1 3/8" wide knurled supporting face.

F. Resilient furring channel: 1/2" deep asymmetrical configuration steel sheet members designed to reduce sound transmission.

2.2 MATERIALS

A. General: provide aux. materials that comply with referenced installation standards.

B. Fasteners for steel framing shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten steel members to substrates as indicated in manufacturers literature.

C. Insulating strip: rubberized, moisture resistant 3mm thick foam strip, 12mm wide, with self sticking adhesive on one face, lengths as required. Strips shall be of a composition such that penetration of fasteners does not displace foam.

PART 3 EXECUTION

3.1 ERECTION

A. Deflection Allowances:

1. Deflection spaces between interior steel stud gypsum wallboard partitions and the structural floor and/or roof components are essential to allow for deflection of the framing components. Such spaces shall be provided at top of steel stud partitions at junction with structural members by use of movement joints.

B. General:

1. Framing and furring indicated is schematic and shall not be considered exact or complete. Location and spacing of members, bracing, supports and securement shall be in accordance with referenced standards as required to provide complete and finished work.

2. Make provision for supporting recessed and surface mounted fixtures and equipment. Provide additional framing, supports and stiffeners as required.

3. Neatly frame around recessed fixtures and openings.

4. Examine mechanical and electrical drawings and coordinate with Divisions 21 to 28 incl. to determine openings required.

5. Construct gypsum board assemblies which are permanently attached to building structure to resist seismic motions in accordance with reviewed shop drawings.

6. The sequence of installation of the gypsum steel stud partitions and furring shall be closely coordinated with the various Contractors whose materials and/or services are being installed within the partitions and metal furring. Sequence of installation shall be in accordance with the requirements of the construction schedule

7. Allowance shall be made in anchoring the floor track to accommodate tolerance in concrete floor slab of 1/8” in 10’-0”.

C. Partitions:

1. The steel stud gypsum wallboard partition types are designated on the drawings in accordance with types listed under Wall Schedule.
2. Unless specified or shown otherwise, extend steel studs to underside of structural slab above. Make provisions to accommodate structural creep and deflection.
3. All steel studs shall be spaced at 16” maximum, except where indicated otherwise. At curved walls/partitions space studs closer so as to maintain uniform curvature.
4. Install runner channels at top and bottom of partition and secure to supporting building elements at maximum 24” o.c.
5. Fix studs to runners by screws, crimping or welding through each stud
6. Where ceiling track is to be anchored to structure, use special track with extended sides and slip track to allow for deflection. Cut studs shorter than partition height and secure to slip track.
7. At partition corners extend one runner channel to end of corner and butt other runner channel; allow clearance for gypsum board thickness; do not mitre runner channels.
8. Install steel studs vertically; fix studs to runner channels by crimping or screwing on both sides of stud.
9. Install additional studs as detailed and required at partition intersections, openings and terminations at dissimilar materials. Place studs not more than 2” from abutting walls, openings and each side of corners.
10. Stiffen partitions over 10’ in height at mid-height with at least one ¾” horizontal bracing channel extending full length of partition.
11. Install structural stud framing in accordance with reviewed shop drawings.
12. Splice studs where necessary by nesting and lap minimum 8”; fix with minimum one screw per stud flange.
13. Where horizontal runs of service lines are to be installed, arrange with applicable trades to install lines simultaneously with partition. If standard openings in studs are too small for service lines, splice studs together as necessary, splice piece to be minimum 12” longer than height of the cut-out; splice as specified above

D. Ceilings and Soffits:

1. Erect suspension and furring system level with a maximum tolerance of 1/8" over a 10' length.

2. Suspension system shall support ceiling assemblies, with maximum deflection of L/360, L being span between supports.

3. Hangers for suspended ceilings shall support grillage independent of walls, columns, pipe and ducts. Space hangers at maximum 4'0" o.c. along rough furring members and not more than 6" from ends.

4. Space rough furring members at maximum 3'0" and not more than 6" from perimeter walls.

5. Space furring channels transverse to runner channels at maximum 24" o.c. except at exterior soffits, and secure to each support with clip or saddle tie with 2 loops of tie wire. Install furring channels so as not to contact perimeter walls.

6. Where ductwork, piping and other elements within ceiling spaces interfere with direct suspension of ceiling from structure, install additional framing securely fastened to main structure to accommodate proper hanging of ceiling.

7. Provide metal suspension system for acoustic wood fibre panel ceilings specified in Section 09 51 56. Provide supports at max 24" o.c. and at all terminations and penetrations. Coordinate with Section 09 51 56 as required.

E. Bulkheads, Coves, Furring:

1. Frame to profiles shown, rigid, square, true to line and securely fastened to supporting building elements.

2. Space furring members to receive gypsum board at maximum 24" o.c.

3. Provide rough framing and bracing members as required to ensure stability and accuracy of work.

F. Framed Openings:

1. Reinforce and frame all openings in steel stud walls and partitions to adequately carry loads, by the use of additional framing members and bracing as specified herein and/or detailed on drawings, and as recommended by manufacturer of steel studs.

2. Frame openings and reinforce as required for all recessed items in steel stud walls and partitions and suspended drywall ceilings, including but not necessarily limited to, mechanical and electrical equipment, electrical cabinets and boxes, fire hose cabinets, light fixtures, diffusers, speakers and other recessed fixtures as indicated or required.

3. Install two (2) 25 ga. steel studs at each side of door openings, pressed steel framed sidelight and window openings and other openings exceeding one stud space in interior steel stud partitions. Extend studs on each side of door openings from floor to underside of structure over.

4. Above door openings in fire rated steel stud partitions install two (2) steel stud runner tracks on flat above door opening and fasten back to back with runner track bent at each end to extend upwards not less than 6” and fastened to adjacent studs.

5. Install runner channel at head and/or sill of openings to accommodate intermediate studs. Each end of runner channel, cut out flanges, turn up web and screw to studs. Install intermediate studs above and/or below openings in same manner and spacing as specified above.

6. Install pressed steel door frames supplied by other Contractors, in steel stud partitions as scheduled. Screw-fix frame anchor clips to jamb, header and/or sill members; fixing to be adequate to prevent movement of frame relative to stud and to manufacturer's directions, shop drawings and ULC or WH requirements where applicable. Fix door frame to floor using floor anchor clips, fixing to be as required by structure and to manufacturer's directions, shop drawings and ULC or WH requirements, where applicable.

G. Backing and Reinforcing:

1. Provide and install all backing and/or reinforcing within interior steel stud gypsum wallboard partitions for items being hung from or anchored to such partitions or furring.

2. Backing or reinforcing to be provided shall include, but are not necessarily limited to, those for wall mounted cabinets, dryers, handrails, wall stops, grab bars and washroom accessories with required attachments for grab bars and washroom accessories as designated by the manufacturers.

3. Backing or reinforcing shall be as specified herein and/or as detailed, or as recommended by the manufacturer of steel stud system for each type and weight of item. Prior approval of all backing shall be received from the Consultant before gypsum wallboard is installed.

4. Attachments for securing plumbing fixtures, mechanical, electrical and other service outlets will be supplied and installed by those respective Contractors

3.2 CLEANING

A. Upon completion of installation, remove surplus materials, all trimmings and rubbish, tools and equipment barriers. Ensure framed partitions are clear of all construction waste in accordance with Section 01.

END OF SECTION 09 22 00

SECTION 09 29 00 — GYPSUM BOARD

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 SECTION INCLUDES

A. Work under this section shall include:

1. Interior Gypsum Wall Board
2. Exterior Gypsum board panels for ceilings and soffits
3. Cement Board Backings

B. Work under this section shall include but shall not necessarily be limited to the supply and installation of the following:

1. blocking, furring, reinforcing channels and steel plate backing behind gypsum wallboard, for attachment of anchors and/or backing for wall hung cabinets, dryers, washroom and bathroom accessories, grab bars, handrails, wall stops, and other wall fixtures or accessories.
2. Access panels in gypsum wallboard ceilings and walls as indicated.
    a. Refer also to Mechanical and Electrical divisions, specifications and scope for valve and service point locations.
3. Installation of pressed steel door frames in gypsum wallboard steel stud partitions.

1.3 RELATED SECTIONS

A. Reserved

B. Section 09 22 00 - Non-load Bearing Metal Framing

C. Section 06 10 00 - Rough Carpentry

D. Section 06 20 00 - Finish Carpentry

E. Section 07 92 00 - Joint Sealants

F. Section 08 11 00 - Metal Doors and Frames

G. Section 08 14 16 - Wood Doors

H. Section 08 34 73 - Sound Control Door Assemblies

I. Section 09 91 23 - Interior Painting

1.4 REFERENCE STANDARDS

A. Reserved

B. American National Standards Institute (ANSI):

1. ANSI A 108.11 - Interior Installation of Cementitious Backer Units
2. ANSI A 118.9 - American National Standard Specification for Test Methods and Specifications for Cementitious Backer Units

C. American Society for Testing and Materials (ASTM International)

1. ASTM C 473 - Standard Test Methods for Physical Testing of Gypsum Panel Products
2. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board
3. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications
4. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
5. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
6. ASTM C 1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
7. ASTM C 1178 - Standard Specification for Coated Glass Mat Water Resistant Gypsum Backing Panel
8. ASTM C 1280 - Standard Specification for Application of Gypsum Sheathing
9. ASTM C 1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units
10. ASTM C 1396 - Standard Specification for Gypsum Board
11. ASTM C 1629 - Standard Classification for Abuse Resistant Nondecorated Interior Gypsum Panel Products and Fiber reinforced Cement Panels
12. ASTM C 1658 - Standard Specification for Glass Mat Gypsum Panels

13. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
14. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
15. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials
16. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
17. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials
18. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials
19. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 176; C.
20. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

D. Gypsum Association (GA)

1. GA-214 - Recommended Levels of Gypsum Board Finish
2. GA-216 - Application and Finishing of Gypsum Panel Products
3. GA-253 - Application of Gypsum Sheathing

1.5 DEFINITIONS

A. Drywall: Gypsum board and vise versa; herby also referred to by the acronym GWB

B. FRR: Fire Resistance Rating.

1.6 QUALITY ASSURANCE

A. Gypsum board application and finishing: comply with requirements of ASTM C840, unless otherwise shown.

B. Gypsum Board finishing shall be to a minimum of level 4 for all interior spaces unless otherwise indicated on Consultant's assembly drawings.

C. Gypsum board elements that are permanently attached to building structure, and their support attachments, shall be designed and constructed to resist the effects

of seismic motions in accordance to local jurisdiction with applicable regulatory requirements.

1.7 FIRE PROTECTION REQUIREMENTS

A. Provide fire rated gypsum and cement board components and assemblies as indicated.

B. Where firehose cabinets, electrical panels or other fixtures or equipment are recessed into fire rated partitions, provide fire rated backing to maintain required fire rating.

C. Protect recessed fixtures in fire rated ceilings in accordance with fire rated assembly design report and/or as indicated.

D. Bulkheads / partitions in ceiling spaces above fire rated glazed screens, doors or other elements shall have same fire rating as screens/doors over which they occur.

E. Fire rated bulkheads may be required in ceiling spaces where construction changes from fire rated floor assembly to non fire rated wall assembly. Carefully examine Drawings to determine locations.

1.8 SUBMITTALS

A. Submit detailed and complete product data for each product required.

B. Where project conditions dictate special detailing of fire-ratings, fire proofing or acoustic seals, provide shop drawings and/or details indicating understanding of scope of work for review by the Consultant.

1.9 DELIVERY, STORAGE AND HANDLING

A. Handle gypsum board panels to prevent damaged and broken edges. Stack neatly to prevent sagging.

B. Store materials in dry place so as to preserve their quality and fitness for work.

1.10 SITE/ENVIRONMENTAL CONDITIONS

A. Maintain temperature range between minimum 10 degrees (C) and maximum 22 degrees (C) for 48 hours prior to and during application of GWB and joint treatment, and for at least 48 hours after completion of joint treatment.

B. Apply gypsum board after building has been completely enclosed, in dry, frost free environment.

C. Ensure that work to be concealed by gypsum board has been installed, tested, inspected and approved before starting work.

D. Report any unsatisfactory conditions, such as excessively sloping concrete floor slabs, in writing, to the Construction Manager.

E. Start no work until conditions are satisfactory. Commencement of work shall imply acceptance of conditions.

F. Protect work of this section against damage resulting from work of other sections. Repair and make good, to approval, damage to other sections caused by this work.

G. Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment materially immediately after its application.

H. Carefully coordinate this section of the work with the work of all other trades on which it is in any way dependent. Ensure the correct positioning and installation of other work with which finished drywall is to align with and/or upon which the work of subsequent trades is dependent.

PART 2 PRODUCTS

2.1 MATERIALS

A. Interior Wall Boards:

1. All gypsum board to comply with ASTM C1396; provide in maximum lengths and widths available that will minimize joints in each area and that correspond with the indicated support system

    a. Regular Type:

        1) 5/8” thick, unless otherwise specified

        2) Long edges Tapered

    b. Type ‘X’

        1) use where required for fire-resistance rated assemblies

        2) 5/8” thick, unless otherwise specified

        3) Long edges Tapered

    c. Flexible Gypsum Wallboard for Curved Surfaces:

        1) Manufactured to bend to fit tight radii and to be more flexible than standard regular-type panels of the same thickness, per as per ASTM C36 or ASTM C1396/C1396M,

        2) 1/4” thick,

3) Long edges tapered

d. Abuse resistant Gypsum Board:

1) 5/8” thick, unless otherwise specified

2) Long edges, tapered.

3) Provide type ‘X’ where required for continuity of fire resistance rating.

B. Shaft Wall Assemblies:

1. Gypsum Shaft Liner Panels:

a. Provide proprietary liner panels with moisture resistant paper faces; per ASTM C 1396/C 1396M / ASTM C 442/C 442M

b. 1” thick

c. Long edges, double beveled.

d. Provide type ‘X’ where required for continuity of fire resistance rating. Refer to Consultant’s drawings for required FRR.

e. Proprietary system shall be metal framed and ULC certified for the required FRR and construction type.

C. Tile Backing Board:

1. provide in maximum lengths and widths available that will minimize joints in each area and that correspond with the indicated support system

a. Moisture Resistant Gypsum Backing Board

1) Manufactured to ASTM C630/C630M or ASTM 1396/C1396M

2) 5/8” thick core

b. Cementitious Backer Board:

1) Manufactured to ANSI A118.9

2) 1/2” thick unless otherwise specified.

2. For adhesive applied ceramic tile in rest rooms, use cementitious back units as a substrate.

3. When using water-resistant gypsum backing board at tile applications, studs shall be spaced at 16 inches on center.

4. When using water resistant backing board on ceilings spacing of supports shall be 12 inches on center.
5. Board for paint finish:
    a. Board: polymer modified, fibreglass mesh reinforced concrte board, ½" thick, tapered edges
    b. Joint tape: 3" wide alkali resistant fibreglass mesh tape
    c. Joint compound: acrylic based
    d. Fill coat: Acrybase by Unifix.

D. Exterior Sheathing Board
1. Service Grade: Exterior grade.
2. Fire-Rated Fibreglass Mat-Faced Gypsum Sheathing:
    a. Thickness: 16mm (5/8"), unless otherwise specified.
    b. Acceptable Products:
        1) DensGlass

E. Refer also to Consultant Assembly Schedule.

2.2 TRIMS AND ACCESSORIES

A. Reveal mouldings and edge trim:
1. Extruded aluminum or other system as specified in the drawings. to ASTM C1047
2. Shapes:
    a. Cornerbead: Beaded angle with perforated flanges.
    b. Casing Bead: Channel shaped; beaded corners.
    c. Bullnose bead.
    d. LC-Bead: J-shaped; exposed long flange receives joint compound.
    e. L-Bead: L-shaped; exposed long flange receives joint compound.
    f. U-Bead: J-shaped; exposed short flange does not receive joint compound.

g. Expansion (control) joint.

h. Curved-Edge Cornerbead: With notched or flexible flanges

3. Use profiles as indicated in the drawings, if no profile is indicated request clarification from Consultant.

4. Acceptable manufacturers: Bailey Metal Products, Fry Reglet Architectural Metals, Gordon Inc. or Pittcon Industries.

5. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

B. Hangers: minimum 1/8" galvanized steel wire.

1. Provide engineered shop drawings of all connections to exiting ceilings for review

C. Tie wire: minimum 16 ga soft annealed galvanized steel.

1. Provide engineered shop drawings of all connections to exiting ceilings for review

D. Metal control joint section: bellows shaped section with perforated flanges.

E. Jamb assemblies:

1. Refer to typical jamb details in the drawings to determine whether jamb assembly is an installed product, or fabricated by the Contractor.

2. Acceptable manufacturers: ZIP-CLIK by ForestView Products or other jamb assembly as specified in the drawings. If no manufacturer is specified in the drawings, then the jamb is to be fabricated by the Contractor.

F. Drywall screws: self drilling, self tapping, case hardened.

2.3 ACCESS PANELS

A. Access panels in gypsum wallboard ceilings and walls, as per mechanical and electrical.

B. Locations and Sizes: As indicated on reflected ceiling plans and interior elevations, or as required.

C. Type: Flush access prime coated steel, concealed hinges, cam operated flush locks; type to suit installation in gypsum wallboard suspended ceilings and in exterior stucco soffits.

D. Approved Manufacturers: Bauco; Maxam Metal Products; LeHage; Milcor; Acudor, Nystrom; or other preapproved manufacturer.

2.4 JOINT TREATMENT MATERIALS

A. Comply with the requirements of ASTM C475/C 475M

B. Joint Tape:

1. Interior Gypsum Wallboard: 2” perforated type.

2. Exterior Gypsum Soffit Board: 2” perforated type..

3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard:

1. For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

a. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.

b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type or setting-type taping compound.

1) Use drying-type or setting-type compound for installing paper-faced metal trim accessories.

c. Fill Coat: For second coat, use drying-type or setting-type, sandable topping compound.

d. Finish Coat: For third coat, use drying-type or setting-type, sandable topping compound.

e. Skim Coat: For final coat of Level 5 finish, use drying-type or setting-type, sandable topping compound.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable compound.

E. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting type sandable compound.

F. Laminating adhesive: CGC Durabond 90 compound by CGC, or equivalent product by CertainTeed.

G. Joint filler and topping cement: casein, vinyl or latex base, slow setting.

2.5 ACOUSTICAL MATERIALS

A. Acoustic Insulation: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

B. Caulking: to CAN/CGSB 19.21 M87. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)

C. Steel deck closures: Expanding Foam Sealant, sized and shaped to fit flutes.

PART 3 EXECUTION

3.1 INSTALLATION

A. Unless otherwise specified, erect gypsum board vertically or horizontally, whichever results in fewer end joints. Make joints tight, accurately aligned and rigidly secure.

B. Locate board end joints over supporting members.

C. Cut and fit gypsum board as required to accommodate other work.

D. Unless otherwise shown or specified, extend gypsum board on both sides of partitions to underside of structural deck above. Fasten gypsum board to studs, not to top channel. Allow for deflection.

E. Do not install gypsum board until wood blocking or other back up components are installed. Remove and reinstall gypsum board at no extra cost to Contract where this requirements is not complied with.

F. Provide corner beads at external corners.

G. Provide casing beads around openings and where gypsum board abutts dissimilar material and construction.

H. Fasten gypsum board to supports with screws spaced at maximum 12” o.c.

I. Install gypsum sheathing horizontally at outside of exterior wall steel studs. Fasten each board at each stud with minimum 3 screws.

J. Adhesive bonded gypsum board; apply ½” x ½” ribbons of laminating adhesive to back side of board, parallel to long dimension; space adhesive ribbons at max.6” o.c. temporarily brace boards until complete adhesive bond develops.

K. Where double layer gypsum board is required, screw fasten second layer through first, into framing; offset joints in second layer.

L. Where using cementitious board joints at locations scheduled to be painted with 3-step joint finishing system as recommended by board manufacturer. Apply fill coat over entire board surface to achieve smooth, uniform surface, ready for painting. Provide corner and casing beads similar to gypsum board installation.

3.2 LEVEL OF FINISH

A. Refer to Consultants Assembly Schedule and Interior Finishes Schedule for Level of finish to be applied throughout project.

B. Finish gypsum board walls and ceilings to the following levels in accordance with the Association of the Wall and ceiling Industries (AWCI) "*International Recommended Specification on Levels of Gypsum Board Finish*"

1. ***Level 0*****:** No taping, finishing or accessories are required.

2. ***Level 1*****:** Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable

3. ***Level 2:*** Embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint and compound; tool marks and ridges are acceptable.

4. ***Level 3:*** Embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and frees of tool marks and ridges.

5. ***Level 4:*** Embed tape for joints and interior angles in joint compound, and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.

6. ***Level 5:*** Embed tape for joints and interior angles in joint compound, and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply additional his skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.

3.3 ACCESSORIES, JOINTS AND RELIEF JOINTS

A. Erect accessories straight, plumb or level, rigid and in proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secure. Mitre and fit corners accurately, free from rough edges. Secure at 150mm on centre.

B. Install casing beads around perimeter of suspended ceilings

C. Install casing beads where GWB butts against surfaces having no trim concealing junction where indicated. Unless otherwise specified, conceal joints with sealant.

D. Unless otherwise indicated, Install insulating strips continuously at edges of GWB and casing beads abutting metal window and exterior door frames to provide thermal break.

E. Control Joints:

1. Provide control joints where shown and at maximum 25' o.c. Install straight and true.

2. Break continuity of gypsum board and framing system at control joints; install continuous metal control joint section.

F. Relief Joints:

1. Provide relief joints where shown and where gypsum board assemblies abutt dissimilar construction.

2. Stop gypsum board ¼" from abutting construction at dissimilar building elements, unless otherwise indicated.

3. Where gypsum board comes into contact with window frames or exterior door/ screen frames install thermal break. Adhere self sticking tape to casing bead and compress during installation of gypsum board.

4. Where indicated, install reveal mouldings.

G. Finish cornbreads, control joints and trim as required per Clause 3.2 (b), feathering compound onto panel faces

1. Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface go GWB so as to be invisible after surface finish is completed.

2. Sand lightly to remove burred edges, and other imperfections. Avoid sanding adjacent surface of board

3. Unless Level 0- Level 2 required, completed installation shall be smooth, level or plumb, free from waves and other defects, ready for surface finish.

4. Apply one coat of white primer sealer over surfaces to be textured.

3.4 SOUND CONTROL

A. Acoustical Insulation: Provide acoustical insulation in gypsum board partitions and ceilings as indicated. Unless otherwise noted provide 2" thick insulation. Extend acoustical insulation over full height of partition, including portions located above ceiling.

B. Acoustical Caulking:

1. Provide acoustical caulking at all partitions, bulkheads and ceilings scheduled to receive acoustical insulation as follows:

    a. At perimeter of gypsum board partitions and ceilings.

    b. Around objects penetrating gypsum board elements.

2. Provide 2 bead caulking system around horizontal and vertical perimeters of partitions. Apply continuous sealant beads at each side of horizontal runner tracks and vertical end studs, between gypsum board and adjacent construction.

3. Caulk around objects such as electrical outlets, light switches, electrical and mechanical panels and boxes, grilles, and other objects penetrating. Caulk behind metal control joint sections.

4. Where acoustically insulated partitions meet steel deck running perpendicularly to partition, provide steel deck closures.

3.5 DOOR FRAMES / ACCESS DOORS

A. Coordinate work with Division 8

B. Install access doors supplied by Divisions 21 to 28 incl. Build doors into gypsum board elements flush and parallel to walls and securely fastened.

C. Install steel door frames occurring in gypsum board partitions. Follow installation requirements specified in Section 08 11 00.

D. Coordinate the work and prepare openings and install access panels in steel stud walls, partitions and ceilings. Access panels will be supplied by other applicable subtrades for access to plumbing, mechanical, electrical and other service points

3.6 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged:

1. Indications that panels are wet or moisture damaged include, but are not limited to, discolouration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

END OF SECTION 09 29 00

SECTION 09 30 00 — TILE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED WORK

A. Section 07 92 00 — Joint Sealants

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Member of Terrazzo, Tile and Marble Association of Canada (TTMAC) or approved by the Consultant.

1.4 SUBMITTALS

A. Of each type of tile required, submit sample consisting of minimum 4 tiles bonded to rigid board back up and joints filled with grout. Select tiles to show full range of tile to be used. Resubmit sample if required until tile range and group colour is approved by the Consultant.

B. Submit list of mortar mixes and grouts to be used. In each case products proposed must be suitable for the purpose intended and they shall be capable to produce top quality work. Upon Consultant's request submit evidence of material manufacturer's endorsement of products proposed.

C. Upon Consultant’s request submit samples of bases, trim, edgings, and fittings.

D. Submit manufacturer’s recommended maintenance procedures and materials for inclusion into operation and maintenance manual.

1.5 SITE CONDITIONS

A. Maintain minimum air temperature of 10*C during installation and curing period.

B. Exclude construction traffic from areas to receive tile during installation and curing period.

C. Protect tile flooring subjected to construction traffic with non staining protective covers.

PART 2 PRODUCTS

2.1 MATERIALS

A. Refer to Room Finish Schedule for tile specifications and proposed grouting, subject to change and colour selection by Consultant.

B. Products by Laticrete listed herein are specified to establish a standard of acceptance. Equivalent products, subject to Consultant's review, by Mapei and H.B. Fuller are also acceptable.

C. Water: clean and non staining.

D. Portland cement: CSA A3001-13.

E. Sand: ASTM C114-11.

F. Waterproof membrane: liquid rubber with reinforcing fabric: Laticrete 9235

G. Thin set mortar: latex-portland cement mix: Laticrete 211/4237.

H. High strength mortar: 100% solids epoxy adhesive: Latapoxy 300.

I. Organic adhesive: latex adhesive to ANSI A136.1: Laticrete 15 Multi-Mastic.

J. Floor grout: Presanded, coloured latex grout: Laticrete 1500 Series/1776; colours selected by Consultant.

K. Wall grout: Unsanded dry set, coloured: Laticrete 1600 Series/1776; colours selected by Consultant.

L. Edge trim: Reno-U by Schluter Systems in brushed antique bronze anodized aluminum finish, height to suit tile thickness or slab depression.

M. Control joints: Schlüter DILEXL-BWB, height to suit tile thickness, colour selected by Consultant.

N. Cleaning, sealing and top coating compounds: as recommended by TTMAC and acceptable to the tile manufacturer.

2.2 MIXES

A. Mortar and grout: mix using suitable mechanical mixers in accordance with material manufacturer's directions.

B. Place liquid into mixer, start mixer and add dry material. Mix only long enough to wet out batch; do not overmix. Dump mixed material from mixer promptly and clean out mixer with water after each batch

PART 3 EXECUTION

3.1 PREPARATION

A. Substrates shall be structurally sound and clean and free of foreign matter and minimum 10°C. Fill rough and uneven surfaces with patching mortar.

B. Clean substrates as required to produce acceptable surface. Dampen and sweep dusty and dry surfaces

3.2 INSTALLATION

A. Waterproofing Membrane:

1. At floors with floor drains and where indicated at other areas, provide waterproofing membrane below ceramic tile. Follow manufacturer's directions.
2. Reinforce cracks in substrates and junctions of horizontal and vertical surfaces with 8" wide strip of waterproofing reinforced with 6" wide reinforcing fabric.
3. Apply waterproofing liquid with roller or brush and, while still wet, place reinforcing fabric onto it. Use brush to embed fabric and to smooth out wrinkles. Lap fabric 2" at seams.
4. Apply second coat to cover fabric and let dry to touch. Apply final coat to completely seal membrane.
5. Carry waterproofing membrane up and over curbs and up surrounding walls, minimum 6" high, but in no case shall membrane be visible in finished work.
6. Place liquid into mixer, start mixer and add dry material. Mix only long enough to wet out batch; do no over mix. Dump mixed material from mixer promptly and clean out mixer with water after each batch.

B. Tile General:

1. Unless otherwise specified, meet applicable requirements of TTMAC Tile Installation Manual 2012 - 2014.
2. At interior floors with floor drawings, at ground floor areas and where required to meet level of adjacent floors, provide mortar bed to slopes and thickness required.
    a. All locations except where indicated otherwise: thin set mortar.
    b. Gypsum board substrate: organic adhesive.
3. Finished work shall be level, plumb, or sloped as shown, true, square and free of defective, chipped, broken, discoloured or blemished tiles. Maximum allowable finished surface variation shall be 1/8" in 10' when measured, in any direction, with a 10' straightedge.
4. Lay out tile patterns symmetrically within each area and to patterns shown. Unless otherwise indicated or directed provide stacked pattern.
5. Joints shall be parallel, uniform, neat, straight, square and completely filled. Provide joint width as directed by Consultant.

6. Fit tile neatly against and around interruptions, penetrations and abutting dissimilar surfaces. Wherever possible, drill holes for penetrating elements to ensure neat fitting.
7. Provide accent patterns as shown, or if not shown, as directed by Consultant.
8. Provide tile manufacturer's standard trim pieces at changes in direction and at terminations. Unless otherwise indicated provide the following corner and edge conditions:
    a. Internal horizontal corners: coved.
    b. External vertical and horizontal corners and edges: bullnose.
    c. Internal vertical corners and unexposed edges: square butt joints.
9. Provide metal edge trim at junction of floor tiles with other flooring materials.
10. After setting, sound tiles and replace hollow backed tiles.

3.3 GROUTING

A. Commence grouting not earlier than 24 hours after setting tiles unless otherwise directed by grout manufacturer.

B. Force grout into joint so as to fill them flush, leaving no voids.

C. Promptly as work progresses remove excess grout from adjacent tile surfaces before grout established tight permanent adhesion.

D. Cure grout in accordance with manufacturer’s directions.

3.4 CLEANING

A. Thoroughly clean tile surfaces in accordance with material manufacturer’s recommendations.

B. Polish after cleaning with clean, dry cloths.

C. Seal and top coat unglazed tiles in accordance with TTMAC recommendations, as directed by Consultant, except where tile manufacturer recommends against it.

D. Remove grout haze from tile surfaces. Use acid wash method if required.

END OF SECTION 09 30 00

SECTION 09 51 56 — ACOUSTIC WOOD AND FIBRE PANEL CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED WORK

A. Section 09 29 00 - Gypsum Board

B. Division 21 to 25: Mechanical fixtures

C. Division 26 to 28: Electrical fixtures

1.3 DESCRIPTION

A. Work of this Section includes acoustic wood fibre panel ceilings secured to metal suspension system provided by Section 09 29 00.

1.4 SUBMITTALS

A. Submit detailed and complete product data for each product required.

B. Submit detailed installation drawings showing panel layout, fastening details and joint treatment.

C. Submit duplicate 8” x 8” wood fibre panel with required paint finish/colour and incorporating the required edge profile.

1.5 MOCK UP

A. At location directed by Consultant provide mock-up of acoustical wood fibre panels, minimum 8’ x 8’ showing required materials, installation method, finishes/ colours, edge conditions.

B. Mock-up may be incorporated into finished work, once approved by Consultant.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

C. Prevent soiling, physical damage or wetting.

D. Store cartons open at each end to stabilize moisture content and temperature.

1.7 JOB CONDITIONS

A. Do not install ceiling panels until building is closed in and HVAC system is operational.

B. Locate materials onsite at least 24 hours before beginning installation to allow materials to reach temperature and moisture content equilibrium.

C. Maintain the following conditions in areas where acoustical materials are to be installed 24 hours before, during and after installation:

1. Relative humidity: 65 - 75%

2. Uniform temperature: 13 - 21*C

PART 2 PRODUCTS

2.1 MATERIALS

A. Ceiling Panels: 1” thick cementitious wood fibre panels consisting of Aspen wood fibres bonded with inorganic cement by Tectum Inc.

1. Tectum panels with steel stud framing.

2. Panel sizes: 4’ x 8’ nominal; (cut to fit where required)

3. Panel edge: square

B. Fasteners: self drilling, self tapping countersunk plated screws. Colour to match colour of painted panels.

C. Panel finish paint: alkali resistant latex paint : No pre-finished panels. Spray paint exposed panel surfaces prior to installation. Refer to Finish Schedule for specific paint colour.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine existing conditions, particularly the metal suspension system provided by Section 09 21 16, to ensure that they are acceptable for the installation of the acoustic wood fibre panel ceiling.

B. Start of installation shall imply acceptance of conditions.

3.2 INSTALLATION

A. Install panels in accordance with reviewed shop drawings and with manufacturer’s printed directions, level, square and true to line.

B. Where panel width required is less than the fabricated width, cut panels to suit. Cut edges shall be clean, straight and unbroken bevel cut edges.

C. Fasten panels to supporting framing with screws spaced at maximum 300mm o.c. along each support member and not less than 20mm, not more than 60mm from panel edge. Countersink screws.

D. Make cut-outs in panels to accommodate penetrating work of other Sections.

E. Field paint cut edges and fastener heads to match surface colour and sheen.

3.3 CLEANING AND TOUCH UP

A. Keep panels clean. Remove blemishes promptly as work progresses.

B. Touch up any minor finish damage.

C. Replace panels which in the opinion of the Consultant cannot be satisfactorily repaired.

END OF SECTION 09 51 56

SECTION 09 65 30 — SHEET LINOLEUM FLOORING

PART 1 GENERAL

1.1 GENERAL INSTRUCTIONS

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

1.2 QUALITY ASSURANCE

A. Qualifications: Provide work of this section, executed by competent installers with minimum 5 years experience in application of Products, systems and assemblies specified and with approval and training of Product manufacturers.

B. Conduct a pre-installation meeting in accordance with Section 01312

C. Products installed as part of the work of this section shall be from same production run.

1.3 SUBMITTALS

A. Submit required submittals in accordance with Section 01330.

B. Product data sheets:

1. Submit manufacturer's Product data sheets for Products proposed for use in the work of this section.

C. Samples:

1. Submit samples of each pattern and colour of linoleum flooring proposed for use in the work of this section.

D. Samples for verification: in manufacturer's standard size, but not less than 150mm x 230mm (6" x 9") sections of each different colour and pattern of floor covering required.

1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 230 mm (9") long, of each colour required.

E. Seam Samples: for seamless-installation technique indicated and for each floor covering product, colour, and patter required; with seam running lengthwise and in centre of 150 mm x 230 mm (6" x 9") sample applied to a rigid backing and prepared by Installer for this Project.

F. Closeout submittals:

1. Maintenance data:

a. Submit maintenance data in accordance with Section 01770.

b. Provide data sheets for maintenance of flooring for incorporation into maintenance manual.

2. Maintenance materials:

   a. Submit maintenance materials in accordance with Section 01770.

   b. Submit 2000 mm x 4500 mm (6'6" x 14'8") of each colour in full running length, pattern and type flooring material required for this project for maintenance use.

   c. Maintenance materials to be same production run as installed materials.

   d. Suitable package for protection and storage, each identified with name of manufacturer and flooring material.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Install materials of this section only when surfaces and air temperatures have been maintained between 18*C and 32*C for 48 hours preceding installation, and will be so maintained during installation and for 48 hours thereafter. Maintain a minimum temperature of 13*C after above period.

B. Ensure that adequate ventilation is provided during installation and curing of materials of this section.

C. Ensure that spark-proof electrical equipment is provided, and smoking is prohibited, in ares where flammable adhesives are used. Store materials to prevent spontaneous combustion.

D. Conduct the tests in accordance with ASTM F710-05 and the following:

   1. Test for moisture vapour transmission in accordance with ASTM F710-05 and ASTM F1869-04 or ASTM F2170-02 in accordance with manufacturer's written flooring installation instructions. Results must not exceed 170 µg/m2 (3 pounds per 1,000 square feet) in 24 hours when tested to ASTM F1869-04, or exceed 75% when tested to ASTM F2170-02.

   2. Test for surface pH. Levels of pH shall not exceed the written recommendations of the flooring manufacturer and adhesive manufacturer. Test in accordance with ASTM F710-05.

   3. For each test type: Conduct 3 tests for flooring applications up to 93 m2 (1000 square feet) in area, and 1 additional test for each additional 93 m2 (1000 square feet) of flooring area.

   4. Testing shall be conducted by independent inspection and testing company and in accordance with Section 01450.

5. In areas that are exposed to intense or direct sunlight, Products shall be protected during the conditioning, installation, and adhesive curing periods, by covering the light source.

1.5 DELIVERY, STORAGE AND HANDLING

A. Package flooring materials and identify contents of each package.

B. Store materials for a minimum of 24 hours immediately before installation at no less than 18*C.

1.6 WARRANTY

A. Warrant work of this section for a period of 2 years, in accordance with Section 01780.

PART 2 PRODUCTS

2.1 LINOLEUM

A. Linoleum sheet flooring: to ASTM F2034, Type 1, colours and pattern detail shall be dispersed throughout the thickness of the wear layer.

1. Thickness: .1 2.5 mm (1/10”).

2. Acceptable Products:

a. Forbo Marmoleum

2) Colour: refer to Finish Schedule.

b. Substitutions: refer to Section 01250.

B. Base board: Johnsonite Tightlock for resilient flooring. 3” face. Colour to be selected by Consultant.

2.2 ADHESIVES

A. Primers and adhesives: Low VOC, maximum VOC limit of 50g/L (1.8 oz/gal), as recommended and manufactured by linoleum sheet flooring manufacturer.

2.3 ACCESSORIES

A. Substrate filler; for patching, smoothing, and levelling monolithic substrates: Low VOC, as recommended by linoleum sheet flooring manufacturer.

B. Flash cove accessories:

1. Resilient cove cap: Johnsonite SCC-XX-A or approved alternate, 19 mm (3/4") x 3 mm (1/8") J-profile, colour to later selection by Consultant.

2. Plastic filler; for sealing joints between top of wall base or integral cove cap and irregular wall surfaces: Low VOC, plastic filler applied according to flooring manufacturer's recommendations.

3. Fillet support strip; for integral cove base: minimum radius of 25 mm (1”) of plastic.

C. Seaming system: Low VOC, heat welding rode system as manufacturer linoleum manufacturer. Colours as selected by Consultant.

D. Temporary protection material: Heavy kraft paper with joints lapped and taped or as otherwise required to prevent damage of finished finishing application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate to ensure clean lines, correct level and freedom from cracks, ridges, dusting, scaling and carbonation.

B. Examine floors in advance of application of flooring to ensure that floors are protected against entry of water and moisture. Perform compatibility test with primer/adhesive and substrate.

C. Ensure that environmental conditions have been provided as requested and specified.

3.2 PREPARATION

A. Comply with recommendations of ASTM F710-05

B. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Alkalinity and adhesion testing: Perform tests and proceed with installation only after substrates pass testing. Document tests performed and submit in writing to Consultant.

E. Fill cracks, holes and depressions in substrates with trowel-applied levelling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

F. Do not install floor coverings until they are same temperature as space where they are to be installed.

1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

G. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

H. Remove chalking and dusting from concrete surfaces with wire brushes.

3.3 FLOORING APPLICATION

A. Apply adhesive uniformly and install flooring in accordance with flooring manufacturer's instructions. Do not spread more adhesive that can be covered by flooring before initial set takes place.

B. Lay out floor coverings as follows:

1. Lay flooring with joints parallel to building lines to produce symmetrical pattern and minimum joints. Use full sheet size to produce minimum joints. Lay sheet flooring centered in corridors, with equal sized sheet to either side of center sheet. Weld all joints. Border widths minimum 1/3 width of full material.

2. Install in accordance with Consultant's floor pattern.

3. Maintain uniformity of floor covering direction.

4. Minimize uniformity of floor covering direction.

5. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 150 mm (6") away from parallel joints in floor covering substrates.

6. Match edges of floor coverings for colour shading at seams.

7. Avoid cross seams.

C. Do not reverse alternate sheets.

D. Install rolls in sequential order and reverse sheets.

E. Cut pieces to length allowing approximately 75 mm (3") excess for trimming.

F. Cut the first piece to fit by freehand knife, direct scribing or pattern scribing method.

G. Remove 12.7 mm (1/2") off the factory seam edge using an edge trimmer or straight edge and knife.

H. Position all remaining sheets so that the top sheet overlaps the previous sheet by 12.7 mm (1/2". Trim 12.7 mm (1/2" off opposite seam edge using an edge trimmer or straight edge and knife.

I. Fold back the sheets and apply the adhesive to the subfloor and allow proper open time.

J. Install flooring to entire area indicated or scheduled, including cover plates occurring within finished floor ares. Maintain overall continuity of colour and pattern with pieces of flooring installed on cover plates. Tightly butt edges to perimeter of floor around cover plates and to cover plates. Cut flooring to floor drains occurring within finished floor areas.

K. Roll the flooring in both directions using 68 kg (150 lb) three-section roller. (Stay approximately 75 mm (3” from the seam).

L. Cut and fit neatly around the fixed or excessively heavy objects.

M. Terminate flooring at centreline of door in openings where adjacent floor finish or colour or dissimilar.

N. Install rubber strips at unprotected or exposed edges where flooring terminates.

O. Flooring installation shall not show telegraphing of substrate. Flooring installation shall be homogeneous free of substrate lines, pockets, bumps and unevenness.

P. Heat-welded seams:

1. Weld seams in accordance with ASTM F1516-03

2. Wait a minimum of 24 hours after installation before heat welding the seams.

3. Rout joints to approximately 2/3 of the thickness of the material and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

4. Finished welded seam be flat and flush with adjacent flooring. Trimming of welded joint while warm is not permitted unless final trimming is performed after weld has cooled to flooring temperature.

5. Roll the seam area with 45 kg (100 lb) three-section roller.

3.4 WALL BASE INSTALLATION

A. Install wall bases in accordance with manufacturer’s instructions.

3.5 ACCESSORIES

A. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer’s recommendations.

3.6 CLEANING

A. Perform initial maintenance according to the manufacturer's printed instructions.

B. Remove excess adhesive from surfaces of the sheet flooring and base as work progresses.

C. Thoroughly clean surfaces in accordance with manufacturer's recommendations

3.7 PROTECTION

A. Protect new floors from time of final set of adhesive until final inspection. Install suitable protection sheeting, lap joints of material by 150 mm (6") and seal with non-asphaltic tape.

B. Prohibit traffic on floor for 48 hours after installation. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.

C. Install floor protection in areas where other work, repairs and installation of equipment, and foot traffic will occur.

END OF SECTION 09 65 30

SECTION 09 68 13 — TILE CARPETING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Section 09 65 13 — Resilient Base and Accessories

1.3 SUBMITTALS

A. Submit duplicate minimum 4” x 4” samples of complete range of each specified carpet tile.

B. Submit four 20” x 20” pieces of each type and colour carpet tile selected.

C. Submit duplicate, minimum 12” long pieces of binder bar.

D. Provide maintenance data for carpet tile maintenance for incorporation into maintenance manual, per the requirements of Section 01 77 00 — Project Closeout Procedures and Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver carpet tile to site and store until used in protective coverings with each package numbered and identified as a dye lot.

B. Store materials within building in a dry area having ambient temperature of at least 15°C for a period of at least 48 hours immediately before commencement of carpet installation.

C. Do not stack cartons more than six high.

1.5 EXTRA MATERIALS

A. Deliver an additional 5% of each type, pattern and colour of carpet tile required for this project for maintenance use. Store where directed. Clearly identify each package.

B. Maintenance materials to be same production run as installed materials.

1.6 SITE CONDITIONS

A. Protect carpet tile which will be subjected to construction traffic against damage, soiling and staining during installation period and thereafter until completion of entire building.

1.7 WARRANTY

A. At no cost to Owner, remedy defects in work of this Section due to curling, rolling or shifting of carpet squares for a period of 2 years from Substantial Performance.

PART 2 PRODUCTS

2.1 MATERIALS

A. Carpet tile: by Interface Flooring

1. refer to Finish Schedule for carpet tile type, colour and locations.

B. Adhesive: releasing type as recommended by carpet manufacturer

C. Edge Protection: Schluter Reno-U transition profile. Aluminum. Height to suit carpet.

D. Base board: Johnsonite Tightlock for resilient flooring. 3” face. Colour to be selected by architect.

E. Wiremould: ‘Connectrac’, in carpet wireway

1. coordinate with electrical requirements per Division 26 - Electrical and comms requirements per Divison 27 - Communications.

2. Finish to be selected by Architect from standard range of colours.

F. Requests for substitution shall be made in accordance with Section 01 25 00 — Substitution Procedures.

PART 3 EXECUTION

3.1 PREPARATION

A. Test substrates for moisture content with moisture meter. Do not proceed with carpet installation unless moisture content is within range acceptable to carpet manufacturer and verified by Consultant.

B. Clean substrates of dirt, dust, grease and other foreign substances detrimental to adhesion and appearance.

C. Fill gaps, cracks, and depression in substrates with levelling compound as recommended by carpet manufacturer.

3.2 INSTALLATION

A. Install carpet tile in strict accordance with manufacturer’s current printed directions.

B. Lay-out carpet tiles symmetrically within each area so as to provide maximum size perimeter.

C. Install carpet tiles following patterns shown in the Finish Floor Plan. Quarter turn tiles.

D. Unless otherwise directed, lay squares in ashlar pattern running parallel to major building lines, as directed by Consultant.

E. Apply adhesive in approximately 6” wide strips, one strip for each course of tiles.

F. Install carpet tiles when adhesive has reached a consistency where it will no longer transfer to back of squares.

G. Lay tiles in straight rows with tightly butted joints. Check joints frequently to ensure that they are tight and square. Blend edges with a seam roller.

H. Accurately cut carpet tiles to fit as openings, perimeter, protrusions and penetrations.

I. Install edge protection bar at exposed carpet edges.

3.3 CLEANUP

A. Immediately following installation, vacuum clean carpet; remove all loose pieces of face yarns with sharp scissors; remove adhesive spots and other stains in accordance with carpet manufacturer’s recommendations.

B. Hand over to Owner stacked, sorted according to colour, wrapped and properly identified, all cut carpet squares or half width or large.

END OF SECTION 09 68 13

SECTION 09 91 00 — PAINTING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED WORK

A. Section 06 20 00 — Finish Carpentry

B. Section 05 12 23 — Structural Steel for Buildings

C. Section 05 21 00 — Steel Joist Framing

D. Section 05 31 00 — Steel Decking

1.3 ACCEPTABLE MANUFACTURERS

A. Unless otherwise specified, materials shall be manufactured and supplied by one of the following:

1. Benjamin-Moore
2. Canadian Industries
3. Dulux Paints
4. Para Paints
5. Pratt & Lambert
6. Sherwin-Williams

1.4 LIST OF MATERIALS, SAMPLES

A. List of Materials:

1. Before ordering materials, submit written request in form acceptable to Consultant, for approval of paint materials. List each of the materials proposed and surfaces to be covered. State manufacturer’s name and brand name of materials.
2. List of materials shall be endorsed by manufacturer as being the best material for the applicable condition.
3. Do not order material or commence work until list of materials is approved by Consultant.

B. Samples:

1. Submit two 8" x 10" draw downs of each paint colour coated with manufacturer's paint system to confirm colour match with colours selected by Consultant.
2. Submit sample of natural and stained finishes on each species and grade of wood to receive such finishes.
3. Prepare full size samples showing each type of door finish.
4. Prepare sample panels of each wall and ceiling paint system specified, as directed by Consultant.

C. Maintenance Materials:

1. Upon completion of work provide one sealed and properly identified 1 gallon can of each type and colour paint used on this project.
2. Only top coating paints used in building interior are required.

1.5 PRODUCT HANDLING

A. Deliver paint materials to site in sealed original labelled containers bearing manufacturer's name, brand name, type of paint and colour designation.

B. Store materials in strict accordance with manufacturer's recommendations.

C. Store paints, stains, varnishes, equipment in designated area only. Maintain separate workshop/storage area for duration of work by this Section.

1.6 JOB CONDITIONS

A. Environmental Conditions

1. Maintain temperature in interior areas to receive coatings between 15*C and 25*C for at least 24 hours before, during application and until coatings have cured after application. Apply exterior coatings only when temperature is above 10*C.
2. Adequately ventilate areas where coatings are being applied. Maintain a reasonably dust-free atmosphere for duration of work.

B. Protection:

1. Protect adjacent surfaces not scheduled to receive coatings from damage.
2. Remove electrical plates, surface hardware, fittings, and fastenings prior to painting operations. These items shall be carefully stored, cleaned and

replaced on completion of work in each area. No solvent shall be used to clean hardware that will remove permanent lacquer finish on these items.

3. Mask labels and specification plates occurring on equipment to be painted.

4. Post “wet coating” signs and “no smoking” signs while work is in progress and while coatings are curing.

5. Keep oily rags, wastes and other combustible materials in closed metal containers and remove at end of each work day. Take every precaution to avoid spontaneous combustion.

C. Work Schedule:

1. Unless otherwise permitted, apply coatings only after all other Sections have completed their work.

2. Co-ordinate work of this Section with that of Section 07 92 00 and review order of installation with Consultant where sealants are installed adjacent to painted surfaces.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials shall be “top line quality” products and shall be supplied by a single manufacturer except for specialty products not available from paint manufacturer.

B. Materials wherever possible shall be low odour products, free or low in VOC content.

C. Paints shall be factory mixed unless otherwise specified, except any coating in paste or powder form, or to be field-catalyzed shall be field-mixed in accordance with manufacturer’s directions.

D. Primers shall be as specified by manufacturer and fully compatible with finish coats.

E. Stains shall be of the rapid dry, alkyd base type or pigment oil type.

F. Varnishes shall be synthetic type.

G. Shellac shall be pure white gum in pure grain alcohol.

H. Thinners, cleaners: as recommended by paint manufacturer.

I. Epoxy paint: two part epoxy polyamide system: Dulux 5461/5242 primer and 5240/5242 top coat or equivalent system by other manufacturers listed.

J. Concrete floor sealer: clear penetrating, 100% Silane: Chem-Trete Dynasylan BH-N by Degauss.

K. Zinc rich primer: reinforced inorganic zinc coating: CathaCoat 302 by Devoe.

L. Paint for structural steel: white aliphatic polyurethane, field applied. Epoxy primer shop applied in light grey.

2.2 FINISHES

A. Paint colours and other finishes will be selected by Consultant. Do not start work until after receiving colour schedule.

B. Refer to Finish Schedule for paint colours.

C. Colours selected by the Consultant will not necessarily be from manufacturer's standard colours.

D. A variety of colours may be used. Consultant may select different colours for different elements such as ductwork, bulkheads, exposed decks, slabs and structural steel. Some colours may be deep tones.

E. Confirm gloss levels for all surfaces with Consultant before starting work. Unless otherwise indicated, allow:

1. Walls: eggshell
2. Ceilings: flat
3. Frames, doors, trim: semi-gloss.

F. Paint all exposed framing, roof deck, structural steel, piping, ductwork, conduits, electrical components and miscellaneous components in all areas of the project in colours directed by Consultant.

PART 3 EXECUTION

3.1 CONDITIONS OF SUBSTRATES

A. Sound, non-dusting, and free of grease, oil, dirt, and other matter detrimental to adhesion and appearance of coatings.

B. Temperature: minimum 13*C.

C. Moisture content: maximum 12%. Test for moisture content using moisture meter.

D. Alkalinity: test cementitious substrates for alkalinity. Use method recommended by coating manufacturer.

3.2 PREPARATION OF SUBSTRATES

A. All substrates: clean as required to produce an acceptable surface. If wood, metal or any other surface to be finished cannot be put in proper condition for finishing

by cleaning, sanding and filling as specified, notify Consultant in writing or assume responsibility for and rectify any unsatisfactory finish resulting.

B. Wood generally: clean soiled surfaces; sand smooth and dust off; putty nail holes, splits, scratches, after prime coat has been applied and dried; colour putty to match finish; putty stained wood after stain application.

C. Wood for paint: clean knots, pitch streaks and sappy sections of residue and seal with sealer before applying prime coat.

D. Wood for transparent finish: clean knots, pitch streaks and sappy sections of residue and seal with white shellac; seal after applying stain. Apply filler to open grained woods, prior to application of stain unless directed otherwise by Consultant. Do not apply satin varnish coat until Consultant has inspected and approved gloss varnish coat.

E. Bare ferrous metal: remove rust and scale; wash with solvent; chemically clean; apply coat of metal primer.

F. Previously primed metal: remove rust, oil, grease and loose shop paint by washing or wire brushing; make good shop coat; feather out edges of touch-up.

G. Zinc coated metal: wash and etch to dull paint receptive surface using an approved crystalline zinc phosphate or vinyl pretreatment.

H. Hot dip galvanized steel: coat with etching cleanser (MPI #25) and thoroughly rinse.

I. Unit masonry & concrete: fill minor cracks, holes and fissures with non-shrinking filler and smooth to a flush surface. Texture filled areas to match surrounding surface.

J. Plaster: fill minor cracks, holes and fissures with patching plaster, allow to dry, smooth to a flush surface and texture filled area to match surrounding surface.

K. Gypsum board: fill minor cracks, holes and imperfections with patching plaster; allow to dry and sand smooth; sand taped joints and remove dust.

L. Alkaline surfaces: wash and neutralize using proper type of solution compatible with paint to be used.

3.3 BACK PRIMING

A. Back prime wood schedule for paint or enamel finish immediately on arrival at site with interior or exterior primer as applicable.

B. Back prime wood scheduled for stain, varnish or natural finish immediately on arrival at site, with gloss varnish reduce 25% with mineral spirits.

3.4 APPLICATION OF COATINGS

A. Apply paint by brush or roller, except on wood and metal surfaces where paint shall be applied by brush only.

B. Spray painting may be permitted where deemed advantageous and shall be subject to Consultant's approval. When spray painting is permitted, use only airless spray guns. Consultant may prohibit use of spray painting at any time for such reasons as carelessness, poor masking or protective measures, drifting paint fog, disturbance to other trades or failure to obtain a uniform satisfactory finish.

C. Applied and cured coatings shall be uniform in thickness, sheen, colour and texture and free of brush or roller marks, sags, crawls, and other defects detrimental to appearance and performance.

D. Regardless of the number of coats specified for any surface, apply sufficient paint to completely cover and hide substrate and to produce a solid uniform appearance.

E. Thoroughly mix materials before application. Use same brand of paint for primer, intermediate and finish coats.

F. Where two or more coats of same paint are to be applied, undercoats shall be tinted in lighter shades of final coat to differentiate from final coat.

G. Touch up suction spots after application of first coat. Sand lightly between coats with fine sandpaper.

H. Each coat of finish shall be dry and hard before succeeding coats are applied with a minimum of 24 hours between coats, unless manufacturer's instructions state otherwise. Do not proceed with any coat until the last preceding coat is approved by the Consultant.

I. Stained woodwork shall be covered with a uniform coat of stain and wiped off if required. Wood shall have uniform shade. Match stain so that dissimilar woods have uniform finished appearance.

J. Apply epoxy paint in accordance with manufacturer's directions.

3.5 PATCHING/TOUCH-UP

A. Poor to takeover of project by Owner, inspect work of this Section and touch-up or refinish damaged finishes and finishes unsatisfactory to Consultant

3.6 SCHEDULE OF FINISHES

A. General Requirements:

1. Paint exposed surfaces of building materials, services and equipment, except those which are prefinished in factory and except those which are located in areas designed as not requiring painting.

2. Comply with the following requirements except in areas designated as not requiring painting.

    a. Paint behind surface mounted fixtures on walls and ceilings with full coats of paint.

    b. Paint walls behind wall mounted heating units with full coats of paint.

    c. Paint inside surfaces of light coves white.

    d. Finish tops of doors, trim, projections and other work as specified for surrounding work whether above site lines or not.

    e. Finish edges of doors to match face of door. Refinish edges of doors after fitting.

    f. Paint tops, bottoms and edges of shelves with full specified coats, whether exposed to view or not.

    g. Paint interior of ducts at grilles and diffusers with two coats of flat black paint, so that duct interior is not visible when grilles and diffusers are installed.

    h. Paint piping, ducts and conduits in colours matching background wall or ceiling colours, unless otherwise directed by the Consultant. Ducts in mechanical rooms require only one finish coat in addition to primer. Other exposed ductwork to receive two finish coats.

    i. Paint all gas piping whether exposed to view or not, with high-visibility yellow-orange paint meeting CGSB Colour Code #1-GP-12, Code 505-101 or equal.

    j. Unless specifically indicated to be painted, all finish carpentry work shall receive transparent finish.

    k. Unless specifically indicated otherwise paint all rooftop equipment and components, regardless of material and finish, including but not necessarily limited to mechanical rooftop equipment, vent stack flashings, sleeve flashings window washing anchors, but not including prefinished sheet steel flashings.

    l. Use abuse resistant paint in areas shown to require “high traffic paint”.

3. Where finishing formula for surfaces requiring painting is not included hereunder, follow recommendations of MPI Architectural Painting Specification Manual, latest issue.

B. Interior Finishing:

    1. Concrete and concert block:

a. Block filler

b. 1 coat primer, latex or PVA based (Vapour barrier primer at pool area)

c. 2 coats alkyd enamel

2. Metal, prime painted:

a. spot prime with alkyd metal primer

b. 2 coats alkyd metal enamel

3. Metal, zinc coated:

a. 1 coat galvanized primer

b. 2 coats alkyd metal enamel

4. Exposed interior structural steel, joists and steel deck:

a. coat epoxy primer, shop applied.

b. coats aliphatic polyurethane, field applied.

5. Woodwork, painted:

a. 1 coat alkyd enamel undercoat

b. 2 coats alkyd enamel

6. Woodwork, stained and varnished (transparent finish):

a. 1 coat stain

b. 1 coat sanding sealer, sand lightly

c. 1 coat alkyd or polyurethane varnish, gloss

d. 1 coat alkyd or polyurethane varnish, satin

7. Gypsum board (walls):

a. 1 coat drywall primer

b. 2 coats alkyd enamel

8. Gypsum board (ceilings and bulkheads):

a. 1 coat drywall primer

b. 2 coats acrylic latex

9. Exposed piping, wrapped:

a. 1 coat block filler

b. 2 coats acrylic latex

10. Exposed piping and conduit, unwrapped:

a. 1 coat alkyd metal primer

b. 2 coats acrylic latex

11. Exposed ductwork, insulated:

a. 1 coat block filler and primer

b. 2 coats acrylic latex

12. Steel handrails:

a. 1 coat epoxy paint reduced with solvent thinner

b. 2 coats epoxy paint, high gloss

13. Concrete floors and stair treads:

a. 2 coats sealer

C. Exterior Finishing

1. Metal, zinc coated (hot dip galvanized):

a. 1 coat epoxy primer

b. 2 coats aliphatic polyurethane

2. Metal, zinc coated (inorganic zinc rich primer):

a. 1 coat epoxy primer

b. 2 coats aliphatic polyurethane

3.7 EXISTING SURFACES

A. Repaint existing surfaces where they are scheduled to be painted or where finish is damaged by alteration work. Extend new paint finish over full height and/or width of area affected, to a straight line in location determined by Consultant.

B. All existing surfaces to be repainted shall receive as many coats of new paint, as required to hide existing finish.

C. Materials used for repainting shall be of equivalent quality to those specified for new work, but in each case shall be compatible with finishes to which they are applied.

D. Where compatibility of new coating with existing surface is uncertain, apply test patch of approximately 5 sf and check for results.

E. Prepare existing surfaces to be repainted as follows:

1. Clean as required to remove dirt, dust, oil, grease, lose paint, rust and any other foreign matter which would prevent proper bonding of new finish.

2. Peeled, chipped, scratched and otherwise damaged surfaces shall be filled, sanded and repaired as required to provide consistent surface with texture matching that of adjacent area.

3. Sand glossy surfaces to uniform dull texture.

4. Treat bare areas as specified for new work.

F. Blast clean existing structural steel scheduled to be repainted to “Near White Grade” (SSPC-SP-10) and spray apply a coat of zinc rich paint maximum 3 mills thick. Top coat with minimum 2 coats of aliphatic polyurethane.

G. Prior to repainting existing surfaces request Consultant’s review and acceptance of prepared substrates; existing surfaces repainted without Consultant’s review and acceptance of substrates may have to be prepared again as directed by Consultant and repainted at no extra cost.

END OF SECTION 09 91 00

SECTION 10 14 19 — SIGNAGE (Carry Cash Allowance)

PART 1 Reserved

END OF SECTION 10 14 19

SECTION 10 22 39 — FOLDING PANEL PARTITION

PART 1 GENERAL

1.1 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures

B. Section 06 10 10 - Rough Carpentry

C. Section 06 20 00 - Finish Carpentry

D. Section 08 71 10 - Door Hardware

E. Section 09 91 00 - Painting

1.2 REFERENCES

A. American Society for Testing and Materials International (ASTM)

1. ASTM E90-02, Method for Laboratory Measurements or Airborne-Sound Transmission Loss of Building Partitions and Elements.

2. ASTM E336-97, Method for Measurement of Airborne Sound Insulation in Buildings

B. Canadian Standards Association (CSA International)

1. CAN/CSA-Z808-96, A Sustainable Forest Management System: Guidance Document.

C. Environmental Choice Program (ECP)

1. CCD-047a-98, Paints Surface Coatings

2. CCD-048-95, Recycled Water-Borne Surface Coatings.

1.3 SUBMITTALS

A. Product Data:

1. Submit manufacturer’s printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

2. Shop Drawings

a. Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

b. Indicate panel construction, hinging arrangement, track and trolley assembly hardware and required clearance.

1.4 SAMPLES

A. Submit samples in accordance with Section 01 33 00 - Submittal Procedures

B. Submit duplicate 100 x 100mm samples of panel finish material, door latch and pull for size, style and finish.

C. Manufacturer's Instructions:

1. Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

A. Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

B. Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

C. Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section .

1.6 WARRANTY

A. The folding partition shall be guaranteed for a period of no less than two (2) years, and the track and trolley system for a period of no less than five (5) years against defects in materials and workmanship. This warranty covering material and labor, shall be effective upon the date of signature of the certificate relative to the substantial completion of work.

PART 2 PRODUCTS

2.1 FOLDING PANELS

A. Basis of Design: Corflex Series 5500.

1. Panels will be nominally 92mm (3 5/8") thick in manufacturer's standard widths. Panel faces must be removable and replaceable on site. Channels made of 1.3mm (18 gauge) steel will be installed horizontally inside every panel and spaced at 610mm to 762mm (24" to 30") c/c. Channel dimensions will be 51mm X 51mm (2" X 2") and will insure a higher impact and torsional capacity.

2. Frames shall fully enclose all edges of the surface material, in order to provide protection upon handling and stacking of the operable partition. The panel frames will be made of a minimum of 1.6mm (16 gauge) steel with a power coated finish in black. Trim less panels not providing finish and edge protection are not acceptable. All trims and seals shall match the color of the panel framing.
3. Vertical sound seals between panels will incorporate an alignment moulding made of unbreakable PVC. This moulding will be installed on the edge of each panel in order to ensure a good vertical sound seal and proper alignment when setting up the partition.
4. Horizontal seals must not exceed the panel width, to prevent damage while handling. Retractable bottom seals are made from formed steel, incorporating 6mm (1/4") vinyl strips for proper acoustical seal upon activating. Top and bottom retractable seals simultaneously operable by a removable handle at panel edge. Bottom seal shall have anti-slip pads.
    a. Top retractable seals must be made from formed steel; incorporating 6 mm (1/4” vinyl strips for proper acoustical seal upon activating. They should be activating simultaneously with the bottom seals.
    b. Top seals shall be continuous contact vinyl sweep seals.

B. Construct folding doors vertically hinged panels as follows. Refer to architectural drawings for width of panels:
    1. Substrate: gypsum or wood fibre particle board free of urea formaldehyde
    2. Acoustic Insulation: mineral wood. Fire proof.
    3. Face:
        a. Factory applied reinforced vinyl fabric with woven backing weighting not less than 465 g/m (15 oz/ly). Colour shall be selected from manufacturer’s standard colour selector. Submit full range of samples to Consultant for selection.
        b. Standard fabrics (colour shall be selected from manufacture’s standard colour selector). The fabric shall have an acrylic backing and a stain resistant coating.
        c. Factory applied vertical ribbed acoustical carpet weighing not less than 744g/m (24 oz/ly). (Colour shall be selected from manufacture’s standard colour selector).
        d. Factory applied high pressure laminate. (Colour shall be selected from manufacture’s standard colour selector).

e. Factory applied full height steel white board that can be used as a working surface.

f. Factory applied wood veneer. The wood finishing will be done by others.

g. Factory applied Architectural Fusion (colour shall be selected from manufacture's standard colour selector).

h. Fabric covered 12mm (1/2") acoustical treatment with a 0.60 NRC, factory applied (for complete specifications, refer to series 5800 "Performance Plus").

4. Hinges: vertical [metal] [vinyl] [metal with veneer insert] [vinyl with veneer insert] [0.610mm hard drawn, high carbon spring wire, galvanized].

5. Finish: must be applied with VOC-free glue. Hot melt glue recommended.

6. Accessories

a. Tackboard

b. Chalkboard

c. Whiteboard for dry eraser marker and projection

d. Recessed chair rail (consult manufacturer for available finishes)

e. Window with tempered glass (Consult manufacturer for sizes and thicknesses)

f. A recessed chalk/marker rail matching the panel trims must be installed at the bottom of each work surfaces.

g. A recessed chalk /marker box matching the panel trims must be installed on one side of the partition.

2.2 POCKET DOORS (DOORS FOR STORAGE OF FOLDING PANELS)

A. Type II: Double leaf pocket door.

1. The pocket door shall have the same finish as the operable partition. Hinges shall project no more than 6mm (1/4") from the door frame. The door will operate with a turn-type handle. A spring loaded mechanism will activate a 10mm (3/8") diameter steel rod at the top and at the bottom of the door. A plate anchored to the ground receives the lower stem.

2.3 TRACK AND HANGER ASSEMBLY

A. Suspension system shall consist of anodized thermally treated architectural grade extruded aluminum track (painted steel track not acceptable) connected to the structural support by pairs of steel threaded rods provided by the manufacturer. Guide pins will ensure perfect alignment of track joints. Track design shall be clear anodized aluminum, provide precise alignment at the trolley running surfaces and provide integral support for adjoining ceiling, soffit, or plenum sound barrier. A section of track should be removable in order to make it possible for a panel to be removed from the track for later maintenance.

B. Each panel shall be supported by one trolley assembly consisting of four (4) steel ball bearing wheels nylon coated. Friction disc puck type carrier and track systems are not allowed. A report showing that a reliability test covering a distance of 160 Kilometers (100 miles) was completed and must be available on request.

C. Size track to suit weight of panels.

D. Provide double truck at lead posts.

2.4 HARDWARE

A. Apply aluminum door pulls on leading edge of door.

B. Provide magnetic catch.

C. Install standard latch thumb turn

D. Arrange door for single jamb

2.5 ACOUSTICAL RATED DOORS

A. Supply a copy of an acoustical test report certifying that the partition was tested by an independent accredited laboratory. The partition tested must be fully functional, sized at 4267mm X 2743mm (14'0" X 9'0") and meet ASTM-E90 standard. The test results must be similar to or exceed the performance specified. The acoustical test report must show the weight and the panel construction as well as the acoustical seals tested.

B. Sound rating: STC 54 (11.9 lb/sq.ft)

C. Hinge doors and provide vinyl sweeps at top and bottom of doors.

D. Provide sound seal to throat of track.

E. Sound seal jamb mouldings and lead post.

2.6 OPERATION

A. Partitions shall be top supported, manually operated panels. Friction disc/puck type carrier and track systems are not allowed. Bottom horizontal seals will be

operated by a removable handle located approximately 1066 mm (42") from the floor at panel edge. Operation of the seals requires no more than 180 degree turn of the handle. Horizontal bottom seals to provide 51mm (2") nominal operating clearance in order to make manipulation of the panels easier and to accommodate a deflection of the support beam or out of level floor. A stabilizing pressure shall be exerted when lowering seals. Automatic or foot pedal type activation of seals is not acceptable.

1. An expandable closure panel will ensure the final acoustical seal. It will have the same finish as the operable partition. A removable lever accessible from both sides of the partition will activate it. It shall compensate for out-of-plumb conditions or minor wall irregularities and provide a positive pressure seal to achieve maximum sound control. It will provide a minimum of 250 lbs. (113.4kg) seal force against the adjacent wall

2. A full height hinged closure panel with a recessed handle accessible from both sides, will permit access between adjacent rooms. It will be of the same construction as basic panels but with continuous contact multi-ply vinyl top and bottom seals.

B. Acoustic Integrity of First Panel

1. Provide dual bulb seals against the wall

2. Permanently fixed wall jamb

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

A. Install folding doors in accordance with manufacturer's printed instructions.

B. Adjust doors for smooth operation.

3.3 CLEANING

A. Perform cleaning after installation to remove construction and accumulated environmental dirt.

B. Remove traces of primer, caulking; clean doors and frames.

C. Clean aluminum, track and hardware with damp rag and approved non-abrasive cleaner in accordance with manufacturer's instructions.

D. Clean vinyl, wood and laminate surfaces in accordance with manufacturer's instructions.

E. Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION 10 22 39

SECTION 10 28 00 — WASHROOM ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Reserved

1.3 SUBMITTALS

A. Submit manufacturer's catalogue cut of each component required.

B. Submit a washroom accessories schedule indicating all accessories required, on a room by room basis, showing model number, finish and mounting height.

1.4 WARRANTY

A. At no cost to Owner, replace mirrors should defects in silvering occur within a period of 5 years from date of Substantial Performance.

PART 2 PRODUCTS

2.1 GENERAL

A. Fabricate work true to dimensions, square and plumb.

B. Thickness of metal shall be adequate for the various conditions, and intended uses.

C. Finished work shall be free from warping, open seams, weld marks, rattles and other defects. Drilling shall be reamed and exposed edges finished smooth.

D. Fastenings shall be concealed or theft-proof type where possible. Exposed fastenings shall be neatly executed and shall be of the same material and finish as the base metal on which they occur.

E. Accessories required, in each case, are specified in the Equipment and Fixture schedule, by a reference to a particular product by one manufacturer. The products listed shall serve to establish a standard of acceptance. Accessories of the same materials, construction and finishes, similar in function, design appearance and conforming to the standard of those specified, manufactured by the following are acceptable:

1. Bobrick
2. Bradley

3. Frost
4. ASI Watrous

F. Refer to Fixture and Equipment Schedule for list of accessories.

2.2 WASHROOM ACCESSORIES

A. Refer to Equipment and Fixture Schedule.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install components at locations shown. Where location is not given install as directed by Consultant.

B. Install Owner supplied accessories.

C. Fastenings shall be non corrosive type.

D. Provide mounting and anchorage devices to be built into walls and other construction elements as required to securely anchor components in place.

E. Securely anchor components in place. Method of fastenings shall ensure that components will be capable of withstanding expected loads without movement.

F. Install mirrors with concealed wall hangers and lock in place with theft-proof screws.

G. Insulate accessory surfaces to prevent electrolysis due to contact with dissimilar metal surfaces. Use bitu¬minous paint or other approved means.

3.2 CLEANING AND ADJUSTMENT

A. Upon completion of work or when directed, remove all traces of protective coatings or paper.

B. Test mechanisms, hinges, locks and latches and where necessary, adjust and lubricate and ensure that accessories are in perfect working order.

END OF SECTION 10 28 00

SECTION 10 75 00 — FLAG POLE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Materials, fabrication and installation for steel, aluminum and fibreglass flagpoles.

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures.

1.3 REFERENCES

A. The Aluminum Association (AA).

1. AA DAF 45 [R03], Designation System for Aluminum Finishes 9th Edition.

B. American Society for Testing and Materials International, (ASTM).

1. ASTM A53/A53M [02], Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless.
2. ASTM A480/A480M [03b], Standard Specification for General Requirements for Flat Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.
3. ASTM B241/B241M [02], Standard Specification for Aluminum and Aluminum Alloy Seamless Pipe and Seamless Extruded Tube.

C. Canadian Standards Association (CSA International).

1. CAN/CSA G164 [M92 (R1998)], Hot Dip Galvanizing of Irregularly Shaped Articles.

D. The Master Painters Institute (MPI).

1. Architectural Painting Specification Manual [March 1998 (R2002)].

1.4 SUBMITTALS

A. Submit product data in accordance with Sections 01 33 00 - Submittal Procedures.

B. Submit manufacturer’s technical data and installation instructions for each type of flagpole.

C. Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

1. Indicate dimensions, finishes, base joining, anchoring and support systems, cleats, halyard boxes, trucks, finials, and base collar for flagpoles.

2. Submit shop drawings of flagpoles and bases, showing general layout, jointing and complete anchoring and supporting systems.

1.5 QUALITY ASSURANCE

A. Provide each flagpole as complete unit produced by single manufacturer, including fittings, accessories, bases and anchorage devices.

1.6 DELIVERY AND STORAGE

A. Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

B. Spiral wrap each flagpole with heavy kraft paper, wood strip and steel band, or polyethylene wrap and pack in tubing for shipment.

C. Ship flagpole in installation site in one piece.

D. Deliver flagpole in 1 pieces.

1. When more than one piece is required, provide precision joints with self aligning internal splicing sleeve arrangements.

1.7 WASTE MANAGEMENT AND DISPOSAL

A. Remove from site and dispose of packaging materials at appropriate recycling facilities.

B. Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

C. Separate for reuse and recycling and place in designated containers waste in accordance with Waste Management Plan.

D. Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 MATERIALS

A. Galvanized Steel: hot dipped galvanizing with minimum zinc coating 610 g/m2 to CSA G164.

B. Stainless Steel: seamless stainless steel tubing, AISI type 304, ASTM A480/ A480M No. 4 Finish.

C. Aluminum:

1. Aluminum Association alloy AA 6063 T6 seamless extruded aluminum tubing.

2. Fabricated from seamless extruded tubing in accordance with ASTM B241, alloy 6063 T6, having minimum tensile strength not less than 20 MPa and a yield point of 17 MPa. Heat treated and age hardened after fabrication.

D. Fibreglass: polyester and fibreglass woven cloth, resistant to acids, petroleum and salt water; flame retardant.

E. Isolation coating: alkali resistant bituminous paint or epoxy resin solution.

2.2 FABRICATION

A. Provide 35’ long flagpole as complete unit including base anchorage and fittings. Total of ONE unit required.

B. Straight One Section Pole

1. Basis of Design: Flag Outlet Ltd. Economy Flagpoles .

a. Clear anodized aluminum flag pole

b. Butt Diameter: 3”.

c. Top Diameter: 3”.

2. Options and Accessories:.

a. Flag Attachment: eye bolts

b. Ball: stationary ball

c. Mount: 16 gauge galvanized foundation sleeve with base plate and lightening strike.

d. Concrete Foundation: 5’ deep

e. Shield: model 810100, cast aluminum alloy A366, T6 clear anodized, 12” x 3” pole

3. Flags: Owner supplied

C. Do welding to appropriate CSA Standard, by welders certified by Canadian Welding Bureau. Finish exposed welds flush and smooth.

2.3 FIELD FABRICATION

A. Fabricate ground set foundation assembly for sleeve installation of flagpole as indicated.

B. Fabricate mountings of same metal as flagpoles where exposed and of galvanized steel below ground level where encased in concrete.

PART 3 EXECUTION

3.1 INSTALLATION

A. Shop apply isolation coating to metal surfaces of flagpole and base that will be encased in concrete.

B. Install flagpoles, base assemblies and fittings to shop drawings and manufacturer's instructions.

C. Provide ground stakes for flagpole installation.

D. Check and adjust installed fittings for smooth operation of halyards.

END OF SECTION 10 75 00

SECTION 11 51 00 — LIBRARY EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Library Equipment

1.2 RELATED SECTIONS

A. Section 07 21 00 — Thermal and Acoustic Insulation

B. Section 07 27 00 — Air Barriers

C. Section 07 40 00 — Metal Roofing and Siding Panels

D. Section 07 62 00 — Sheet Metal Flashings and Trims

E. Section 07 92 00 — Joint Sealants

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00 - Submittals.

B. Product Data: Manufacturer’s data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

C. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

D. Verification Samples: For each finish product specified, two samples, representing actual product and finish.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish area designated by Architect

2. Do not proceed with remaining work until workmanship is approved by Archiect

3. Refinish mock-up area as required to produce acceptable work.

1.5 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers

1. Kingsley Metal Works, U.S.A.

2. Brodart

3. Carr McClearn

2.2 MATERIALS

A. Products: Kingsley Metal Works, U.S.A.

1. Book Depository

a. thruWall Depositories

1) Catalog #: 100-8100

b. Ease Through Wall Thick Wall Extension

1) Catalog #: 10-8100-EXT

2. Rolling Carts

a. duraLight easyRoller Cart

1) Catalog #: 33-9050 50 Series

b. duraLight Under Counter Cart

1) Catalog #: 90-9044 44 Series Cart

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instruction and in proper relationship with adjacent construction. Test for proper operation and adjust until satisfactory results are obtained.

B. Installation of thruWall Depositories

1. Rough Cut dimensions and trim: 36-1/2" [927.10mm] from exterior floor to bottom of cut out. Rough cut opening 20-1/4" W x 18-5/16" H [514.4mm W x 465.1 mm H] all the way through the wall. 1/4" [6.35,,] trim in the top, bottom and sides of opening.

2. To ensure ADA complain and proper clearance for Kingsley high capacity carts, the thruWall unit must be installed so that the measurement from the exterior ground to the bottom of the depository opening is 48 inches.

3. Be aware that the interior and exterior grades of your building. It is imperative that the thruWall unit is mounted so that the exterior ground height to the bottom of the depository opening is 48 inches. If the interior and exterior grades are different this will affect the cart clearance inside the building.

4. Maximum wall thickness is 13”. Unless used with optional thick wall kit.

5. Trip Top, Bottom and Sides of rough cut opening with 1/4” shim 4” depth from the front exterior edge of the cut out. This will centre the thru wall in the hole cut out and provide material to screw into depending upon your building material type.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 11 51 00

SECTION 12 24 13 — ROLLER WINDOW SHADES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Reserved

1.3 QUALITY ASSURANCE

A. Acceptable manufacturers:

1. Solarfective
2. Sunproject

B. Installer qualifications: forces in the direct employ or under the control of the system manufacturer, skilled, trained and experienced in work of similar scope and complexity of work specified herein.

C. Shade fabric:

1. Shade fabric shall hang flat, without buckling or distortion.
2. Fabric edge, when trimmed shall hang straight without ravelling.
3. An unguided roller shade cloth shall roll true and straight, without shifting sideways more than 3 mm in either direction due to warp, distortion or weave design.
4. Fabric shall pass "Small Scale Vertical Burn Test" in accordance with CAN/ULC-S109-03.

1.4 SUBMITTALS

A. Submit detailed shop drawings showing configurations, materials, finishes, methods of operation, wiring diagrams, joint locations and method of joining, anchorage details. Verify dimension in the field prior to submission of shop drawings.

B. Submit duplicate, minimum 8” x 8” samples of each shade fabric required.

C. Submit duplicate, minimum 2” x 4” samples of each metal finish / colour required.

D. Submit samples of each type of hembar required.

E. Provide operating and maintenance instructions for inclusion into maintenance manual. Include instructions on care, maintenance and cleaning of shade fabrics.

F. Submit test results from recognized independent testing agency, acceptable to jurisdictional authorities showing that fire hazard classification of shade fabric meets regulatory requirements.

1.5 DELIVERY STORAGE AND HANDLING

A. Window shades shall not be delivered to site until building is enclosed and respective rooms are subsequently complete.

B. Store products in manufacturer's unopened packaging until ready for installation.

1.6 PROJECT CONDITIONS

A. Site Environmental Limitations: Install roller shades only after finishing work such as painting is complete.

1.7 WARRANTY

A. Shade Fabric and Components: Manufacturers non-depreciating limited lifetime warranty.

B. Shade Installation: One year from date of substantial completion.

C. Motorized Components: Manufacturers standard non-depreciating 5 year warranty

PART 2 PRODUCTS

2.1 SHADE SYSTEM

A. Basis of Design: Legrand Solarfective Single Manual Teleshades,

1. Recessed in ceiling pocket.

2. Finish: Clear Anodized where exposed

C. Shade Mounting: refer to details for proposed locations and mounting requirements

D. Roller Tube: extruded aluminum, diameter to be selected by manufacturer to accommodate shade type and size

E. Shade Fabric:

1. Fabric to roll off back of roller tube: Regular roll method

2. Hembar: extruded aluminum flat bar, single lengths for each shade panel. Insert in fabric pocket and sew both ends.

2.2 SHADE FABRICS

A. Solar shade fabric: SolarGlass Duo, 3% Opacity, Colour to be selected by Consultant.

B. Where shade fabrics are sewn, needle holes shall not permit light penetration.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install work of this Section, plumb, level, square, in required configurations and locations, securely anchored to supporting work.

B. Make all systems fully operational.

C. Locate equipment, controls, switches in locations shown, or if not shown, as directed by Consultant.

D. Check test operation of each unit and, if necessary make adjustments to ensure proper operation.

3.3 PROTECTION

A. Installer is to protect installed products until completion of project.

END OF SECTION 12 24 13

SECTION 12 48 00 — ENTRANCE MATS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Comply with requirements of Division 1.

1.2 RELATED SECTIONS

A. Section 06 10 00 — Rough Carpentry

B. Section 08 41 13 — Aluminum Framed Entrances

C. Section 08 44 00 — Glazed Curtain Wall

D. Section 09 30 00 — Tile

1.3 REFERENECE STANDARDS

A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. The Standards listed here are identified with a designation number, title or other designation established by the issuing authority.

B. American Society for Testing and Materials (ASTM):

1. ASTM C1028 Static Coefficient of Friction

2. ASTM E648 Critical Radiant Flux

3. ASTM D3884 Abrasion Resistance

1.4 SYSTEM DESCRIPTION

A. Provide entrance floor mat system, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.5 SUBMITTALS

A. Product data: Submit product data, including manufacturer’s specification sheet and installation instruction for specified products. Include methods of installation and substrate preparation for each type of substrate.

B. Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colour, patterns and textures.

C. Submit samples for each type and colour of exposed entrance mat, frames and accessories required. Provide samples of mat materials.

D. Quality Assurance Submittals:

1. Certified test reports showing compliance with specified performance characteristics and physical properties, and
2. Manufacturer's Installation Instructions.

E. Closeout Submittals:

1. Cleaning & Maintenance Data (Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance), and
2. Warranty.

1.6 QUALITY ASSURANCE

A. Installer should be highly experienced in performing work of this section, having previously done work similar to that required for this project.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with Manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Deliver materials in Manufacturer's original, unopened, undamaged packaging.

C. Store materials at temperature and in humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

D. Except as otherwise indicated herein, sequencing or scheduling for performance of work of this section in relation with other work is Contractor's option. Delay installation of mats until near time of substantial completion for the project.

1.8 SITE CONDITIONS

A. Maintain temperature where products will be installed before, during and after installation as recommended by Manufacturer.

B. Where possible, verify actual measurements by field measuring before fabrication and include measurements in shop drawings. To avoid construction delays, coordinate field measurements and fabrication schedule based upon construction progress.

PART 2 PRODUCTS

2.1 MATERIALS

A. Requests for substitution shall be made in accordance with Section 01 25 00 — Substitution Procedures

B. Basis of Design: KN Crowder Kenagrille Recessed Foot Grille, FG-1, GB Frame

1. Size: as per drawings

a. Finish: Clear anodized

PART 3 EXECUTION

3.1 SUBSTRATE PREPARATION

A. Examine substrates and conditions where floor mats will be installed. Do not proceed with installation until unsatisfactory conditions are corrected. Sub floor shall be clean and dry, and within acceptable tolerances.

B. Provide latex screed to fill irregular conditions at the discretion of the installer according to manufacturer's recommendation.

3.2 INSTALLATION

A. Sizes: Shop-fabricate units of floor mat to greatest extent possible in sizes as indicated. Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints. Where possible, verify sizes by field measurement before shop fabrication.

B. Provide waterproofing underlay when installed over wood substrate to protect from exposure to moisture.

C. Accessories: Where indicated for recessed or wall-to-wall installations, provide aluminum framework as recommended by manufacturer.

D. General: Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and to prevent tripping hazards.

3.3 CLEANING AND PROTECTION

A. General Cleaning: Refer to Manufacturer's Cleaning and Maintenance Instructions.

B. Owner's Personnel: Instruct Owner's personnel in proper maintenance procedures.

C. Protection: Protect installed product and finish surfaces from damage during construction and until acceptance.

END OF SECTION 12 48 00

SECTION 12 50 00 — FURNITURE (Separate Contract)

PART 1 Reserved

END OF SECTION 12 50 00

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Portable Fire Extinguishers shall be rated in accordance with CAN/ULC- S508.

.2 Portable Fire Extinguishers in Mechanical and electrical room shall be mounted on wall brackets.

.3 Portable Fire Extinguishers in finished and public areas shall be mounted in a recessed cabinet. Cabinet shall be flush mounted. National Fire Equipment Model CE-950-3 or equal.

1.2 REFERENCE STANDARDS

.1 Department of National Defence Canada (DND)/Infrastructure and Environment/Construction and Property Services

.1 Canadian Forces Fire Marshal (CFFM)

.2 Fire Commissioner of Canada (FC)

.3 National Fire Prevention Association (NFPA)

.1 NFPA 10 Standard for Portable Fire Extinguisher

.4 Underwriters' Laboratories Inc. (UL)

.1 CAN/ ULC- S508, Rating and fire testing of Fire Extinguishers

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for fire extinguishing systems and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit floor plan showing fire extinguishers for approval by engineer.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for portable fire extinguishers for incorporation into manual.

.3 Submit fire plan in a frame to be installed within the building.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location, indoors, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect Fire Extinguishers from all damages.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

.1 Portable fire extinguishers in public areas shall be 3A40BC rating, 2.26Kg (5Lbs) multipurpose dry chemical powder type and ULC labelled (Ammonium phosphate) and shall be mounted in a recessed cabinet specified above.

.2 Portable fire extinguisher in Mechanical and Electrical rooms shall be 6A80BC rating, 4.53 Kg (10 lbs) multipurpose dry chemical type and ULC labelled.

.3 Portable fire extinguishers in Kitchen shall be 1-A:K rating, 6L (1.6 gallon) wet chemical type, stainless steel and ULC labelled.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Spacing of fire extinguishers shall be as per code requirements and the requirements of authority having jurisdiction.

.2 Provide a separate fire extinguisher for each mechanical and electrical room.

.3 Install a fire extinguisher in kitchen area.

.4 In no case maximum travel distance to a fire extinguisher from any occupied area shall be more than 75 feet.

3.2 RECHARGING

.1 At completion of project, ensure each cylinder contains specified quantity of chemical and weight of extinguishing agent.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by fire extinguishing systems installation.

END OF SECTION

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PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for:

.1 Water Heaters
.2 Plumbing Fixtures
.3 Plumbing Specialities

.2 Shop Drawings:

.1 Indicate on shop drawings:

.1 Mounting Arrangements
.2 Operating and Maintenance Clearances

.2 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.
.2 Points of operation on performance curves.
.3 Certification of compliance to applicable codes.

1.2 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for water heater and plumbing fixtures and specialities.

.1 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
.2 Data to include schedules of tasks, frequency, tools required and task time.

.2 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
.2 Equipment performance verification test results.
.3 Special performance data if applicable.

.3 As-built drawings:

.1 Prior to final inspection of the building finalize production of as-built drawings.
.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
.3 Submit to Engineer for approval and make corrections as directed.
.4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

PART 2 EXECUTION

2.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation of all plumbing items.

.1 Visually inspect substrate and notify engineer of any unacceptable condition.

.2 Proceed with installation only after unacceptable conditions have been remedied.

.3 Contractor will be responsible for all installation meeting with manufacturers recommendations and applicable codes whichever is more stringent.

2.2 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Interior Painting Section.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

2.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers.

2.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Service.

.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

2.5 DEMONSTRATION

.1 Engineer will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Water Heater

.2 Hot Water Re-circulation Pump

.3 Sanitary Fixtures

.3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

2.6 CLEANING

.1 Progress Cleaning: Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

2.7 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 05 00 General Instructions for Plumbing Services

.2 Section 22 42 01 Plumbing Specialities and Accessories

.3 Section 22 42 03 Plumbing Fixtures

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/Canadian Standards Association (ANSI/CSA)

.1 ANSI Z21.10.1-2014 /CSA 4.1-2014, Gas Water Heaters - Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu Per Hour or Less

.2 Canadian Standards Association (CSA International)

.1 CSA B51-03(R2007), Boiler, Pressure Vessel, and Pressure Piping Code

.2 CAN/CSA-B149.1-05, Natural Gas and Propane Installation Code

.3 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada 2015(NPC)

1.3 ACTION AND INFORMATIONAL SUBMITTAL

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Shop Drawings:

.1 Submit shop drawings complete with manufacturer's printed product literature and datasheets for domestic water heater, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Provide maintenance and engineering data for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Store equipment off ground indoors in dry and well ventilated space.

.3 All damaged equipment shall be replaced with new.

1.6 WARRANTY

.1 For the Work of this Section Domestic Water Heaters shall have a warranty of 12 months period from the date of commissioning.

PART 2 PRODUCTS

2.1 NATURAL GAS WATER HEATER

.1 Provide natural gas direct vent type power vented hot water tank with capacities as per the equipment schedule.

.2 Unit shall be ASHRAE/IESNA 90.1 thermal efficiency compliant.

.3 Natural gas, spiral shaped, glass lined heat exchanger, high efficiency modulating pre-mix powered burner.

.4 Provide advance electronic gas control system, direct spark ignitor.

.5 Steel tank construction and powered anodes for corrosion protection.

.6 Unit shall have 3 years warranty against leaks.

.7 Electrical power shall be 120V, 60Hz, 1Ø and 15 Amps.

.8 Vent and intake air pipe materials shall be ULC S636 PVC / CPVC, ULC S636 Polypropelene, AL29-4C Stainless Steel.

PART 3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.

.2 Mount heater on concrete floor.

.3 Install natural gas fired domestic water heaters in accordance with CAN/CSA-B149.1.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 This section covers plumbing specialities.

.2 All installation must be done as per Ontario Building Code (OBC-2012).

1.2 RELATED REQUIREMENTS

.1 Section 22 30 05 Domestic Water Heaters

.2 Section 22 05 00 General Instructions for Plumbing Services

.3 Section 22 42 01 Plumbing Specialities and Accessories

1.3 REFERENCE STANDARDS

.1 ASTM A 47 Ferritic Malleable Iron Castings

.2 ASTM A 53 Pipe, Steel, Black and Hot Dipped Zinc-Coated, Welded and Seamless

.3 ASTM A 403 Wrought Austenitic Stainless Steel Piping Fittings

.4 ASTM B 62 Composition Bronze or Ounce Metal Castings

.5 ASTM B 88 Seamless Copper Water Tube

.6 ASTM B 280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

.7 ASTM D 1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120

.8 ASTM D 2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings

.9 ASTM D 2665 Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings

.10 AWWA C104 Cement-Mortar Lining for Cast-Iron and Ductile-Iron Fittings for Water

.11 AWWA C106 Cast-Iron Pipe Centrifugally Cast in Metal Moulds, for Water and Other Liquids

.12 AWWA C110 Ductile-Iron and Grey-Iron Fittings, 3 in Through 48 in, for Water and Other Liquids

.13 AWWA C111 Rubber-Gasket Joints for Ductile-Iron and Grey-Iron Pressure Pipe and Fittings

.14 ASME B16.5 –Edition 09, Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24 Metric/Inch Standard

.15 ASME B16.10 – Edition 09, Face-to-Face and End-to-End Dimensions of Valves

.16 API STD 608 – Edition 4, Metal Ball Valves, Flanged, Threaded and Welding Ends

.17 ASME B16.34 – Edition 09, Valves - Flanged, Threaded and Welding End

.18 API STD 598 and MSS SP-61 – Valve Inspection and Testing

.19 ASTM A193/A193M – Edition 12a, Standard Specification for Alloy-Steel Bolting Materials for High-Temperature Service or High Pressure Service and other Special Purpose Applications

.20 ASTM A194/A194M – Edition 12, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both

.21 MSS SP-25 – Edition 08, Standard Marking System for Valves, Fittings, Flanges and Unions

.22 ASTM B85/85M – Edition 10, Standard Specification for Aluminium – Alloy Die Castings

.23 ASTM E515 – Edition 11 – Standard Practice for Leaks Using Bubble Emission Techniques

.24 ASTM A743/A743M – Edition 6, Standard Specification for Castings, Iron- Chromium, Iron-Chromium-Nickel, Corrosion Resistant for General Application

.25 ASME B36.10M Welded and Seamless Wrought Steel Pipe

.26 ASME B36.19M Stainless Steel Pipe

.27 OBC – Ontario Building Code

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Submit shop drawings complete with manufacturer's instructions, printed product literature and data sheets for all plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Instructions: submit manufacturer's installation instructions.

.5 Manufacturers' Field Reports: manufacturers' field reports specified.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements

.1 Store materials off ground in dry location indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect all plumbing materials from all damages.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 PIPES AND FITTINGS

.1 See Pipe Schedule in this Section and the individual Piping Sections referenced.

.2 Provide unions to facilitate the removal of equipment for service. Use threaded, all bronze unions with ground seat, 1034 kPa rating.

.3 Plumbing Piping Systems

Piping System	Materials
Sanitary Sewer	CI (cast iron hubless), PVC
Sanitary Sewer Vent	CI (cast iron hubless), PVC
Sanitary Sewer Vent Within Building Above Floor	GS (galvanized)
Sanitary Force Main, Within Building, Above Floor	GS (galvanized)
Potable Water 75 mm and smaller	CU, SS

.4 Pipe Class CI: Cast Iron Soil Pipe

.1 Exposed Piping: (Hub and Spigot or Mechanical Joint)

Item	Description	Standard
Exposed pipe Hub-and-spigot Or plain-end	80 - 375 mm Cast iron drainage and vent pipe	CAN 3/CSA B70-M86
Cast iron drainage fittings	80 - 375 mm Gray iron	ANSI/AWWA C110/A21.10
Cast iron threaded drainage fittings	80 - 100 mm Gray iron	ANSI B16.12
Couplings Mechanical joint	80 - 375 mm Elastomer sleeve with or without stainless steel sheath and stainless steel gear clamps	
Gaskets for hub and spigot	80 - 375 mm Self-locking neoprene gasket. Use special pipe coupler tools and lubricant for assembly	CSA B70M-1986

.5 Buried or Concrete Encased Piping

Item	Description	Standard
Buried or concrete encased hub and spigot cast iron drain pipe	80 - 375 mm with self-locking neoprene gasketed joints only	CSA B70M-1986
Buried fittings	80 - 375 mm cast iron with self-locking neoprene gasketed joints	Fittings to ANSI/ AWWA C110/A21.10

.6 Pipe Class GS: Galvanized Steel Pipe and Drainage Fittings

.1 Pipe: Hot-dipped galvanized steel, welded or seamless wall pipe, schedule 40, ASTM A 53 threaded joints.

.1 Fittings: Black or galvanized cast-iron drainage fittings, ASME B16.12 threaded ends, ASTM A 126 or A 197.

.7 Pipe Class GS: Galvanized Steel Pipe and Drainage Fittings

.1 Pipe: Hot-dipped galvanized steel, welded or seamless wall pipe, schedule 40, ASTM A 53 threaded joints.

.1 Fittings: Black or galvanized cast-iron drainage fittings, ASME B16.12 threaded ends, ASTM A 126 or A 197.

.8 Pipe Class SS: Stainless Steel Pipe

.1 All pipe and fittings, including gaskets and couplings that will be in contact with potable water, water that will become potable water, or carrier water for chemicals that will be added to potable water or water that will become potable water to be NSF/ANSI 61 certified.

.2 All materials and fabrication methods shall conform to the following codes, except as modified by this specification.

Item	Description	Standard
Pipe	12-65 mm, IPS Sch. 40S, Material AISI type 304 or 304L or 316 or 316L, screwed ends	ASTM A530 ASTM A312 ANSI B21
	80 to 600 mm, IPS Sch. 10S, Material AISI type 304L, or 316L, bevelled Ends	ASTM A530 ASTM A312
Fittings	12-65 mm, IPS Sch. 40S, Material AISI type 304 or 304L or 316 or 316L, screwed ends	ANSI B16.11 ASTM A403
	80 to 600 mm, IPS Sch. 10S, Material AISI type 304L or 316L, bevelled ends	ANSI B16.9 ASTM A403
Flanges	80 to 600 mm 1 Mpa ANSI B16.5 Slip On, bored to suit pipe or welding neck, if required. Raised face for pipe to pipe or fittings, Flat Face to valves, equipment and orifice flanges. Drilled to ANSI B16.1 to 1 Mpa rating	ASTM A105 A182, A350 Carbon Steel
Gaskets	3 mm thick neoprene, full face for flat face flanges, unless otherwise specified for a particular service	
Nuts	Heavy hex. Threaded to ANSI B1.1, Class 2.B fit. Sizes 25 mm (1”) and smaller course thread, and 8-pitch thread for 28 mm (1 1/8”) and larger dia. bolts AISI type 303 Grade 8F or 8FA, or AISI type 304 Grade 8 or 8A	ASTM A194
Bolts, Stud Bolts, Anchor Rods	Heavy hex machine bolt, or stud bolt, to ANSI B18.2.1, threaded to ANSI B1.1, class 2A fit. Sizes 25 mm (1”) and smaller course thread and 8-pitch thread for 28 mm (1 1/8”) dia. and larger bolts. AISI type 303 or 304	ASTM A320 B8F, B8FA, B8, B8A ASTM A193 B8 or B8A

.9 Couplings

.1 Victaulic Coupling

.1 Coupling body material is steel hot dipped galvanized after fabrication or type 316L stainless steel. Bolts and nuts are zinc electroplated steel or stainless steel. Collar rings for the "Victaulic" style 44 couplings to be made of steel or stainless steel to AWWA C606-97, type "D" and to be manufactured and welded to the pipe in accordance with the coupling manufacturer's dimensions. Material of collar rings to be carbon steel to ASTM A36, A105, A182, A350 or type 316L stainless steel. The gasket material to be grade "E" EPDM.

.2 Select Victaulic coupling styles as per table below:

Service	Pipe Size	Coupling Style	Method
Pressurized	50 to 300 mm	Rigid 489 Flexible 77S 89	Roll grooved ends, stainless steel housing Ductile iron housing
Pressurized	350 and above	44	Type "D" ring to AWWA C606-97
Gravity	all	07 or 77	Roll grooved ends

.10 Welding

.1 Welding of stainless steel shall be carried out as specified under Part 3 – Execution. The welding of suitable lengths of piping shall be carried out in an accredited welding shop by certified welders for specified type of medium. Any required field welds shall be approved by the COMPANY NAME.

.2 For pipe wall thickness up to 4.75 mm (3/16") and the root pass on thicker materials use Inert-Gas Tungsten-Arc (TIG) welding process. Subsequent passes by the Gas-Metal-Arc (MIG) process.

.3 Filler metal shall be as follows:

.1 Where field welding is approved Shielded Metal Arc Welding (SMAW) electrode shall be E308L for type 304L stainless steel pipe and E316L for type 316L stainless steel pipe.

.2 Tungsten Inert Gas (TIG) or Metal Inert Gas (MIG) filter metal shall be bare wire type ER 308L for type 304L stainless steel pipe and ER316L for type 316L stainless steel pipe.

.11 Pipe Class PVC: Polyvinyl Chloride Drainage and Fittings

.1 Pipe: PVC, schedule 40; ASTM D 1784 material class 12453-B, ASTM D 1785 pipe specification, with socket-weld joints.

.1 Fittings: PVC fittings to CSA 181.2 PVC-DWV or where buried to medium cast iron soil pipe to CSA B70 "Cast Iron Soil Pipe and Fittings".

.2 Buried portion to be concrete encased where indicated.

.3 Drainage Fittings: PVC, type I, grade 1; ASTM D 2665.

.4 Solvent Welded

.1 Ends to be joined square and free of saw bucks. All joints must be wiped clean using a cleaner approved by the manufacturer.

.5 Apply solvent weld cement to outside of pipe and inside of fittings in accordance with the manufacturer's recommendations. Solvent Cement: ASTM D 2564.

.6 Flanged

.1 Flexible PVC gaskets or as recommended by manufacturer.

.12 Pipe Class CU: Copper Tube (Pressure Application)

.1 Pipe

.1 Pipe other than Drain Waste Vent (DWV) shall be seamless copper tube, type K or L, hard or soft temper as indicated, conforming to ASTM B88. NSF/ANSI 61 certified for systems where the piping is in contact with potable water or water that will become potable water. DWV pipe shall be seamless copper tube conforming to ASTM B306.

.2 Buried potable water 100 mm size and under (Type "K" soft). Unburied potable water 100 mm size and under (Type "L").

.2 Fittings

.1 Cast solder-joint water fittings shall conform to ANSI B16.18 for "Cast Copper Alloy Solder Joint Pressure Fittings". NSF/ANSI 61 certified for systems where the piping is in contact with potable water or water that will become potable water.

.2 Wrought solder joint water fittings shall conform to ANSI B16.22 for "Wrought Copper and Copper Alloy Solder Joint Pressure Fittings". NSF/ANSI 61 certified where the piping is in contact with potable water or water that will become potable water. Cast solder joint drainage fittings shall conform to CSA B158.1 "Cast Brass Solder Joint Drainage, Waste and Vent Fittings".

.3 Wrought solder join drainage fittings shall conform to ANSI B16.29 "Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV".

.3 Joints

.1 Solder Joints

.1 For copper water piping use a 95/5 antimonial tin solder to ASTM B32.

.2 For copper drainage piping use a 50/50 solder to ASTM B32.

.2 Threaded Joints

.1 For threaded joints use 100% teflon tape on male thread only.

.2 Use dielectric fittings between copper and ferrous piping.

2.2 VALVES

.1 General

.1 All valves shall be from one manufacture and individually tested.

.2 Provide sufficient valves to facilitate equipment servicing.

.3 Valves to comply with the requirements of ASME and ANSI codes with respect to dimensions, materials and service. The manufacturer's name and valve pressure rating to be clearly marked on the outside of each valve body.

.4 In potable water applications valves shall be lead free certified to NSF-61 /NSF-372.

.5 The bronze material in bronze valves is to conform to ASTM B62. Cast iron and semi-steel valves conform to ASTM A126 (Class B or C). Bronze valves to be suitable for 1380kPa water working pressure solder joint type. Iron body valves to be Class 125 flanged type.

.6 Drain valves located directly over hot, funnel or floor drains to be globe valves with outlet nipples. All other drain valves to be ball valves.

.7 All ball valves to have brass-threaded caps secured to the valve body by a brass chain.

.8 Acceptable Valve Manufacturers: "Watts", "Crane", "Clow Canada", "Victaulic", "Kitz", "Toyo", "Mueller", "Dezurick", "Grinnell", "Nibco", "Jenkins", "Bonney Forge", "Beric", "Velan", "Legend", "Bray", "Moygro", "MAS" or "Powell" unless otherwise specified.

.2 Ball Valves (8 mm to 100 mm)

.1 A 2-piece, standard port, Lead Free* copper silicon alloy or cast iron body, stainless steel ball, stainless steel blowout proof stem, glass filled PTFE seats, EPDM seats also acceptable, PTFE or EPDM stem packing, PTFE stem thrust bearing, and adjustable packing nut. Vale seats shall be rated between -20 and 120 degrees Celsius.

.2 Pressure rating no less than minimum 300psi (21 bar) WOG non-shock; 150psi (10 bar) WSP for sizes 8 mm – 50 mm and minimum 200psi (28 bar) WOG non-shock; 125psi (8.6 bar) WSP for sizes 63 mm – 100 mm.

.3 Ball Valves shall be constructed using Lead Free materials compliant with NSF 61 standard. Valve must conform to MSS-SP-110 Standard.

.3 Gate Valves

.1 50 mm and smaller: 125 psi (865 kPa) gauge SP/200 psi (1 380 kPa) gauge WOG, bronze body, RS, solid wedge disc, inside screw, screwed ends.

.2 63 mm and larger

Type:	-	Solid wedge, non-rising stem
Body:	-	Cast iron, ASTM A126 Class B
Wedge:	-	Cast iron complete with bronze rings
Stem:	-	Bronze, ASTM B584
Seat Rings:	-	Bronze, ASTM B584
End Style:	-	Flanged, ANSI B16.1, Class 125
Operator:	-	Handwheel in accordance with Section 15010
Rating:	-	1050 kPa cold working pressure

.4 Globe Valves (13 mm to 200 mm)

.1 150 psi (1 035 kPa) gauge SP/300 psi (2 070 kPa) gauge WOG, bronze body, SB, teflon disc, screwed ends.

.5 Horizontal/Vertical Check Valves

.1 44 mm and smaller

.1 Class 150, bronze, 2070-kPa WOG rated horizontal swing type check valves with solder ends.

.2 50 mm and larger

Type:	-	Iron body, bronze trim
Other:	-	Bronze/cast iron disc and hinge, horizontal swing, replaceable brass/stainless steel hinge pin, bolted cover, replaceable bronze seat rings, swing type and self closing in horizontal and vertical positions.
End Style:	-	Flanged, ANSI B16.1, Class 125
Rating:	-	1050 kPa cold working pressure

2.3 TRAP SEAL PRIMER

.1 P.P.P Inc. model PO-500 Automatic trap seal primer valve serving individual or remote area drains with ½" (12.7 mm) NPT connections with strainer and integral back flow preventer and vacuum breaker.

2.4 FLOOR DRAINS

.1 General

.1 Floor Drains and Trench Drains: to CSA B79.

.2 Locate all floor, funnel, and hub drains accurately with respect to equipment. Set all floor drains accurately to finished floor elevations that will permit complete drainage of all floors, pits, gutters, and trenches. Maintain air gaps as required by Code for all indirect wastes.

.3 Standard floor drains are cast iron body, with strainer and collar of material and finish as specified, and with inside caulk outlet to best suit the connection. Drains to be fitted with traps and vent lines where shown and where required. Cast iron traps to be the same weight as the pipe, fitted with cleanouts, primer connections, and automatic primers as shown on the Drawings or where required. Drains installed in floors on fill and in any floor containing a waterproofing membrane will have flashing clamps.

.4 Acceptable manufacturers: Watts, Zurn, Jay R. Smith, Mifab and Ancon.

.2 FD-1: Washrooms: Watts #FD-100-C-A5-1-6-7 Floor Drain - epoxy coated, cast iron body, reversible flashing clamp with primary and secondary weepholes, trap primer connection with plug, vandal proof, no hub outlet. Watts -A5-1 5" (127 mm) diameter, nickel bronze, adjustable round strainer.

.3 FD-2: Foot grille floor drain: Watts #FD-310-Y-4-5-6-7 Floor Drain - epoxy coated, cast iron body, sediment bucket, vandal proof, trap primer connection with plug, anchor flange and weepholes, no hub outlet. Watts -4 6-1/2" (165 mm) diameter epoxy coated ductile iron, non-tilt heavy duty round grate.

.4 FD-3: Mechanical room Funnel Floor Drain**:** Watts #FD-100-C-EG-50-6-7 Floor Drain - epoxy coated, cast iron body, reversible flashing clamp with primary and secondary weepholes, 5" (127 mm) diameter nickel bronze, adjustable round strainer, 4" x 9" (102 mm x 229 mm) oval cast iron funnel, vandal proof, trap primer connection with plug, no hub outlet.

.5 FD-4: Mechanical room Heavy duty floor drain: Watts #FD-320-6-7 Floor Drain – 4" diameter, epoxy coated, cast iron body, sediment bucket, vandal proof, trap primer connection with plug, anchor flange and weepholes, no hub outlet.

2.5 ROOF DRAINS (NO CONTROL FLOW REQUIRED)

.1 Watts #RD-103-B-D-E-K Roof Drain - epoxy coated, 14-1/8" (359 mm) diameter, cast iron body, flashing clamp and integral gravel stop, with self-locking 12-3/8" (314 mm) diameter ductile iron dome, sump receiver, adjustable extension, under deck clamp, 3"Ø (76 mm), no hub outlet..

2.6 CLEANOUTS

.1 Cleanouts shall conform to the following schedule unless otherwise noted.

.2 Acceptable manufacturers are Watts, Zurn and Ancon.

.3 Finished Areas - Nickel bronze frame and round scoriated full opening nickel bronze cover. Watts # CO-100-C-R-1-6-34G.

.4 Tiled Areas - Nickel bronze frame and round recessed full opening nickel bronze access cover. Watts # C0-100-C-T-1-34.

.5 Monolithic Floor Areas- Tops of cleanouts in monolithic floor areas shall have an extended flange to suit application of monolithic floor finish. Watts's # C0-100-C-RFC-34.

.6 Unfinished Areas - Cast iron frame heavy duty scoriated cast iron round tractor cover and internal plug. Watts # C0-100-C-RX-50-34.

.7 Exposed Areas and Accessible Pipe Chase - Cast iron caulking ferrule with neoprene gasket and plug secured to body with cap screws. Watts # C0-200.

.8 Behind Finished Tile Block Walls - With stainless steel round access cover. Ferrule shall be installed so that bolted cover is within 25 mm of finished wall. Watts # C0-450-RD.

.9 At Base of Exposed Stacks and Rain Water Leaders – Watts # C0-460.

.10 Concealed Stack Cleanout – Watts #C0-460-RD.

.11 In carpeted areas, Floor Cleanout with nickel bronze cover and frame similar to Watts # CO-200-RC-1-6-34G.

2.7 HOSE BIB

.1 Exterior HB-1: Watts #HY-725 Hydrant non-freeze hydrant, all bronze head, seat casting and internal working parts, wall mount hydrant, concealed, bronze wall casing, chrome plated face, integral vacuum breaker, nickel bronze box and door, loose key, 3/4"Ø (19 mm) hose connection, 3/4"Ø (19 mm) female x 1"Ø (25 mm) male pipe connection.

.2 Interior HB-2: Watts #SC8-1 Hydrant **-** cast brass, wall mount, Watts Model 8B tamper-proof vacuum breaker with break-away screw, adjustable packing nut cartridge, no kink faucet, 1/2" (13 mm) male NPT of copper sweat connection with tee handle.

2.8 WATER HAMMER ARRESTORS

.1 P.P.P. INC. 'Water Hammer Arrestors' Series 'SC' with brass piston in a type 'K' copper casing size according to manufacturer's recommendations to eliminate water hammer and shock from piping system. Provide Water Hammer Arrestors on hot and cold water supplies to all quick valves, solenoids, and plumbing fixtures, and locate in an upright position between the last two fixtures on a line, or horizontally at the end of line closest to supply source.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialities and accessories installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Engineer of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.3 INSTALLATION

.1 Install in accordance with local authority having jurisdiction provincial codes (OBC- 2012).

.2 Install in accordance with manufacturer's instructions and as specified.

3.4 PIPES

.1 General: Install straight, parallel and close to walls and ceilings, with specified pitch. Use standard fittings for direction changes.

.2 Minimum slopes for drains are as follows, unless otherwise specified:

.1 76 mm dia. and less – 2 percent.

.2 102 mm dia. and greater – 1 percent.

.3 Install groups of piping parallel to each other on trapeze hangers; Space piping to permit application of insulation, identification and service access.

.4 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets.

.5 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment. Reducing bushings are not permitted.

.6 Install brass and copper pipe and tubing free from surface damage. Replace damaged pipe or tubing.

.7 Provide vents to atmosphere for all gas regulators as required by Code.

.8 Ream ends of pipes and tubes before installation.

.9 Lay copper tubing so that it is not in contact with dissimilar metal and will not be kinked or collapsed.

.10 Use non toxic lubricant or teflon tape applied to male thread.

.11 Clean ends of pipes or tubing and recesses of fittings to be brazed or soldered. Assemble joints without binding.

.12 Sanitary and storm drainage: Run piping to main sewers with uniform grade.

.13 Jointing of pipe: Compatible with type of pipe used.

.14 Water piping: Run water piping from service connection to fixtures and equipment. At lavatories install supplies as high as possible.

.15 Provide washroom groups and branch take-offs from mains with isolating valves. Install stop valve in each fixture supply.

.16 Where two or more branch recirculating hot water lines are connected to main recirculating line, provide lockshield globe valve and check valve in each branch line for balancing water flow and for prevention of back flow in one branch. Adjust balancing valves to provide recirculation through each circuit. Turn over lockshield valve key to Owner.

.17 Provide hose end ball valves for complete system drainage.

.18 Provide all parts of the plumbing system including all required venting in accordance with the Ontario Plumbing Code, Revised Regulation of Ontario 1990, Regulation 901, Ontario Regulation 401/91, Ontario Regulation 134/92 to current amendments.

.19 Indirectly connect, to the sanitary sewer only, all drains and overflow lines from cooling towers.

3.5 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

3.6 HOSE BIBS

.1 Install 600mm above finished grade.

3.7 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures.

3.8 TRAP SEAL PRIMERS

.1 Install for floor drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space.

.3 Install soft copper or plastic tubing to floor drain.

3.9 FLASHING

.1 Flash piping, extending through roof or other waterproofed area, with neoprene flashing about 500 mm square, burned to a lead sleeve extending up around pipe at least 150 mm above roof line and caulked into pipe tube. Leave flashing ready as directed by Roofing or Waterproofing Trades for them to make watertight connections.

3.10 VENTS

.1 Vents passing through roof shall not be less than 300mm high above roof (minimum 600 mm above planter areas) and shall have roof vent connections, vent stack sleeve with caulking recess, flashing clamp device, under deck clamp, bearing pan, and shall be of suitable length to suit deck thickness (Zurn Z-195-1) (Ancon RD-630).

3.11 START-UP

.1 Timing: start-up only after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.2 Provide continuous supervision during start-up.

3.12 TESTING AND ADJUSTING

.1 General

.1 Test and adjust plumbing specialties and accessories.

.2 Timing

.1 After start-up deficiencies rectified.

.2 After certificate of completion has been issued by authority having jurisdiction.

.3 Application Tolerances

.1 Pressure at fixtures: +/- 10%

.2 Flow rate at fixtures: +/- 10%.

.4 Adjustments

.1 Verify that flow rate and pressure meet design criteria.

.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.5 Floor Drains

.1 Verify operation of trap seal primer.

.2 Prime, using trap primer. Adjust flow rate to suit site conditions.

.3 Check operations of flushing features.

.4 Check security, accessibility, removability of strainer.

.5 Clean out baskets.

.6 Roof Drains

.1 Check location at low points in roof.

.2 Check security, removability of dome.

.3 Adjust weirs to suit actual roof slopes, meet requirements of design.

.4 Clean out sumps.

.5 Verify provisions for movement of roof systems.

.7 Access Doors

.1 Verify size and location relative to items to be accessed.

.8 Cleanouts

.1 Verify covers are gas-tight, secure, yet readily removable.

.9 Water Hammer Arrestors

.1 Verify proper installation of correct type of water hammer arrester.

.10 Hose Bibbs

.1 Verify that flow and pressure meet design criteria.

3.13 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.14 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 30 05 Domestic Water Heater

.2 Section 22 05 00 General Instructions for Plumbing Services

.3 Section 22 42 01 Plumbing Specialities and Accessories

1.2 REFERENCE STANDARDS

.1 CSA Group

.1 CAN/CSA-B45.0 to CAN/CSA-B45.9 Series-02(R2013)

.2 CSA B125.3-12, Plumbing Fittings

.3 CSA B651-12, Accessible Design for the Built Environment

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit shop drawing complete with manufacturer's instructions, printed product literature and data sheets for all fixtures and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Indicate Fixtures and Trim

.1 Dimensions, construction details, roughing-in dimensions.
.2 Factory-set water consumption per flush at recommended pressure.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Include following the closeout submittals:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, indoors and in dry location in accordance with manufacturer's recommendations in a clean dry and well-ventilated area.

.2 Store and protect materials from all damages.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 GENERAL

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CSA B125.3.

.3 Exposed plumbing brass to be chrome plated.

.4 Fixtures in any one location to be product of one manufacturer and of same type.

.5 Trim in any one location to be product of one manufacturer and of same type.

2.2 FLOOR MOUNTED TOILET - VITREOUS CHINA - FOR FLUSHOMETER – EXPOSED – NO TOUCH - HARD WIRED (WC)

American Standard Madera Flowise Right Height Elongated #3461.001.020 HET Toilet, 419 mm high, vitreous china with EverClean antimicrobial surface which inhibits the growth of stain and odor causing bacteria mold and mildew, elongated bowl, white finish, Floor Mounted, siphon jet flush action, operates in the range of 4.2 L to 6 L (1.1 US Gal to 1.6 US Gal) per flush, condensate channel, 305 mm x 254 mm (12" x 10") water surface, siphon jet flush action, condensate channel, elongated bowl, 54 mm (2-1/8") fully glazed internal trapway, floor outlet, bolt caps, 38 mm (1-1/2") dia. Top spud.

Centoco #820STS.001 Toilet Seat, extra heavy duty, for elongated bowl, open front, solid plastic, with cover, stainless steel check hinges, metal flat washers stainless steel posts and nuts. **Sloan Royal Optima #Royal Optima 111 ES-S-CP, Exposed Flushometer** for Top Spud Toilet, polished chrome finish, 6 L (1.6 US Gal) factory set flow, quiet action 'PERMEX' diaphragm type with dual filter by-pass, infrared sensor located on a 125 mm x 125 mm (4-15/16" x 4-15/16") stainless steel plate, solenoid operated flush controller circuitry, Courtesy Flush electronic over-ride button, V.P. Smooth design stop cap on bak-chek angle stop (screwdriver operated), flush tube for 292 mm (11-1/2") rough-in, high pressure vacuum breaker, sensor located above the toilet, 5 VA Power Required per unit. **Sensor to clear toilet seat cover. Provide 4" (102 mm) square electrical box for mounting sensor plate. Sloan #EL-154, Box Mount Hard Wired Transformer,** 120 VAC/ 24 VAC, 50 VA. **Will operate up to 10 'Optima' flush valve units. Provide Floor Flange,** (same material as the connecting pipe drain), with all brass bolts and with rubber gasket.

2.3 WALL HUNG BASIN - ELECTRONIC FAUCET BARRIER FREE (LAV)

American Standard Murro with Everclean #0954.004EC/0062.000EC basin, 3 holes, 4" (102 mm) center, 540 mm x 520 mm x 165 mm (21-1/4" x 20-1/2" x 6-1/2") high, vitreous china, white finish, for carrier with concealed arms, rear overflow, recessed self-draining faucet ledge, **semi-pedestal P-trap cover**. **Sloan Optima #ETF-600-LT-CP-VPB-SL-BDT-LF Electronic Faucet,** polished chrome finish, 4" (102 mm) centerset, cast brass, vandal resistant 1.9 LPM (0.5 GPM) multi-laminar spray head outlet, infrared sensor with screw adjustable range, under counter filtered solenoid valve with serviceable strainer filter, module control assembly housed in splash proof junction box, 24VAC 50/60Hz, vandal proof box, 12" (305 mm) sq. Recessed metal box with 13"(330 mm) sq. V.P. S.S face, located in wall under basin. Flexible copper supply, lead free, below deck SL-BDT-LF Thermostatic Mixing Valve, nickel plated bronze body, temperature adjusting spindle, 10 mm (3/8") inlet and outlet FNPT connection, integral checks, offer temperature range between 95 C (203 F) and 46 C (114.8 F). Set valve temperature at 46 C (114.8 F). **Provide tee, adaptors and flex. copper tubing to suit installation. 15 VA power required per unit. Sloan #EL-154, Box Mount Hard Wired Transformer,** 120 VAC/ 24 VAC, 50 VA. **McGuire #155A Open Grid Drain,** cast brass one piece top, 17 GA. (1.5 mm) tubular 32 mm (1-1/4") tailpiece. **McGuire #8872C P-Trap,** heavy cast brass adjustable body, with slip nut, 32 mm (1-1/4") size, shallow wall flange and seamless tubular wall bend. Covering By Another Division **Watts #WCA-411 Basin Carrier,** concealed arms, wall flanges to attach to backing plate secured in wall with locking device and levelling screws, heavy gauge steel uprights with integral welded feet. For one unit: 102 mm (4") for two to six units in a row: 152 mm (6") finished metal stud wall to back of pipe space.

2.4 SINGLE BOWL UNDERCOUNTER (S-1)

Franke Commercial #NCX110-12 Single Bowl Under counter sink, 349 mm (13-3/4") wide x 476 mm (18-3/4") long x 200 mm (7-7/8") high deep, counter mounted, no ledge, 18 GA. (1.2 mm) type stainless steel, radius coved bowls corners, 89 mm (3-1/2") crumb cup waste assembly with 38 mm (1-1/2") tailpiece.

Chicago Faucets #431-E34VPABCP Single Handle Faucet, chrome plated finish, 1 hole, ECAST construction lead free (equal or less than 0.25%) ECAST brass construction, volume control and hot water limit stop ceramic cartridge, 5.7 LPM (1.5 GPM) vandal resistant pressure compensating Softflo aerator outlet, 241 mm (9-1/2") projection cast brass spout, lever handle. **McGuire #LFH170BV Faucet Supplies,** chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm (1/2") I.D. Inlet x 127 mm (5") horizontal extension tubes, combination V.P. Loose key handles, escutcheon and flexible copper risers. **McGuire #8912CB P-Trap,** heavy cast brass adjustable body, with slip nut, 38 mm (1-1/2") size, box flange and seamless tubular wall bend.

2.5 DOUBLE BOWL UNDERCOUNTER (S-2)

Franke Commercial #NCX120-29 Double Bowl Under counter sink, 784 mm (30-7/8") wide x 450 mm (17-11/16") long x 229 mm (9") high deep, counter mounted, no ledge, 18 GA. (1.2 mm) type stainless steel, radius coved bowls corners, 89 mm (3-1/2") crumb cup waste assembly with 38 mm (1-1/2") tailpiece.

Chicago Faucets #431-E34VPABCP Single Handle Faucet, chrome plated finish, 1 hole, ECAST construction lead free (equal or less than 0.25%) ECAST brass construction, volume control and hot water limit stop ceramic cartridge, 5.7 LPM (1.5 GPM) vandal resistant pressure compensating Softflo aerator outlet, 241 mm (9-1/2") projection cast brass spout, lever handle. **McGuire #LFH170BV Faucet Supplies,** chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm (1/2") I.D. Inlet x 127 mm (5") horizontal extension tubes, combination V.P. Loose key handles, escutcheon and flexible copper risers. **McGuire #8912CB P-Trap,** heavy cast brass adjustable body, with slip nut, 38 mm (1-1/2") size, box flange and seamless tubular wall bend.

2.6 SERVICE / MOP SINK - TWO HANDLES FAUCET (SS-1)

.1 Stern Williams #SB-900 square Service / Mop Sink, 610 mm (24") wide x 610 mm (24") long x 305 mm (12") high deep, floor mounted, terrazzo composed of pearl gray marble chips and Portland cement ground smooth, sealed to resist stain finish, one piece stainless steel cast integral on all sides, without tiling flange, cast brass drain with stainless steel strainer, 3"(75 mm) outlet.

.2 Complete with drain gasket. Chicago Faucets #897-RCF Wall Mounted two handles Faucet, Rough Chrome Finish, 2 hole, 8" (203 mm) centerset, solid brass exposed body, ceramic 1/4 turn operating cartridge, unrestricted hose end outlet, 203 mm (8") projection spout with atmospheric vacuum breaker and bucket hook, 60 mm (2-3/8") metal vandal proof lever handles with blue and red index buttons, wall brace support. Stern Williams T-35 Hose and Wall Hook 36" (914 mm) long hose with 3/4" (19 mm) chrome coupling, stainless steel wall bracket. Stern Williams #T-40 Mop Hanger, stainless steel #4 finish, 24" (610 mm) long with 3 rubber spring loaded clips. Stern Williams BP Back Splash Panel 20 GA. (0.9 mm) type 304 stainless steel. Provide P-Trap, same material as the connecting pipe drain.

2.7 BOTTLE FILLING STATION (DF-1)

Elkay EZH2O Bottle Filling Station Filtered In-Wall Recessed (non-chilled) #LZWSMDK In-Wall Recessed Mounted bottle/glass filling station, sensor, touchless activation with auto 20-second shut off (bottle filler), single, 8 GPH of 50 ºF drinking water at 90 ºF ambient and 80 ºF inlet water, non-chilled water delivered, laminar flow provides minimal back splash, lead-free design, real drain system eliminates standing water, stainless steel bottle filler wrapper with ABS plastic alcove, quick fill rate of 1.5 gpm, Innovative Green Ticker counts bottles saved from waste. Current of 1.0 Amps, power consumption: 15W, WaterSentry Plus 3000-gallon capacity filtration system, NSF/ANSI 42 & 53 certified, LED Visual Filter Monitor shows replacement when necessary, Green Spec Listed. Integrated silver ion anti-microbial protection in key areas. Provide electrical duplex box with GFI. **McGuire #LFHST11LK Drinking Fountain Supply,** chrome plated finish polished brass, straight stops, 10 mm (3/8") I.P.S. Inlet, V.P. Loose key.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for washroom fixtures installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate before start of work.

.2 Inform Engineer of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Mounting Heights

.1 Standard: as indicated on architectural drawings.

.2 Barrier-free: to CSA B651 standard.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Adjust flush valves to suit actual site conditions.

.4 Adjust urinal flush timing mechanisms.

.5 Set controls of automatic flush valves for WCs and urinals to prevent unnecessary flush cycles.

.3 Checks

.1 Water closets, urinals: flushing action.

.2 Aerators: operation, cleanliness.

.3 Vacuum breakers, backflow preventers: operation under all conditions.

.4 Thermostatic Controls

.1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This section specifies requirements, products, characteristics, and methods and executions that are common to one or more sections, and it is intended as a supplement to each section and is to be read in conjunction with the drawings.

1.2 WORK INCLUDED

.1 This Section covers the General Mechanical Clauses for the supply and installation of all heating and ventilation together with other works as required.

.2 The drawings indicate the general location and route to be followed by the piping and ductwork. Where details are not shown on the drawings or only shown diagrammatically, the equipment shall be installed in such a way as to conserve headroom and interfere as little as possible with the free use of space through which they pass.

.3 Contractor shall provide all labour and materials, obtain all necessary permits and pay all fees as may be required.

.4 Unless specifically noted otherwise, specifications for pipe shall also apply to the respective fittings. Where the word piping is used, it shall mean both pipe and fittings.

.5 Supports for pipe and equipment are not shown in detail. Adequately support all piping, ducts, and equipment as part of this Division. Provide appropriate vibration isolators for all vibrating equipment and appropriate connections between dissimilar materials.

1.3 GENERAL

.1 Supply the equipment complete in all respects including all other accessories and auxiliaries necessary to provide for a satisfactory installation.

.2 Install all VAVs in accessible locations above suspended ceiling panels.

.3 Where equipment is supplied with larger or smaller power requirements than that shown, co-ordinate with the electrical requirements to ensure compatibility with electrical and control components so that a complete working system is in place without extra cost to the client.

.4 The exact location and routing of mechanical and electrical services are to be properly planned, coordinated and established with all affected trades prior to installation such that the services will clear each other as well as any obstruction.

.5 Check dimensions associated with existing structures, equipment and piping in the field before fabrication and installation are started.

.6 All shutoff valves, balancing devices, air vent, and similar products, particularly such products located above suspended ceilings, must be located for easy access for servicing. Products, which do not meet this location requirement, are to be relocated at no cost. Identify location of valves on ceiling panels.

.7 All mechanical piping system work including equipment, must comply in all respects with requirements of the TSSA, and CSA.

.8 All Codes and Standards referred to in the specifications are the latest edition at the time of tendering. All electrical items associated with mechanical equipment are to be CSA certified, or ESA approved.

1.4 CODES AND STANDARDS

.1 Do work in accordance with, but not limited to, the following codes and standards deemed to be part of this specification.

.2 Ontario Building Code

.3 Canadian Standards Association

.4 CAN3-B70 Cast Iron Soil Pipe, Fittings, and Means of Joining

.5 CAN3-B137.3 Specification for PVC Pipe for Pressure Application.

.6 CSA B139

.7 CSA B140.0

.8 CSA B158.1 Cast Brass Solder Joint Drainage, Waste and Vent Fittings

.9 CAN3-B181.2 PVC Drain, Waste and Vent Pipe and Pipe Fittings

.10 CSA B242 Groove and Shoulder Type Mechanical Pipe Couplings

.11 CSA B51 Pressure Piping

.12 The American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.13 The American National Standards Institute (ANSI)

.14 The American Society for Testing and Materials (ASTM)

.15 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)

.16 Ministry of Environment of the Province of Ontario

.17 National Fire Protection Association (NFPA)

.18 Unless otherwise specified, references to documents in this Division shall mean the documents in effect on the date of proposal submission. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in this Division, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit three electronic copies and one hard copy bound in hard cover operation and maintenance data for all equipment and controls used on the project. Operation and maintenance manual shall be approved by the consultant before final copies are submitted to the client.

.1 Operation data to include:

.1 Control schematics for systems.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.2 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.3 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Testing, adjusting and balancing reports as specified in Section 23 05 93- Testing, Adjusting and Balancing for HVAC.

.4 Approvals

.1 Submit one copy of draft Operation and Maintenance Manual to Consultant for approval.

.2 Make changes as required and re-submit as directed by the Consultant.

.5 Additional Data

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.6 As-built Drawings

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.7 Submit copies of as-built drawings for inclusion in final TAB report.

1.6 COOPERATION

.1 Coordinate with other trades before installing work included in this Division. If work is installed without coordinate with other trades or contractors, the Owner may direct that such work be removed, relocated and/or modified as necessary.

.2 Should the Contractor fail to correspond with requests or should he misdirect other trades, such corrections and/or additional work, as directed by the Owner shall be at the Contractor's expense.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer’s recommendations.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect equipment from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 GENERAL

.1 In addition to material and equipment specified, the Subcontractor shall provide incidental materials to effect a complete installation. Such incidental materials include solders, tapes, caulkings, mastics, gaskets and similar items.

.2 Materials and equipment shall be uniform throughout the installation. Equipment of the same type shall be of the same manufacturer. All materials and equipment shall be new.

2.2 WATERPROOFING AND SEAL MATERIALS

.1 Modular, mechanical seal assemblies consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the pipe sleeve or wall opening, assembled with stainless steel bolts and pressure plates and designed so that when the bolts are tightened the links expand to seal the opening watertight, the seal assemblies are to be selected to suit the pipe size and the sleeve size or wall opening size.

.2 Acceptable manufactures: Thunderline Corp “Link Seal” model S; Metraflex “MetraSeal Type ES.

2.3 PIPE SLEEVES

.1 Steel Pipe Sleeve

.1 Minimum thickness: 5 mm

.2 Seep Ring

.1 5 mm minimum thickness center steel flange for water stoppage on sleeves in exterior or water-bearing walls.

.2 Outside Diameter: 75 mm greater than pipe sleeve outside diameter.

.3 Continuously fillet weld on each side all around.

.4 Factory Finish

.1 Galvanizing:

.1 Hot-dip applied, meeting requirements of ASTM A153.

.2 Electroplated zinc or cadmium plating is unacceptable.

.2 Shop Coating: Factory prepare, prime and finish coat

.2 Insulated and Encased Pipe Sleeve

.1 Manufacturer: Pipe Shields, Inc; Models WFB, WFB-CS and –CW Series, as applicable.

.3 Modular Mechanical Seal

.1 Type: Interconnected synthetic rubber links shaped and sized to continuously fill annular space between pipe and wall sleeve opening.

.2 Fabrication: Assemble interconnected rubber links with ASTM A276, Type 316 stainless steel bolts, nuts, and pressure plates.

.3 Size: According to manufacturer’s instruction for the size of pipes shown to provide a watertight seal between pipe and wall sleeve opening.

.4 Manufacturer: Thunderline Link-Seal.

2.4 EQUIPMENT NOISE LEVELS

.1 Design equipment for quiet operation with the overall sound pressure level at any equipment not exceeding 85 decibels when measured on the "A" weighting network using survey and field methods conforming to ANSI S1.13 and CSA Z107.2. A more stringent requirement may be specified in the detailed equipment Sections.

.2 Exterior equipment which is continuously in operation shall have noise levels which abide by the MOE requirement of 45 dB at property boundary. Equipment which is manufactured with a dB rating at property boundary higher then above shall be equipped with a means of dissipating the noise to MOE guidelines, i.e. silencers.

2.5 EQUIPMENT GUARDS

.1 Provide, for couplings, belts, chain drives, extended shafts and exposed moving parts, securely mounted guards with the following features.

.2 Reinforced and neatly formed minimum 2.8 mm sheet steel or expanded sheet metal.

.3 Eliminate sharp edges with suitable borders neatly welded to perforated sheet.

.4 Pivoting access covers for shaft speed measurement.

.5 Hot dip galvanize the guards after fabrication.

2.6 FLANGES

.1 For equipment, valves, and devices with integrally cast flanges, provide flanges to the dimensions and drilling of ANSI B16.1 or ANSI B16.5 with bolt holes straddling the vertical centreline.

.2 For fabricated equipment and vessels, provide forged flanges of the same material as the equipment or vessel. Stainless steel lap joint flanges with carbon steel backing rings are not acceptable. Neither lap joint nor Van Stone flanges are acceptable on gas systems. Orient flanges with bolt holes straddling the vertical centreline.

.3 Finish flanges in accordance with MSS standard of practice SP 6.

.4 Refer to the detailed equipment and piping Specifications for working pressures and class.

2.7 EQUIPMENT NAMEPLATES

.1 Securely fit, in an easily read location, corrosion resistant metal nameplates with impressed type lettering on equipment. Include the following information.

.2 For Roof Top Packaged Unit, VAV boxes, fans, blowers, etc.

.1 Model number

.2 Serial number

.3 Capacity

.4 Motor information.

.5 Electrical data

.6 Other information required to uniquely identify the equipment.

2.8 FINISHES

.1 Finish piping and mechanical equipment to the following quality:

.1 Welds free of slag, ground, and buffed.

.2 Surfaces of castings ground smooth.

.3 Corners and edges on sheet metal work rounded.

.4 Stainless steel pipe free of steel wire rope marks.

.5 Materials, piping and equipment free of dents.

.6 Machined surfaces finished to specified tolerances.

PART 3 EXECUTION

3.1 INSTALLATION OF EQUIPMENT

.1 Install, calibrate and test equipment in accordance with manufacturer's written instructions and when specified, under supervision of competent experts provided by the equipment manufacturer.

.2 Erect mechanical equipment on foundations complete with suitably sized anchor bolts and take special care to ensure true alignment of parts, especially electrical drives.

.3 Recheck alignment of equipment handling hot fluids, during initial operation.

.4 Erect equipment level and plumb.

3.2 GENERAL PIPING AND DUCTWORK INSTALLATION REQUIREMENTS

.1 Unless otherwise specified, locate and arrange horizontal pipes and ducts above or at the ceiling on floors that they are shown, arranged so that under consideration of all other work in the area, the maximum ceiling height and/or usable space is maintained.

.2 Unless otherwise specified, install all work concealed on finished spaces, and concealed to the degree possible in partially finished and unfinished spaces. Refer to and examine the architectural drawings and room finish schedules to determine finished, partially finished and unfinished area.

.3 Install pipes and ductwork parallel to building lines. Neatly group and arrange all exposed work.

.4 Determine exact location of each pipe/duct in the field with respect to adjacent and interconnecting piping and equipment.

.5 Locate all valves, dampers and any other equipment which will or may need maintenance or repair and which are installed in accessible construction so as to be easily accessible from access doors. Where valves, dampers and similar piping or ductwork accessories occur in vertical service shafts, pipe space or partitions locate accessories at the floor level.

.6 Make all connection between pipes of different material using proper approved adapters. Provide cast brass dielectric type adapters at connections between steel and copper.

.7 Clean all ducts, pipe and fittings prior to installation, temporarily cap or plug ends of pipe, ducts and equipment that are open and exposed during construction. Install piping and ductwork that are to be insulated so that they have sufficient clearance to permit insulation to be applied continuously and unbroken around the pipe or duct, except at fire barriers.

.8 Inspect surfaces and structures prepared by other trades before performing your work. Verify that surfaces or the structure to receive your work have no defects or discrepancies which could result in poor application or cause latent defect in installation and workmanship. Report defect in writing.

.9 Clean and wire brush ferrous metal product before applying the prime coat. For factory applied finishes, repaint or refinish surfaces damaged during shipmen, erection or construction work.

.10 Design, provide and install piping systems in accordance with the ANSI code for pressure piping, B31.1, .2, .3, and 9.

.11 Provide, where shown on the Drawings, flanged joints intermittently in welded piping systems to facilitate removal of every section of the piping system.

.12 Provide unions intermittently in all screwed piping systems to facilitate removal of every section of the piping system without cutting any pipe or joint.

.13 Provide flanges or unions as specified for the particular piping system on both sides of sleeved or cast in place pipe sections through interior walls, ceilings and floors.

.14 Provide unions on both sides of equipment such as in line pumps, condensate traps, separators, etc. incorporated into piping systems with screwed joints.

3.3 DUCT OPENINGS

.1 Duct openings, air inlet and outlet openings, fire damper and similar openings will be provided in poured concrete work, masonry, drywall and other building surfaces by the trade responsible for the particular construction in which the opening is required.

3.4 INSTALLATION OF FASTENING AND SECURING HARDWARE

.1 Provide all fastening and securing hardware required for mechanical Work to maintain installations attached to the structure or to finished floors, walls and ceilings in a secure and rigid manner capable of withstanding the dead loads, live loads, superimposed dead loads, and any vibration of the installed products.

.2 Use fasteners compatible with structural requirements, finishes and types of products to be connected. Do not use materials subject to electrolytic action or corrosion where conditions are liable to cause such action.

.3 Where the floor, wall or ceiling construction is not suitable to support the loads, provide additional framing or special fasteners to ensure proper securement to the structure that is to support the products. Provide reinforcing or connecting supports where required to distribute the loading to the structural components.

3.5 DISCONNECTION AND REMOVAL OF EXISTING MECHANICAL WORK

.1 Where indicated on the Drawings, disconnect and remove existing mechanical Work. Disconnect at the point of supply, remove obsolete connecting services and make the system safe. Cut back obsolete piping behind finishes and cap water-tight unless otherwise specified.

.2 Where existing mechanical services pass through or are in an area to serve items which are to remain, maintain the services in operation. Include for rerouting existing services concealed behind existing finishes and which become exposed during the renovation work, so as to be concealed behind new or existing finishes.

.3 Unless otherwise specified, remove from the site and dispose of all existing materials which have been removed and are not to be relocated or reused.

.4 Unless otherwise specified, remove from the site and dispose of all existing materials which have been removed and are not to be relocated or reused, except for the following which are to be handed over to the Owner at the site.

3.6 INTERRUPTIONS TO AND SHUT-DOWNS OF MECHANICAL SERVICES AND SYSTEMS

.1 Co-ordinate all shut-downs and interruptions to existing mechanical systems. Any shut down to mechanical services and systems shall be coordinated with the client prior to commencing.

.2 Upon award of contract, submit a list of anticipated shut-down times and their maximum duration.

.3 Prior to each shut-down or interruption, inform the Owner in writing seventy-two hours in advance of the proposed shut-down or interruption and obtain written approval to proceed. Do not shut-down or interrupt any system or service without such written approval.

.4 Perform work associated with shut-downs and interruptions as continuous operations to minimize the shut-down time and to reinstate the systems as soon as possible, and, prior to any shut-down, ensure that all materials and labour required to complete the work for which the shut-down is required are available at the site.

3.7 NATURAL GAS PIPE TESTING

.1 Refer to section 23 11 23 Natural gas piping.

3.8 INSTALLATION AND COMMISSIONING

.1 When the Contractor has completed his installation work and before any equipment is operated, the Contractor is to instruct the Supplier to commission the equipment.

.2 Provide the services of a skilled representative at the site to carry out the following work:

.3 Check the installation as to its workmanship and completeness.

.4 Check the equipment operation.

.5 Perform running tests under load conditions to check power draw and ensure units operate smoothly and without excessive vibration.

.6 Instruct the plant personnel in the routine operation, preventive maintenance and breakdown repair of the equipment.

3.9 INSTRUCTIONS TO OWNER

.1 Instruct the Owner’s designated representatives in all aspects of the operation and maintenance of systems and equipment specified in this Division of the Specification.

.2 Arrange and pay for the services at the site of qualified technicians and other manufacturer’s representatives to instruct on specialized portions of the installation.

.3 Submit, prior to issue of a Certificate of Substantial Performance, a complete list of systems for which instructions where given, stating for each system:

.4 Date instructions were given to the Owner’s staff.

.5 Duration of instruction.

.6 Names of persons instructed.

.7 Other parties present (manufacturer's representatives, etc.).

.8 Obtain the signatures of the Owner's staff to verify they properly understood the system installation, operation and maintenance requirements and have received operating and maintenance manuals and record Drawings.

3.10 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

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PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Electrical motors for mechanical equipment and systems.

.2 Supplier and installer responsibility indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

.3 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 22 and 23. Refer to Division 26 for quality of materials and workmanship.

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).

.2 Electrical Equipment Manufacturers' Association Council (EEMAC)

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: In accordance with Section 01 33 00- Submittal Procedures.

.2 Motor details shall be submitted with the equipment shop drawings.

.3 Product Data

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00- Submittal Procedures. Include product characteristics, performance criteria, and limitations.

PART 2 PRODUCTS

2.1 GENERAL

.1 Motors: high efficiency, in accordance with local Hydro company standards and to ASHRAE 90.1.

2.2 MOTORS

.1 Motors are to conform to EEMAC standard MGI, applicable IEEE Standards and applicable CSA C22.2 Standards.

.2 Single Phase Motors

.1 Unless otherwise specified, motors smaller than 0.373 kW are to be 115 V, continuous duty capacitor start type with an EEMAC 48 or 56 frame size, solid base, heavy-gauge steel shell with solid die-cast end shields, dynamically balanced die-cast rotor, integral automatic reset thermal overload protection, Class “B” insulation and a 1.15 service factor at 40Degree C ambient temperature.

.3 Three Phase Motors

.1 Unless otherwise specified, motors larger than 0.373 kW are to be totally enclosed, fan cooled 3Ph, T-frame, squirrel cage, continuous duty induction motors suitable for voltages indicated on the drawings with an EEMAC Design “B” for normal staring torque of Design “C” for high starting torque as required by the application, Class “F” insulation and a 1.15 service factor at 40 degree C ambient temperature, re-greaseable open ball bearings with grease fittings to permit re-lubrication without dismantling the motor, a cast iron frame with cast iron feet where required, cast iron end bracket and precision machined bearing fit, and balanced carbon steel shaft assembly with die-cast aluminium rotor windings.

.4 The efficiency of single-phase motors is to be in accordance with CAN/CSA C747. The efficiency of the three-phase motors shall be equal to or exceed CSA C39 or IEEE1123.

.5 Motors larger than 22.37 kW are to be complete with a heat sensing PTC thermistor in the end turn of the starter winding for each phase and connected in series inside the motor with two marked leads brought out to the motor conduit box.

.6 Packaged Air Handling Unit motor shall be ECM type. Refer to Section 23 73 11 Package Air Handling Unit for details.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC Air system.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Consultant at least 3 weeks before the commencement of the work.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1.

.2 National Environmental Balancing Bureau (NEBB).

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

.4 Coordinate with the manufacturer or manufacturer's representative to meet the performance requirements.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

.1 Review equipment shop drawings and all HVAC drawings, details and documents related to HVAC system before commencement of work.

.2 Coordinate with engineer and the equipment manufacturer before starting work at site.

.3 Air handing system is variable air volume. Air system shall be balanced to provide flow within +/- 5% of the design flow.

.4 Submit draft report to the engineer before submitting final report. Allow for any extra time required to meet engineer's requirements.

.5 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.6 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

.7 Balance supply air, return air, outside air and exhaust air for both the systems.

.8 Coordinate with sheet metal contractor before starting work. If any additional dampers are required, inform the engineer in writing before commencement of work.

1.6 PRE-TAB REVIEW

.1 Review specified standards and report to Consultant in writing proposed procedures which vary from standard.

.2 During construction or immediately after award of contract, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Coordinate with the equipment manufacturer for equipment startup. Initial startup of the equipment to be done by equipment manufacturer. Follow start-up procedures as recommended by equipment manufacturer while performing TAB unless specified otherwise.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB.

1.9 START OF TAB

.1 Notify Engineer 7days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.1 Installation of ceilings, doors, windows, other construction affecting TAB.

.2 Application of weatherstripping, sealing, and caulking.

.3 Pressure, leakage, other tests specified elsewhere Division 23.

.4 Provisions for TAB installed and operational.

.3 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air Systems

.1 Filters in place, clean.
.2 Duct systems clean.
.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
.4 Correct fan rotation.
.5 Fire, smoke, volume control dampers installed and open.
.6 Coil fins combed, clean.
.7 Access doors, installed, closed.
.8 Outlets installed, volume control dampers open.

1.10 APPLICATION TOLERANCES

.1 Do TAB to +/- 5% tolerances of design values.

1.11 INSTRUMENTS

.1 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

1.12 TAB REPORT

.1 TAB report to show results in both SI units and imperial units and shall include:

.1 Project record drawings.

.2 System schematics.

.2 Submit electronic copy of testing and balancing report to the contractor for submission to engineer for review and comment.

1.13 VERIFICATION

.1 If requested by the engineer provide personnel and instrumentation to verify up to 10% of reported results.

.2 Number and location of verified results as directed by Consultant.

.3 Pay costs to repeat TAB as required to satisfaction of Consultant.

1.14 SETTINGS

.1 After TAB is completed to satisfaction of Consultant, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.15 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by the Engineer.

END OF SECTION

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PART 1 GENERAL

.1 This section includes thermal & acoustic insulation applied to ductwork.

.2 Qualifications: Execute work of this section only by skilled tradesmen regularly employed in the application of insulation to piping, ductwork, plenums, tanks, pressure vessels, equipment casings and heating panels for building heating, cooling, ventilating and plumbing systems.

.3 Insulation, self-adhesive tape, adhesives and any insulation finishes to be ULC labelled.

.4 Acceptable Manufacturers

.1 Insulation: Fiberglas Canada Inc., Knauf Fiber Glass, Manson, Roxul

.2 Tape: Avery Dennison, Mactac, Tuck, Compac

.3 Canvas: Fattal Thermocanvas, Alpa-Maritex 3451-RW, Clairmont Diplag 60

.4 Lagging adhesive: Childers CP.50A-HV2, Fosters 30-36 asbestos free

1.2 RELATED REQUIREMENTS

.1 Section 23 05 00 General Instructions for HVAC Services

.2 Section 23 05 93 Testing adjusting and balancing for HVAC

.3 Section 23 31 13 01 HVAC Ductwork

.4 Section 23 32 48 Acoustic Silencers.

.5 Section 23 33 14 Damper Balancing

.6 Section 23 33 15 Damper Operating.

.7 Section 23 36 00 Air Terminal Units

1.3 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1-16, Energy Standard for Buildings Except Low-Rise Residential Buildings

.2 ASTM International Inc.

.1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

.2 ASTM C335- 10e1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation

.3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation

.4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement

.5 ASTM C547-15, Standard Specification for Mineral Fiber Pipe Insulation

.6 ASTM C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

.7 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation

.8 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel

.9 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

.3 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005)

.4 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

.2 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering

1.4 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - means "not concealed" as previously defined.

.3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide shop drawing in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Description of equipment giving manufacturer's name, type, model, year and capacity.
.2 Details of operation, servicing and maintenance.
.3 Recommended spare parts list.

.3 Shop Drawings

.1 Submit shop drawings complete with manufacturer’s provided performance data and material composition and details.

.4 Manufacturers' Instructions

.1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence, cleaning procedures.

1.6 QUALITY ASSURANCE

.1 Where acoustical lining is installed, the dimension of sheet metal shall be increased to include the thickness of the lining material. Dimension shown on the drawing is the clear internal dimension after the lining has been installed.

.2 Qualifications

.1 Installer: specialist in performing works of this section, and have at least 3 years successful experience in this size and type of project.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC markings.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Rigid board: For outdoor ductwork only. 72 kg/m3 (4.5 lbs/ft^3) density ULC listed glass fibre board with glass fibre reinforced aluminium foil vapour seal facing and minimum thermal conductivity of 0.035 W/m ^{0}C at 24 ^{0}C mean temperature. Insulation shall be 50 mm (2 inches) thick.

.2 Blanket: For concealed indoor ductwork. 24 kg/m3 (1.5 lbs/ft^3) ULC listed flexible glass fibre blanket with glass fibre reinforced aluminium foil vapour seal facing with thermal conductivity of 0.036 W/m ^{0}C. Insulation shall be 25 mm (1 inch) thick.

.3 Duct Liner: For all indoor exposed supply air ducts.

.1 Duct Lining shall be applied in strict accordance with the latest edition of SMACNA's "HVAC Duct Construction Standard Metal & Flexible" and NAIMA's "Fibrous Glass Duct Liner Standard". Acceptable manufacturer is Johns Manville Linacoustic RC insulation or equal.

.2 Fiber Glass Duct Liner with Reinforced.

.3 Acoustically line all indoor exposed supply air duct work.

.4 Insulation shall be 25 mm (1inch) thick. R value 0.74 m2•°C/W, conductance 1.36 W/m2•°C

.4 All insulation materials are to meet requirements of CAN/ULC-S700 Series Standards.

2.3 JACKETS

.1 Canvas: 170 g/m2 with lagging adhesive, ULC labelled. Fire resistant canvas for covering mechanical insulation indoors. Plain weave cotton, no dyes, no odour, non-toxic the only canvas jacketing that's easy to tear both directions with no starting cut fabric is 1333 mm wide with ULC and ASTM 25/50 stamp, packaged in rolls. Acceptable manufactures: Robson Thermal Flamex FR Canvas; S. Fattal Canvas Inc.

.2 Protective covering (aluminium): For outdoor exposed ductwork .020 Childers corrugated aluminium preformed covering complete with strapping and seals.

.3 Trowelled-on weather protective coating: Bakor 110-14 asphalt mastic vapour barrier coating.

2.4 ACCESSORIES

.1 Wire: Minimum 1.8 mm dia. (15 gge) galvanized annealed wire.

.2 Stainless Steel Banding: Childers Products Co. "FABSTAPS" 0.6 mm (24 gge) Type 304 minimum 12 mm (½")wide stainless steel strapping or approved equivalent.

.3 Duct Insulation Fasteners: Weld-on 2 mm (12 gge) zinc coated steel spindles of suitable length, complete with minimum 40 mm (1½")square plastic or zinc plated steel self-locking washers.

.4 Tape Sealant: MACtac Canada Ltd or approved equivalent ULC listed and labelled 25/50 rated self-adhesive insulation tapes, types PAF, FSK, ASJ, or SWV as required to match the surface being sealed.

.5 Adhesive - Mineral Fibre Insulation: Clear, pressure sensitive, quick setting brush consistency adhesive, non-flammable when wet, fire resistive when dry, suitable for a temperature range of -20□C (-4□F) to 82□C (180□F) and compatible with the type of material to be secured, and WHMIS classified as non-hazardous.

.6 Adhesive – Flexible Elastomeric Insulation: Armstrong World Industries Inc. # 520 air-drying contact adhesive.

.7 Adhesive – Phenolic foam Insulation: As recommended by the insulation manufacturer.

.8 Sheet Metal Screws: No. 10 stainless steel sheet metal screws.

PART 3 EXECUTION

3.1 APPLICATION

.1 The acoustical liner shall be fixed to the duct with a minimum 50% coverage of a fire resistant adhesive. Where the duct width exceed 300 mm or the height 600mm, the liner shall be additionally secured with mechanical fasting on maximum 450 mm centre on all sides. Mechanical fastener must not pierce the duct.

.2 All edges of the lines shall be coated with fire resistant cementing material to prevent leakage or erosion. All joints shall be firmly butted and ends coated with an adhesive to ensure that the lining is smooth across all joints.

.3 All exposed ductwork shall have acoustic insulation applied inside the duct.

.4 Fibreglass insulation with canvas jacket shall be applied on concealed ductwork only.

.5 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PRE-INSTALLATION REQUIREMENTS

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and as indicated.

.3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.5 Ensure hangers, and supports are outside vapour retarder jacket.

.6 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.7 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 Common Work Results for HVAC

.2 Section 23 73 11 Packaged Air handling units

.3 Section 23 07 13 Duct Insulation

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE 90.1-04-SI Edition, Energy Standard for Buildings except Low-Rise Residential Buildings

.2 ASTM International Inc.

.1 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation

.2 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement

.3 ASTM C533, Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation

.4 ASTM C547, Standard Specification for Mineral Fiber Pipe Insulation

.5 ASTM C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

.6 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation

.7 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel

.8 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52MA, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation

.2 CAN/CGSB 51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS)

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168, Adhesive and Sealant Applications

.6 Thermal Insulation Association of Canada (TIAC)

.1 National Insulation Standards

.7 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 Fire and smoke ratings to CAN/ULC-S102

.1 Maximum flame spread rating: 25

.2 Maximum smoke developed rating: 50

2.2 INSULATION

.1 Semi-Rigid Fiber Glass Board (Type H): Elevated Temperature (ET) Panel meeting ASTM C 612 Type II and III, semi-rigid, non-combustible

.1 Maximum Service Temperature: 1000ºF (538ºC)

.2 Density: 2.4 PCF (38 kg/m3)

.3 'K' ('ksi') Value: ASTM C 177, 0.25 at 100ºF. (0.036 at 38ºC) mean temperature

.2 Flexible Fiber Glass Blanket (Type I): Elevated Temperature (ET) Blanket; flexible, non-combustible

.1 Maximum Service Temperature: 1000ºF (538ºC)

.2 Density: 1.1 PCF (18 kg/m3)

.3 'K' ('ksi') Value: ASTM C 177, 0.28 at 100ºF. (0.040 at 38ºC) mean temperature

2.3 CEMENT

.1 Thermal insulating and finish

.1 To: ASTM C449/C449M

.2 Air drying setting on mineral wool, to ASTM C449

2.4 JACKETS

.1 Provide a 22 gauge (.85 mm) solid galvanized metal liner over insulated areas throughout interior of unit. All units not mounted on a roof curb will also require a solid liner underneath to cover floor insulation.

PART 3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PRE- INSTALLATION REQUIREMENTS

.1 Pressure testing of equipment.

.2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards

.1 Hot equipment: To TIAC code 1503-H

.2 Cold equipment: to TIAC code 1503-C

.2 Elastomeric Insulation to remain dry. Overlaps to manufacturer's instructions. Joints tight and sealed properly.

.3 Provide vapour retarder as recommended by manufacturer.

.4 Apply materials in accordance with insulation and equipment manufacturer's instructions and this specification.

.5 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.6 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports outside vapour retarder jacket.

.7 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1	Section 23 05 00	General Instructions for HVAC Services
.2	Section 23 05 13	HVAC Equipment Motors
.3	Section 23 05 93	Testing Adjusting and Balancing for HVAC
.4	Section 23 11 23	Natural Gas Piping
.5	Section 23 31 13 .01	HVAC Ductwork
.6	Section 23 33 14	Damper Balancing
.7	Section 23 33 15	Damper Operating
.8	Section 23 34 00	HVAC Fans

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Mechanical contractor to coordinate between HVAC equipment and Controls supplier.

.3 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for electric and electronic control system for HVAC and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Diagrams for all required electrical and control wiring clearly differentiating between factory-installed and field-installed wiring.

.5 Manufacturer’s installation instructions.

.6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials in dry location indoors off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect electric and electronic control systems from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 BUILDING HVAC CONTROLS

.1 SECTION INCLUDES

.1 System Manager

.2 VAV Zone Controllers

.3 Room Temperature Sensors for VAV

.4 Packaged Air Handling Unit Controllers

.5 Generic I/O Device

.6 BACnet Thermostat

.2 SUMMARY

.1 The System Manager gives building owners access to manage their building's HVAC system. The operator can make schedule changes, adjust set points, trend data, and manage alarms. Custom control sequences and alarms can be created for building specific controls requirements. Owners and maintenance personnel can ensure the comfort of the occupants through the local touch screen interface or through a remote computer using a standard web browser when panel is connected to the buildings local network.

.2 Air handler and VAV zone controllers shall be installed and commissioned at the factory with pre-set addresses and job specific control parameters.

.3 Job specific device lists, custom tags, system relationships, and schedule groups shall be pre-loaded into System Manager from the factory to diminish on site programming.

.4 The system shall be designed in such a way that all HVAC equipment included are configured and capable of standalone operation through the use of their onboard DDC controllers independent of the system level controls and panels.

.3 COMMUNICATION

.1 All unit and system level controls shall be provided with BACnet MSTP communication protocol. Systems and equipment using a proprietary communications protocol shall be excluded from this bid.

.2 System manager shall be equipped with IP port to provide browser based access to system.

.1 Remote access will be accomplished by use of the building LAN. Building owner shall provide static IP address for internet or local intranet for this purpose.

.2 Access shall be security enabled by means of:

.1 Standard Windows 7 Embedded firewall and compatible security programs.
.2 Application login requirement.

.3 Remote interface shall have the exact same look and feel as the local user interface.

.4 System Manager shall regularly scan the network for new or missing devices.

.1 Communication errors with existing or configured devices shall be reported as system alarms and be indicated on the display.
.2 Additional BACnet devices that are discovered shall be indicated on the system panel interface automatically.

.5 System Manager computer shall automatically integrate to Packaged Air Handling Equipment and BACnet thermostats, equipment property pages shall be pre-configured for these devices.

.6 System shall be capable of integrating 3rd party BACnet/MSTP devices and device property pages shall be capable of being configured on site.

.4 SYSTEM MANAGER

.1 Touch Screen Display

.1 A 15.6” projective capacitive touch monitor shall be provided with minimum 1366 x 768 resolution for user interface with the System Manager computer.
.2 User interface shall be icon and menu driven browser based control for easy operation.
.3 Users shall have access to view or manage schedules, alarms, trend information, setpoints, building configuration depending on the security level of the user.
.4 User shall have ability to edit or delete system components depending on the security level of the user.
.5 System manager shall have the ability to store Portable Document Format (PDF) files and display them through the user interface.

.2 Wall Mount

.1 An adapter bracket that is appropriate to hold the System Manager computer and touchscreen shall be provided to allow components to be mounted on an interior wall.

.3 Schedules (Coordinate with the User)

.1 User shall have ability to:

.1 Manage, add, and delete individual and group schedules.
.2 Add exception schedules (holidays).
.3 Allow more than one occupancy period per day.
.4 Reassign devices to existing groups or new groups.

.4 Alarms

.1 User shall have ability to view acknowledge, or clear alarms.
.2 User shall have ability to set up alarm notifications via email or text messaging through system panel.
.3 User shall have the ability to create custom alarms based on job specific requirements.

.5 Setpoints

.1 User shall have the ability to adjust all parameters of the unit controllers that are available through the BACnet communications interface.

.6 Unit Controller Properties Access

.1 User shall have the ability to change all configuration parameters of the AHU unit controllers available through BACnet, including:

.1 Discharge temperature setpoints
.2 Duct pressure setpoints
.3 Fan control setpoints
.4 Enable, disable, or limit heating or cooling capacities
.5 Outside air damper minimum position
.6 Occupied and unoccupied control temperature setpoints
.7 Minimum discharge setpoints

.2 User shall have the ability to change all configuration parameters of the VAV terminal units available through BACnet, including:

.1 Min and max airflow setpoints
.2 Zone heating or cooling setpoints
.3 Min/Max allowable zone setpoint restrictions
.4 Occupancy override time
.5 Damper position override
.6 Control parameters, including:
.1 Stage timers
.2 Deadbands
.3 Flow coefficient
.4 Tuning parameters

.7 Trending (Depending on the Security Level of the User)

.1 System controller shall automatically maintain trend logs of key information, including:

.1 Room temperature
.2 Air Volume
.3 Heat/Cool status
.4 Occupancy
.5 Damper position
.6 Air handler status
.7 Discharge temperature
.8 Return temperature
.9 Outside air temperature
.10 Duct pressure
.11 Cooling capacity
.12 Heating capacity
.13 Economizer capacity
.14 Fan speed

.2 User shall have the ability to customize trend information by:

.1 Adding additional or remove existing trend data points, limited only by the points available through BACnet.
.2 Adjusting trending refresh intervals for any data point.
.3 Specifying length of time trend data is retained.

.3 User shall have the ability to graph trend information on System Manager user interface. Up to 5 points shall be able to be displayed at one time with up to two different unit types.

.4 User shall have the ability to export trend information from a remote location and information shall be provided as a comma separated values file. Information in the file shall include point name, date/time stamp, and value for each logged trend interval.

.8 Ancillary Control

.1 Depending on their security level, users shall have the ability to create custom control sequences for job specific requirements, including:

.1 Basic logical control statements
.2 Scheduling outputs
.3 Utilizing voting logic
.4 Monitoring analog and digital inputs
.5 Controlling analog or digital ouptuts based on system information
.6 Create custom system alarms

.9 Pre-programmed System Logic Sequences

.1 Duct pressure reset - System shall have the ability to optimize air handler energy usage by automatically adjusting its duct pressure setpoint based on zone damper positions.

.2 Voting Logic – System shall have the ability to optimize the heat/cool changeover on VVT type systems through various methods:

.1 Zone voting method capable of onsite tuning of single and double vote deadbands and number of votes for success.
.2 Single zone, aggregate, return air, mixed air, our outside air temperature based changeover.

.3 Depending on security level, the user shall have the ability to customize these controls by:

.1 Enabling or disabling.
.2 Identify rouge zones to be left out of algorithms.

.10 Application Security

.1 Security shall have a minimum of 5 levels of access, including Guest, Tenant, Maintenance, Owner, and Commission.
.2 Users shall have the appropriate permissions to add additional users and manage passwords.
.3 Access to visibility and adjustment of certain system functions and unit parameters shall be limited based on the log in access level of the user.

.11 Communications

.1 Downstream communications to unit controllers shall be BACnet MS/TP with a capacity to manage up to 120 BACnet/MSTP capable devices.
.2 IP port shall provide security enabled access by a remote computer or smart phone when connected to a local area network, DSL or cable modem.
.1 Remote computer will access and view system and unit controller information using a standard browser.
.2 Systems that require custom graphics or proprietary software to be loaded for remote access will not be allowed.

.5 VAV AIR TERMINAL UNIT CONTROLLERS

.1 VAV Air Terminal Units shall have a factory mounted BACnet MS/TP DDC controller designed to support the following pressure independent terminal boxes types as a minimum.

.1 VAV cooling only
.2 VAV with electric reheat
.3 Fan-powered series or parallel VAV
.4 Fan-powered series or parallel VAV with electric reheat

.2 All VAV terminal control applications shall be field-selectable such that a single controller may be used in conjunction with any of the above types of terminal units to perform the specified sequences of control.

.3 Controllers shall be ship from the factory with unique devices instances and MAC addresses on each unit controller.

.4 Controllers shall ship from the factory, pre-wired and configured for their specific application and zone. Zone specific tagging, min/max flow setpoints, primary inlet size, and reheat type shall be preprogrammed to ensure plug and play operation.

.5 Unit controllers shall be capable of providing standalone zone control.

.6 ROOM TEMPERATURE SENSORS FOR VAV-ATU CONTROLLERS

.1 All sensors will provide the following:

.1 RJ-11 connection allowing laptop connection for commissioning and servicing the controller.
.2 The room units to be wired with six-conductor phone cables and standard RJ-11 connectors to the VAV-ATU controllers.

.2 Optional features shall include:

.1 Digital display providing simultaneous of current temperature to one decimal place and day/night operation status.
.2 Configurable Display Features:
.1 Room temperature display on or off
.2 Degrees Fahrenheit or Celsius
.3 Graphical or alpha numeric setpoint display

.3 Override button: The override button allows an occupant to change to an occupied control schedule during the unoccupied cycle for a predetermined time period as defined by the controller. Occupancy graphic is shown on the display during occupied time periods.

.7 IR HANDLER UNIT CONTROLLERS

.1 All units shall be equipped with unit controllers and BACnet MS/TP Communication modules.

.2 Communication module shall be pre-programmed with unit specific device instance and MAC address.

.3 Unit controllers shall come with setpoints pre-configured in the factory for use with the System Manager.

.4 Unit controllers shall be capable of providing standalone operation of air handler.

.8 I/O MANAGER

.1 Shall have configurable analog inputs and outputs.

.1 Configurable inputs must be capable of accepting the following types of signals:
.1 Current (0-25ma)
.2 Voltage (0-10 volts)
.3 Thermistor (NI1000, PT1000, I-R2500, NTC10K, or NTC100K)

.2 Configurable outputs must be capable of sending the following types of signals:
.1 Current (0-25ma)
.2 Voltage (0-10 volts)

.2 Shall have a minimum of:

.1 Six digital inputs:
.1 Two dry contacts
.2 Two 24 VAC inputs
.3 Two 115 VAC inputs

.2 Three dedicated thermistor inputs (NTC10K or NTC100K)
.3 Three configurable analog inputs
.4 Four configurable analog outputs.
.5 One dedicated voltage (0-10 volt) analog output
.6 Ten digital outputs:
.1 Six normally open contacts
.2 Two switching relays
.3 Two triac outputs (24 VAC)

.3 I/O Manager shall be capable of controlling analog outputs through an internal PID control.

.4 I/O Manager shall be capable of being monitored and controlled through the touch screen System Manager.

.9 BACnet Thermostats

.1 Networked thermostats shall be capable of communicating through the network and to the System Manager via standard BACnet/MSTP communication protocol.

.2 Networked thermostats shall be capable of being wired to 3rd party electromechanical equipment with standard thermostat connections.

.3 Networked thermostats shall provide the following minimum read only integration points:

.1 Local zone temperature
.2 Remote zone temperature
.3 Mode

.4 Networked thermostats shall provide the following network adjustable read/write integration points:

.1 Occupied heating and cooling zone temperature setpoints
.2 Unoccupied heating and cooling zone temperature setpoints
.3 Occupancy
.4 Fan status
.5 Heating capacity status
.6 Cooling capacity status

2.2 THERMOSTAT (LINE VOLTAGE- COOLING) FOR EF-1 & EF-2

.1 Line voltage, reverse acting wall-mounted thermostat, for cooling within the mechanical and electrical Rooms:

.1 Full load rating: at 120V

.2 Temperature setting range: 15 degrees C to 40degrees C

.3 Thermometer range: 5degrees C to 45degrees C

.4 Markings in 2 degree increments

.5 Differential temperature fixed at 1.1degrees C

2.3 THERMOSTAT GUARDS

.1 Thermostat guards: lockable, plastic, clear, slots for air circulation to thermostat.

.2 Provide thermostat guards on all thermostats.

2.4 SEQUENCE OF OPERATIONS

.1 Packaged Air Handling Unit (RTU-1)

.1 Air handling unit shall operate as per the operator specified schedule.

.2 Air handling unit shall operate in conjunction with the Variable Air Volume Boxes.

.3 Unoccupied mode: The fresh air damper shall be closed and supply and relief fans shall be turned off.

.4 Precooling / Preheating mode: Fresh air damper shall be fully closed and Air Handling Unit shall operate in 100% recirculation mode.

.5 15 minutes (adjustable) before the occupancy period, the fresh air damper shall open to minimum position and supply fan shall continue to operate at required speed.

.6 Once the building is in occupied mode, fan speed shall vary to satisfy the space demand.

.7 Controller shall monitor the space temperature and shall modulate the VAV damper to maintain the set point temperature for the space.

.8 When the space temperature as sensed by the space temperature increases, the VAV damper shall modulate open to maintain the set point temperature and when the space temperature as sensed by the space temperature sensor decreases, the VAV damper shall close.

.9 When the temperature keeps falling and goes below the winter set point temperature, the heat exchanger shall turn on and shall maintain the space temperature while maintaining the minimum VAV damper position.

.10 The heat exchanger shall modulate to maintain the supply air temperature and the space heating demand.

.11 The cooling coil and condensing unit shall modulate to maintain the supply air temperature.

.12 VAV box shall modulate open and close depending upon the space demand.

.13 The minimum supply air for a VAV shall be 30% of the design flow.

.14 Free cooling mode/ economizer mode: Economizer shall be used as first stage of cooling. When the outdoor enthalpy is less than indoor enthalpy and building needs cooling, unit outdoor air and return air damper shall modulate to supply air at set temperature. If necessary, the outside air damper will modulate fully open to maintain the set supply air temperature. When the first stage of cooling (economizer) is not able to maintain the supply air temperature, the outside air damper shall close to minimum position and mechanical cooling shall turn on to maintain the temperature. When the air handling unit is operating in economizer mode, the relief fan shall be turned ON.

.15 When the requirement of cooling is satisfied, the economizer and DX cooling shall disengage in reverse order.

.16 Outdoor air damper shall not be less that the minimum set position.

.17 Humidifier shall maintain 35% humidity during winter operations.

.2 Packaged Air Handling Unit (RTU-2)

.1 Air handling unit shall operate as per the operator specified schedule.

.2 Air handling unit shall operate in conjunction with the Variable Air Volume Boxes.

.3 Unoccupied mode: The fresh air damper shall be closed and supply and relief fans shall be turned off.

.4 Precooling mode: Fresh air damper shall be fully closed and Air Handling Unit shall operate in 100% recirculation mode.

.5 15 minutes (adjustable) before the occupancy period, the fresh air damper shall open to minimum position and supply fan shall continue to operate at required speed.

.6 Once the building is in occupied mode, fan speed shall vary to satisfy the space demand.

.7 Controller shall monitor the space temperature and shall modulate the VAV damper to maintain the set point temperature for the space.

.8 When the space temperature as sensed by the space temperature increases, the VAV damper shall modulate open to maintain the set point temperature and when the space temperature as sensed by the space temperature sensor decreases, the VAV damper shall close.

.9 When the set point temperature is attained the cooling coil and condensing unit shall modulate to maintain the supply air temperature while maintaining the minimum VAV damper position.

.10 VAV box shall modulate open and close depending upon the space demand.

.11 The minimum supply air for a VAV shall be 30% of the design flow.

.12 Free cooling mode/ economizer mode: Economizer shall be used as first stage of cooling. When the outdoor enthalpy is less than indoor enthalpy and building needs cooling, unit outdoor air and return air damper shall modulate to supply air at set temperature. If necessary, the outside air damper will modulate fully open to maintain the set supply air temperature. When the first stage of cooling (economizer) is not able to maintain the supply air temperature, the outside air damper shall close to minimum position and mechanical cooling shall turn on to maintain the temperature. When the air handling unit is operating in economizer mode, the relief fan shall be turned ON.

.13 When the requirement of cooling is satisfied, the economizer and DX cooling shall disengage in reverse order.

.14 Outdoor air damper shall not be less that the minimum set position.

.3 Exhaust Fans (Standalone Controls)

.1 Fan shall operate from a local wall mounted thermostat.

.2 When the space temperature goes 1 degree F above the set point temperature, the motorized fan damper and outside air damper shall open. Fan shall start when the dampers are open.

.3 When the temperature drop 1 degree F below set point, fan shall stop and motorized dampers shall close.

.4 Electric heater (Standalone Controls)

.1 Electric heaters shall cycle ON and OFF based on set point temperature. Thermostat shall be built in to the unit.

.2 When the temperature falls below set temperature, the heater shall start. When the temperature is attained, heater shall turn off.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for electric and electronic control systems installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Engineer of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install System Manager, unit controllers and equipment described herein and according to manufacturer’s requirements, certified drawings and contract documents.

.2 Equipment and control panels shall be installed with adequate access and power as specified on the drawings.

.3 Install all communication wiring per BACnet® MSTP communications wiring per BACnet standards, according to manufacturer's requirements, certified drawings and contract documents.

.4 Coordinate electrical installation and communications wiring with electrical and/or mechanical contractor.

.5 Provide all material required to verify a fully operational MicroTech Integrated System as specified herein and/or as shown in the drawings.

.6 Control panels, including the System Manager and IO Manager shall be installed in a conditioned area within the building envelope.

3.3 START-UP AND COMMISSIONING

.1 The System Manager computer shall be pre-programmed with tagging and addressing of all system components, such as air handlers, VAVs, etc. All system relationships shall be pre-established from the factory.

.2 All Packaged Air Handling Units shall be installed and commissioned prior to the start-up and commissioning of the MicroTech Integrated System.

.3 VAV Air terminal units shall be provided with adequate access, power and communications wiring installed as specified on the drawings prior to the start-up and commissioning of the MicroTech Integrated System.

.4 Packaged Air Handling Unit and VAV Air terminal unit start-up and commissioning shall be the responsibility of manufacturer authorized service agency.

3.4 INSTALLATION

.1 Install control devices.

.2 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior wall.

.3 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

.3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 35 21- LEED Requirements 01 74 21- Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 WARRANTY

.1 All control components, including the System Manager and IO Manager panels shall be free of defect in material and workmanship and shall be supported by the manufacturer's Product Warranty policy for a period of one year from startup or up to 18 months from ship date.

END OF SECTION

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PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Materials and installation for piping, valves and fittings for gas fired equipment.

.2 Related Requirements

.1 Section 23 05 00 General Instructions for HVAC Services

.2 Section 23 05 93 Testing, adjusting and balancing for HVAC

.3 Section 23 09 33 HVAC Controls system

.4 Section 23 73 11 Packaged Air Handling Units

1.2 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B16.5-03, Pipe Flanges and Flanged Fittings

.2 ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings

.3 ASME B16.22-01, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings

.4 ASME B18.2.1-96, Square and Hex Bolts and Screws Inch Series

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A47/A47M-99(2004), Standard Specification for Ferritic Malleable Iron Castings

.2 ASTM A53/A53M-04, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless

.3 ASTM B75M-99, Standard Specification for Seamless Copper Tube Metric

.4 ASTM B837-01, Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems

.3 Canadian Standards Association (CSA International)

.1 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel

.4 Canadian Standards Association (CSA)/Canadian Gas Association (CGA)

.1 CAN/CSA B149.1HB- Natural Gas and Propane Installation Code Handbook

.2 CAN/CSA B149.2 Propane Storage and Handling Code

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS)

1.3 QUALITY ASSURANCE

.1 Gas piping installation shall be performed by licensed gas fitters and apprentices under their direction.

.2 Installation shall be done in accordance with the best recommendations of the gas utility and equipment manufacturers.

.3 Rework and/or relocate natural gas piping and service as required to serve new and existing loads.

.4 Coordinate with local gas provider to provide functioning gas supply.

.5 Comply with the requirements of Natural Gas and Propane Installation Code B149.1-00, CSA and Ontario Gas Utilization Regulation

.6 All costs to provide the new gas services shall be bourne by the Contractor.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Material shall be stored at site in designated area as per manufacturer's recommendations.

.2 All pipe ends must be covered to stop debris from going inside.

PART 2 PRODUCTS

2.1 MATERIALS

2.2 PIPE

.1 Steel pipe: to ASTM A53/A53M, Schedule 40, seamless as follows:

.1 NPS 1/2 to 2, screwed.

.2 NPS2 1/2 and over, plain end.

.2 Copper tube: to ASTM B837.

.3 Buried: steel as above with "Yellow Jacket" factory applied polyethylene coating with approved field applied matching covering for joints.

or

Approved fusion welded plastic piping installed to utility standards.

2.3 JOINTING MATERIAL

.1 Screwed fittings: pulverized lead paste.

.2 Welded fittings: to CSA W47.1.

.3 Flange gaskets: nonmetallic flat.

.4 Brazing: to ASTM B837.

2.4 FITTINGS

.1 Steel pipe fittings, screwed, flanged or welded:

.2 Malleable iron: screwed banded Class 150 to ANSI B16.3.

.3 Steel pipe flanges and flanged fittings: to ANSI B16.5.

.4 Steel butt-welding fittings to match pipe schedule.

.5 Unions: malleable iron, brass to iron, ground seat, to ASTM A47M.

.6 Bolts and nuts: to ANSI B18.2.1.

.7 Nipples: Schedule 40, to ASTM A53.

2.5 REGULATORS

.1 Provide regulators as required and indicated on the drawings.

.2 Type 1 – Provide regulator with cast iron NPT female end connection and body. Unit shall be self-operated for inlet pressures of 35 kPa and outlet pressures from 0.5 to 13.8 kPa, six ranges. Unit to be model 133L as manufactured by Fisher.

.3 Type 2 - Provide regulator with cast iron NPT female end connection and body. Unit to be quick-reacting pressure reducing service regulator able to minimize shock load changes which could occur in the system. Unit to be S200 series as manufactured by Fisher.

2.6 VALVES

.1 Provincial Code approved, 175 Class, W.O.G. rating, wrench operated lubricated plug valve with semi-steel body, tapered plug and screwed ends, Rockwell-Nordstrom Fig. 142 up to 65 mm pipe size and Fig. 143 flanged for pipe size 80 mm and larger or CGA approved ball valves up to 65 mm.

.2 Equivalent material by NEO will be accepted.

.3 Provide gas relief valves as required by code. Located relief valves in suitable areas, refer to CSA B149 Natural gas and Propane installation Code for required clearances. Relief valve pressures shall range from 1.7kPa to 50kPa with four spring ranges. Unit shall be model 289H as manufactured by Fisher.

.4 Ball Valves: CSA Certified, 3100 kPa WOG rated full port ball valve, each complete with a forged brass of bronze body and cap, blowout-proof stem, solid forged brass chrome plated ball, “Teflon” or “PTFE” seat, threaded ends, and removable level handle. Acceptable Manufacturers include: Toyo Valve Co. Fig 5044A; Neo Valves #525; Nibco #T-FP-600.

.5 Plug Valves : CSA certified Class 125, 1380 kPa rated ¼ turn cast iron lubricated plug valves, each wrench operated and complete with cylindrical plug with lubricated grooves, screw and receptacle, Acceptable Manufacturers: Neo Valves #1AS40114; Newman Hattersley #171M.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 PIPING

.1 Install piping in a workmanlike manner in accordance with Provincial Codes, utility requirements and the best practices of the trade.

.2 Assemble piping using fittings to ANSI standards.

.3 Run pipe in straight lines parallel with building walls.

.4 Slope piping down in direction of flow to low points.

.5 Use eccentric reducers at pipe size change installed to provide positive drainage.

.6 Install drip points:

.7 At ends of mains.

.8 At low points in piping system.

.9 At each connection to equipment.

.10 Place and install piping so there will be no interference with the installation of other piping systems, ducts and equipment. Provide clearance for access and for maintenance.

.11 Ream pipes, clean scale and dirt, inside and out.

.12 Branches shall be taken from top or side of mains and drop to location required with a drip pocket.

.13 Secure risers to prevent vibration.

.14 Keep openings in pipes or fittings plugged and capped during installation to exclude dirt.

3.3 VALVES

.1 Install valves and specialties to permit easy operation, access and removal.

.2 Install valves at all branch take-offs to isolate each piece of equipment, and as indicated.

.3 Install valves with stems upright or horizontal unless otherwise approved by manufacturer and local gas provider.

.4 Pre-fabricate valve and auto valve assemblies into uniform arrangements.

.5 Valves shall be regulated and packed and glands adjusted at the completion of the work before final acceptance.

3.4 CONNECTION TO EQUIPMENT

.1 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.

.2 Provide unions or flanges on connections to all equipment and apparatus requiring servicing and/or replacing.

.3 Install connections to equipment to prevent stress on pipes and equipment, and to facilitate removal of equipment without disconnecting more than a minimum of pipe work or shutting down any other piece of equipment.

3.5 TESTING

.1 Test piping in accordance with Natural Gas and Propane Installation Code B149.1-05, except as noted herein.

.2 Test piping to the greater of 1.5 x working pressure or 1034 kPa and correct leaks revealed by this test. Test pressure shall be retained for 8 hours.

.3 While pressure test is in progress, paint joints using a leak detection solution such as "Snoop" and check for bubbles.

.4 Correct leaks noted by the test and retest to the satisfaction of the Engineer.

.5 Purge after pressure test in accordance with the Natural Gas and Propane Installation Code B149.1-05

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Supply, install, and satisfactorily operate a complete ventilating system to the full intent of the Drawings and Specification. All exposed ductwork shall be galvanized steel as specified below.

.2 500 Pa pressure class ductwork is the basis of Contract and design.

.3 Final connections to the linear slot diffusers shall be galvanized duct.

.4 Paint ductwork as per the architectural requirements. Refer to Section 09 91 00 PAINTING.

.5 All external ductwork shall be painted with weatherproof paint.

1.2 RELATED SECTIONS

.1 Section 23 05 00 Common works results for HVAC

.2 Section 23 07 13 Duct Insulation

.3 Section 23 73 11 Packaged Air Handling Units

.4 Section 23 05 00 Testing adjusting and balancing for HVAC

.5 Section 23 36 00 Air Terminal Units

1.3 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE Handbook Series Fundamentals: Ch. 2. Duct Design

.2 ASHRAE Handbook Series Equipment: Ch 6. Duct Construction

.2 National Fire Protection Association (NFPA)

.3 Sheet Metal and Air Conditioning Subcontractors National Association (SMACNA)

.4 Underwriters Laboratories Inc. (UL)

.5 American Society for Testing and Materials (ASTM)

1.4 REGULATIONS

.1 Conform to all codes, by-laws, etc. of Provincial and Municipal authorities having jurisdiction.

.2 No additional compensation will be awarded for carrying out any conditions embodied in such regulations.

.3 When the work as shown and as specified exceeds the minimum requirements of such regulations, the Drawings and/or Specifications shall govern.

.4 Provide all permits, inspections, and certificates required for this Section.

1.5 GENERAL ARRANGEMENTS

.1 Ductwork, position of equipment, etc., specified herein and shown on the Drawings indicates the general arrangement.

.2 Co-ordinate the work under this Section with all other trades, in particular the structural work and make all necessary changes or additions to the runs to accommodate structural conditions, piping, ductwork, mechanical equipment, etc.

.3 Install the systems and apparatus in a practical and first-class manner and guarantee all work and apparatus against defects of workmanship and material and make good any and all defects that may develop.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements

.1 Store materials indoors, in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect metal ducts from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.3 Protect ductwork from dirt, water, and debris. During storage on jobsite, keep ends of ductwork covered to prevent foreign objects and water from entering ductwork.

.4 Deliver sealant materials to site in original unopened containers labeled with manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi component materials.

.5 Store and handle sealant materials in compliance with manufacturers' recommendations to prevent deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

.6 Deliver and store stainless steel sheets with mill applied adhesive protective paper, maintained through fabrication and installation.

1.7 QUALITY ASSURANCE

.1 Industry Standards

.1 Unless otherwise indicated or specified, sheet metal ductwork shall be constructed and installed in accordance with SMACNA duct construction standard relevant to ductwork system being provided. These standards are herein referenced as the SMACNA Manual, unless otherwise indicated.

.2 Comply with ASHRAE Fundamentals Handbook recommendations, except as otherwise indicated.

.2 Manufacturers: Firms regularly engaged in manufacture of ductwork products of types, materials, and sizes required, whose products have been satisfactorily used in similar service for not less than 5 years.

.3 Installer shall be a firm with at least 3 years' experience of successful installation on ductwork systems similar to that required for this Project.

.4 Changes or alterations to layout or configuration of duct system shall be:

.1 Specifically approved in writing by Engineer.

.2 Proposed layout shall provide original design results, without increasing system total pressure.

.5 Supply and install all appurtenances, fittings, ductwork and accessories necessary for the proper functioning of the system or reasonably inferable from the Drawings with the equipment, whether indicated on the Drawings or specified herein, or not.

PART 2 PRODUCTS

2.1 GENERAL

.1 All ductwork shall be galvanized. Sheet metal thickness shall be as per SMACNA standards.

.2 Install ductwork as shown on the Drawings. Duct sizes shown on the Drawings are clear internal dimensions whether internal insulation is installed or not.

.3 Ductwork to be adequately strong and sufficiently rigid to resist all normal shocks, reinforced at all points where necessary to prevent vibration or movement, and securely fastened in place.

.4 Ensure ducts are airtight and all joints gasketed or caulked and made in accordance with the best standards of the trades.

.5 Elbows and other changes in ductwork direction to have centreline radius at least equal to the duct depth or diameter. Where possible, all transitions in duct size will be made with an angle not exceeding 15 degrees. Supply and install dampers in all ducts as indicated.

.6 Install a canvas sleeve where the ductwork connects to the ventilating units such that the unit is isolated from the ductwork. Do not insulate the sleeve.

.7 Exposed Ductwork

.1 All indoor exposed ductwork shall be spiral.

.2 Where ductwork is indicated to be exposed to view in occupied spaces, provide materials that are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains, discoloration, and other imperfections, including those that would impair painting.

.8 Reinforcement Shapes and Plates: Unless otherwise indicated, provide reinforcements of same material as ductwork.

.9 Rigid round Ductwork

.1 Construct rigid round ducts in accordance with SMACNA, unless specified otherwise.

.2 Basic Round Diameter: As used in this Article, is diameter of size of round duct that has circumference equal to perimeter of a given size of flat oval duct.

.3 Where space limitations prevent use of round duct or where shown on Drawings, provide ductwork of flat oval construction.

.4 Fabricate round ducts with spiral seam construction, except where diameters exceed 1800 mm. Fabricate ducts having diameters greater than 1800 mm with longitudinal butt welded seams.

.10 Rigid Round Ductwork Fittings

.1 Construct rigid round ductwork fittings in accordance with SMACNA unless otherwise specified.

.2 90 Degree Tees, Laterals, and Conical Tees: Fabricate to conform to SMACNA manual with metal thicknesses specified for longitudinal seam straight duct.

.3 Diverging Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from body onto branch tap entrance.

.4 Elbows

.1 Fabricate in stamped (die formed), pleated, or segmented (gored) construction 1.5 times elbow diameter. Two piece segment elbows are not allowed, except with turning vanes.

.2 Segmented Elbows: Fabricate with welded construction.

.3 Round Elbows 200 mm and Smaller

.1 Stamped elbows for 45 and 90 degree elbows and pleated elbows for 30, 45, 60, and 90 degrees configuration.

.2 Fabricate nonstandard bend angle configurations or nonstandard sized (e.g., 90 and 115 mm) elbows with segmented construction.

.4 Round Elbows 225 mm Through 350 mm

.1 Segmented or pleated elbows for 30, 45, 60, and 90 degrees.

.2 Fabricate nonstandard bend angle configurations or nonstandard sized (e.g., 240 and 265 mm) elbows with segmented construction.

.11 Round to Rectangular Duct Connection

.1 Peppertree Air Solutions Inc. “SPIN-ON” or approved equivalent G90 galvanized steel, flared notched and beaded round duct take-off collar complete with damper and associated hardware (including spring loaded damper clip, threaded damper clip, locking wing-nut and aluminum handle) to be installed in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Acceptable manufacturers:

.12 Insulated Flexible Ductwork

.1 Fabricate in accordance with:

.1 UL 181, Class 1

.2 NFPA 90A and NFPA 90B

.2 Construction

.1 Outer Jacket: Fire retardant reinforced aluminium vapor barrier jacket with reinforced cross hatched scrim having a permeance of not greater than 0.1 perm when tested in accordance with ASTM E96, Procedure A.

.2 Inner Liner: Tri laminate of aluminium foil, fiberglass, and aluminized polyester.

.3 Reinforcing: Galvanized steel wire helix, mechanically locked to and encapsulated by inner liner fabric.

.4 Insulation

.1 Factory insulated with fiberglass insulation.

.2 R value: 1.05 m² k/w minimum at a mean temperature of 24 degrees C.

.5 Internal Working Pressure: Rating shall be minimum 1500 Pa positive and 1000 Pa negative, with bursting pressure of at least 2 1/2 times working pressure.

.6 Air Velocity Rating: 20 m/s, minimum.

.7 Environment: Suitable for continuous operation at temperature range of minus 29 degrees C to plus 121 degrees C.

.8 Manufacturers and Products

.1 Flexmaster; Type T/L-A

.13 Ductwork Drain Point

.1 Ductmate Canada Ltd. “DUCTMATE METU”, or approved equivalent 20 mm (3/4”) dia. moisture drains with galvanized sheet metal funnel, and chrome plated brass threaded drain, nut and cap.

2.2 DUCT SEALING MATERIAL

.1 Ductmate “PROseal” High Velocity Duct Sealant or approved equivalent ULC listed and labelled, premium grade, grey colour, water base, non-flammable duct sealer, brush or gun applied, with a maximum flame spread rating of 0 and smoke developed rating of 0.

.2 Adhesives, Cements, Sealant, and Installation Accessories: As recommended by duct manufacturer for application.

.3 Solvent Based Sealants

.1 Ultraviolet light resistant

.2 Mildew resistant

.3 Flashpoint: Greater than 21 degrees C, SETA CC

.4 Manufacturers and Products

.1 Hardcast, Inc.; Versagrip 102

.2 Rectorseal; AT-33

.5 Water Based Sealants

.1 Listed by manufacturer as nonflammable in wet and dry state.

.2 Manufacturer and Product: Rectorseal; Airlok 181.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50mm wide.

2.4 DUCT FASTENERS

.1 General

.1 Rivets, bolts, or sheet metal screws.

.2 Ductwork fasteners shall be same metal as duct being supported, unless otherwise noted.

.2 Self-Drilling Screws

.1 Galvanized Steel Ductwork System: Sheet metal screws shall be hex washer head (HWH) TEKS® self-drilling type, formed from heat treated carbon steel with zinc electroplated finish.

2.5 DUCT LEAKAGE

.1 Duct leakage test shall be carried out on all duct work except for the final connection to the air terminals.

.2 Duct leakage test shall be performed in accordance with SMACNA HVAC Air Duct Leakage Test Manual.

.3 Isolate the equipment and VAV boxes while performing air leakage test and use small blower to pressurize the duct.

.4 Pressurize duct up to 1.5 KPa. Air leakage shall not be more than 10% of the total duct volume.

.5 Test ductwork as a whole or in part whatever is convenient.

.6 Seal all leaking joints.

.7 Following information must be provided to the engineer for each air handling system:

.1 System # / name

.2 Duct volume. M^3

.3 Duct leakage. M^3/hr

.4 Allowable leakage. M3/hr

2.6 FITTINGS

.1 Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA.

.2 Elbows

.1 Fit square turn elbows with vane side rails.

.2 Shop fabricate double-blade turning vanes of same material as ductwork.

.3 Fabricate with equal inlet and outlet.

.4 Rectangular radius elbows with inside radius of 3/4 of duct width in direction of turn.

.5 Manufacturers and Products:

.1 Elgen; All-Tight.

.2 Duro Dyne; Type TR

2.7 FIRE STOPPING

.1 Provide fire dampers at all fire wall crossings.

.2 Fire stopping material and installation must not distort duct.

2.8 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA standards.

.3 Joints: to SMACNA or proprietary manufactured duct joint whichever is more stringent.

2.9 HANGERS AND SUPPORTS

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500 mm.

.2 Hanger configuration: to SMACNA.

.3 General

.1 Attachments, hangers, and supports for ductwork shall be in accordance with SMACNA Manual referenced for type of duct system being installed.

.2 Duct hanging system shall be composed of three elements; upper attachment to building, hanger itself, and lower attachment to duct.

.3 Wire hangers are not acceptable.

.4 Hanger Spacing

.1 Ducts Up to 1500 mm in Largest Dimension: 3.0 m, maximum.

.2 Ducts Over 1525 mm in Largest Dimension: 2.4 m, maximum.

.5 Construction Materials: Supporting devices including, but not limited to, angles used for support and bracing, base plates, rods, hangers, straps, screws, bolts shall be as follows:

.1 Galvanized Steel Ductwork: Indoors/Outdoors: Carbon steel, hot dipped galvanized after fabrication.

.6 Building Attachments

.1 Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials.

.2 Do not use powder actuated concrete fasteners for lightweight aggregate concrete or for slabs less than 102 mm thick.

.3 Upper Attachment (Concrete)

.1 Drive pin fastener and expansion nail anchor may be used for ducts up to 450 mm maximum dimension.

.2 Threaded stud fastener may be used for ducts up to 900 mm maximum dimension.

.3 Concrete attachments shall be made of steel.

.7 Duct Fasteners: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials and conforming to requirements of Paragraph DUCTWORK FASTENERS.

.8 Trapeze and Riser Supports: Steel shapes conforming to ASTM A36/A36M, hot dipped galvanized after fabrication.

.9 Hangers: black steel angle with galvanized steel rods to SMACNASPEC NOTE: Ensure upper hanger attachments are compatible with structure.

.10 Upper Hanger Attachments

.1 For concrete: manufactured concrete inserts.

.2 For steel joist: manufactured joist clamp steel plate washer.

.3 For steel beams: manufactured beam clamps.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for metal duct installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate. Do not proceed with the Work until unsatisfactory conditions have been corrected.

.2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 GENERAL

.1 Contractor must coordinate location of all ductwork with process piping, structural and electrical divisions. The general contractor shall approve the route of the ductwork prior to manufacturing.

.2 Ductwork shall be installed in accordance with SMACNA. All ductwork indicated on the drawings is schematic. Therefore, changes in duct size, duct configuration, and location may be necessary to conform to field conditions.

.3 Duct Hardware: Install locking quadrant controls for each volume damper.

.4 Install ducts straight and plumb, following building lines.

.5 Do not install in front of equipment or controls in such manner as to interfere with operation, servicing or repairs.

.6 Provide ductwork adequately strong and sufficiently rigid to resist all normal shocks, reinforced at all joints where necessary to prevent vibration or movement, and securely fastened in place.

.7 All ducts to be airtight and all joints caulked and made in accordance with the best standards of the trade.

.8 Where possible make all transitions in ductwork size with an angle not exceeding 15 degrees.

.9 Provide elbows and other changes in ductwork direction having centreline radius at least equal to 1.5 times the duct depths.

.10 Provide fire dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion-resistant springs, bearings, bushings, and hinges. Refer to architectural drawings for location of fire rated walls.

.11 Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

.12 Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated on the drawing.

.13 Provide duct test holes where indicated on the drawings and required for testing and balancing.

.14 Penetrations

- .1 Provide duct sleeves or prepared openings for duct mains, duct branches, and ducts passing through roofs, walls and ceilings.
- .2 Clearances
  - .1 For un-insulated ducts, allow 25 mm clearance between duct and sleeve, except at grilles, registers, and diffusers.
  - .2 For insulated ducts, allow 25 mm clearance between insulation and sleeve, except at grilles, registers, and diffusers.

.3 Closure Collars

.1 Minimum 102 mm wide on each side of walls or floors where sleeves or prepared openings are installed.

.2 Fit collars snugly around ducts and insulation.

.3 Same gauge and material as duct.

.4 Grind edges of collar smooth to preclude tearing or puncturing insulation covering or vapor barrier.

.5 Use fasteners with maximum 152 mm centers on collars.

.4 Packing: Mineral fiber in spaces between sleeve or opening and duct or duct insulation.

.5 Concealment

.1 Wherever possible in finished and occupied spaces, conceal ductwork from view by locating in mechanical shafts, hollow wall construction, or above suspended ceiling.

.2 Do not encase horizontal runs in solid partitions, except as specifically shown.

.3 Limit clearance to 25 mm where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any.

.6 Coordination with Other Trades

.1 Coordinate duct installation with installation of accessories, dampers, coil frames, equipment, controls, and other associated work of ductwork system.

.2 Ductwork shall be configured, positioned, and installed to permit installation of light fixtures as indicated on Drawings.

.3 Coordinate ductwork layout with suspended ceiling, lighting and sprinkler head layouts and similar finished work.

.4 Electrical Equipment Spaces: Do not run ductwork through transformer vaults and other electrical equipment spaces and enclosures.

3.3 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA.

3.4 SEALING AND TAPING

.1 Apply sealant in accordance with to manufacturer's recommendations or SMACNA.

.2 Bed tape in sealant and recoat with minimum of 1 (one) coat of sealant to manufacturers recommendations.

3.5 LEAKAGE TESTS

.1 Perform leak test as describes above.

.2 Complete test before performance insulation or concealment Work.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 General Instruction for HVAC Services

.2 Section 23 05 93 Testing adjusting and balancing for HVAC

.3 Section 23 31 13 01 HVAC Ductwork

.4 Section 23 73 11 Packaged Air Handling Units

.5 Section 23 36 00 Air Terminal Units

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.2 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)

.3 ANSI/AMCA Standard 210-2007/ (ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

.4 Ontario Building Code – OBC 12

.5 National Fire Protection Association (NFPA)

.1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems

.6 Underwriter's Laboratories (UL)

.1 UL 181 Factory-Made Air Ducts and Air Connectors

.7 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

1.3 GENERAL

.1 Manufacturer to provide acoustical analysis with P.Eng. stamp showing silencer meet NC 35 level.

.2 Contractor to ensure the selected acoustic silencer maintain noise level of NC 35 within the space.

.3 Acceptable manufacturers are Vibro-Acoustics, Kinetics Noise controls or equivalent.

1.4 SUBMITTAL

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for acoustical air plenums and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings

.1 Submit separate drawings for each piece of attenuation equipment complete with product data.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials in dry location indoors off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect silencers from all external damages.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 Rating Data

.1 Provide performance rating data with reference standards as follows:

.1 Silencer: insertion loss, pressure drop at design conditions.
.2 Acoustic plenums: transmission loss and acoustical absorption.
.3 Acoustical performance measurements in accordance with ASTM E477, ASTM E90 and ASTM C423, except where specified otherwise.

2.2 ABSORPTION AND INSULATING MEDIA

.1 Acoustic quality, glass fibre, bacteria and fungus resistant; free of corrosion causing or accelerating agents; packed to density to meet performance requirements; and meet NBC fire requirements or requirements of authority having jurisdiction for duct lining.

2.3 SILENCERS

.1 Silencer inlet and outlet connection dimensions must be equal to the duct sizes as shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.

.2 Factory manufactured of prime coated or galvanized steel, compatible with ductwork specified elsewhere and to ASHRAE and SMACNA standards.

.3 All rectangular silencers shall be constructed with a 22 gauge galvanized steel outer casing and 26 gauge galvanized perforated steel.

.4 All elbow silencers shall be constructed with an 18 gauge galvanized steel outer casing and 22 gauge galvanized perforated steel. All acoustical splitters shall be internally radiused and aerodynamically designed for the schedule insertion loss. All elbow

silencers with a turning cross-section dimension greater than 48" shall have at least two half splitters and one full splitter

.5 Outer casing and galvanized steel inner casing with clean cut circular perforations to enclose acoustic media. Inner casing to have half-splitters running full length of silencer where any cross sectional dimension exceeds 450mm. Protect media from erosion using suitable material between media and perforated metal.

.6 Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be resilient such that it will not crumble or break, and confirm to irregular surfaces.

.7 Silencer materials, including glass fiber shall have maximum combustion ratings as noted below when tested in accordance with ASTM E84, NFPA 255 or UL 723.

.1 Flame Spread Index: 15

.2 Smoke Developed Index: 5

.8 Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in "Section B Materials", are minimums. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.

.9 Casings shall be lock formed and sealed, except as noted in Section 2.2 Materials, to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the Contractor at the jobsite.

.10 All perforated steel shall be adequately stiffened to insure flatness and form. All spot welds shall be painted.

.11 Silencer dynamic insertion loss shall not be less than that listed in the silencer schedule.

.12 Silencer generated noise shall not be greater than that listed in the silencer schedule.

.13 Acoustic performance shall include dynamic insertion loss and generated noise for forward flow (air and noise in same direction) or reverse flow (air and noise in opposite direction) in accordance with the project's air distribution system requirements.

.14 All silencer ratings shall be determined in a duct-to-reverberant room test facility which provides for airflow in both directions through the test silencer in accordance with the ASTM E-477-06a test standard. The test set-up, procedure and facility shall eliminate all effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for silencer installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence.

.2 Inform Engineer of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.3 INSTALLATION

.1 Noise flanking: where indicated, install in wall sleeve with uniform clearance around to ensure no contact of silencer with wall sleeve. Pack with flexible, non hardening caulking on both sides of sleeves.

.2 Instrument test ports: install at inlet and outlet to permit measurement of insertion loss and pressure loss.

.3 Suspension: to manufacturer's instructions.

.4 Protect all acoustic media from dirt and moisture during construction.

.5 After the system has been air balanced the noise control manufacturer shall visit the job and check the sound and vibration levels in those areas requested by the Engineer. Conduct sound tests in areas that do not meet the specified noise levels. Determine the necessary corrective measures.

.6 Sound measurements shall be in accordance with the “American Standard Method for the Physical Measurement of Sound S1.2”.

.7 Sound measuring equipment shall be in accordance with ANSI Standards S1.4 or S1.11.

.8 On system start-up the noise control manufacturer shall inspect the complete installation and report in writing any changes necessary to obtain satisfactory operation of isolated equipment.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment from the work area.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 General Instructions for HVAC Services

.2 Section 23 07 13 Duct Insulation

.3 Section 23 05 93 Testing adjusting and balancing for HVAC

.4 Section 23 36 00 Air Terminal Units

.5 Section 23 31 13.01 HVAC Ductwork

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE Handbook Series Fundamentals: Ch. 2. Duct Design

.2 ASHRAE Handbook Series Equipment: Ch 6. Duct Construction

.2 National Fire Protection Association (NFPA)

.3 Sheet Metal and Air Conditioning Subcontractors National Association (SMACNA)

.4 Underwriters Laboratories Inc. (UL)

.5 American Society for Testing and Materials (ASTM)

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Indicate

.1 Flexible connections.

.2 Duct access doors.

.3 Turning vanes.

.4 Instrument test ports.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements

.1 Store materials indoors, in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect metal ducts from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.3 Protect all material from dirt and external damage.

.4 All damaged material shall be replaced with new at now extra cost.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated on the drawings.

.2 Provide 75 mm wide flexible connections between ductwork and all fans and air handling units.

.3 Except where otherwise indicated, flexible connections to be “Duro-Dyne” Grip-Loc of neoprene coated glass fabric, 1.3 kg/m² with 75 mm wide 24 gauge metal connectors.

2.3 ACCESS DOORS IN DUCTS

.1 Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated on the drawings.

.2 Review locations prior to fabrication.

.3 Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ductwork, install at least 1-inch (25 mm) thick insulation with sheet metal cover.

.4 Access doors smaller than 12-inches (300 mm) square may be secured with sash locks.

.5 Provide access doors at all dampers, controls, shutters, fans, filters, flow switches and duct drains. Access doors to have quick release fastenings, rubber gaskets and be airtight when closed.

.6 Doors in insulated ducts to be of double wall construction filled with 25 mm thick glass fibre insulation.

.7 Supply and install picot tube openings with cap and chain for balance of systems.

2.4 TURNING VANES

.1 Shop fabricate double-blade turning vanes of same material as ductwork as per SMACNA recommendations

2.5 SPIN-IN COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to co-responding round duct standards.

2.6 DUCTWORK DRAIN POINTS

.1 Ductmate Canada Ltd. “DUCTMATE METU”, or approved equivalent 20 mm (3/4”) dia. moisture drains with galvanized sheet metal funnel, and chrome plated brass threaded drain, nut and cap.

2.7 CEILING ACCESS DOORS

.1 Provide ceiling access doors of suitable dimensions for all equipment located above ceiling. Access doors shall be sufficiently large to accommodate removal of equipment from ceiling and regular maintenance.

2.8 INSTRUMENT TEST PORTS

.1 Duro-Dyne of Canada #1P1 or 1P2 (to suit the thickness of the insulation) or approved equal, leak-proof instrument test ports for round or rectangular ducts as required, each complete with a neoprene expansion plug.

2.9 MISCELLANEOUS ACCESSORIES

.1 Sheet Metal Plenums

- .1 Fabricate from minimum 18 gauge metal of same material as ductwork.
- .2 Brace with frame of same material for rigidity.
- .3 Line with sound attenuation material where indicated.

.2 Louver and Grille Blank-Off Sections

- .1 Fabricate from 20 gauge sheets of same material as louver/grille.
- .2 Line with sound attenuation/insulating material.
- .3 Shop prime and paint outside face of blank off section with two coats of flat black exterior paint.

.3 Wire Mesh (Bird Screen)

- .1 Heavy-gauge galvanized steel or aluminum mesh, 12 mm x 12 mm (1/2” x 1/2”) secured in a rigid galvanized steel or aluminum framework and sized as indicated on the Drawings.

.4 Auxiliary Drain Pans

- .1 Dimensions: Minimum 152 mm larger in both dimensions than equipment it is serving and 51 mm high, minimum.
- .2 Construction: 16 gauge galvanized steel with brazed joints. Pans shall be watertight and have hemmed edges.

.5 Drain Connection

- .1 Minimum 1 inch IPS or as shown on Drawings.
- .2 Locate at lowest point of drain pan.
- .3 In lieu of drain connection, float switch may be installed. Float switch shall shut down air handling equipment upon sensing water.

.6 Accessories Hardware

.1 Instrument Test Holes

.1 Cast metal, material to suit duct material, including screw cap and gasket and flat mounting gasket.

.2 Size to allow insertion of pitot tube and other testing instruments.

.3 Provide in length to suit duct insulation thickness.

.7 Flexible Duct Clamps

.1 Stainless steel band with cadmium plated hex screw to tighten band with worm gear action.

.1 Provide in sizes from 75 mm to 450 mm to suit duct size.

.2 Adhesives: High strength, quick setting, neoprene based, waterproof and resistant to gasoline, and grease.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Flexible Connections

.1 Install in following locations:

.1 Inlets and outlets to supply air units and fans.

.2 Inlets and outlets of exhaust and return air fans.

.3 As indicated.

.2 Install in accordance with recommendations of SMACNA.

.3 When fan is running:

.1 Ducting on sides of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.2 Access Doors and Viewing Panels

.1 Size:

.1 As indicated.

.2 Locations:

.1 Fire and smoke dampers.

.2 Control dampers.

.3 Devices requiring maintenance.

.4 Required by code.

.5 Elsewhere as indicated.

.3 Instrument Test Ports

.1 General

.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locate to permit easy manipulation of instruments.

.3 Install insulation port extensions as required.

.2 Locations

.1 For traverse readings:

.1 Inlets and outlets of other fan systems.

.2 Main and sub-main ducts.

.3 And as indicated.

.2 For temperature readings:

.1 At outside air intakes.

.2 In mixed air applications in locations as approved by Engineer

.3 At inlet and outlet of coils.

.4 Downstream of junctions of two converging air streams of different temperatures.

.5 And as indicated.

.4 Turning Vanes

.1 Install in accordance with recommendations of SMACNA.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 Provide balancing damper where shown on the drawing and wherever required for proper air balancing as per section 23 05 00.

.2 Lock balancing dampers after completion of air balancing.

1.2 RELATED REQUIREMENTS

.1 Section 23 05 00 General instructions for HVAC Services

.2 Section 23 07 13 Duct Insulation

.3 Section 23 73 11 Packaged Air Handling Units

.4 Section 23 05 00 Testing adjusting and balancing for HVAC

.5 Section 23 36 00 Air Terminal Units

1.3 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE Handbook Series Fundamentals: Ch. 2. Duct Design

.2 ASHRAE Handbook Series Equipment: Ch 6. Duct Construction

.2 National Fire Protection Association (NFPA)

.3 Sheet Metal and Air Conditioning Subcontractors National Association (SMACNA)

.4 Underwriters Laboratories Inc. (UL)

.5 American Society for Testing and Materials (ASTM).SPEC NOTE: Edit the following paragraphs for this specific project

.6 Sheet Metal and Air Conditioning National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2013

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Shop Drawings

.1 Submit manufacturer's instructions, printed product literature and data sheets for the dampers

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials in dry location indoors off ground] and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SPLITTER DAMPERS

.1 Minimum 0.95 mm thick (20 gauge) damper blade constructed of the same material as the duct, reinforced as required to suit blade size, system velocity, and to prevent “chatter”, and complete with operating hardware Dyn Air Inc. #Q-50 “DYN-A-QUAP S-S” quadrant regulator with RW-50 backup washers to prevent leakage, long square bearing pin, and slide pin or approved equivalent.

.2 Double thickness construction.

.3 Control rod shall be with locking device and position indicator.

.4 Rod configuration to prevent end from entering duct.

.5 Pivot: piano hinge.

.6 Folded leading edge.

2.3 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Inside and outside bronze end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 MULTI-BLADED DAMPERS

.1 Provide and install where shown on plans or schedules, low leakage rectangular dampers, parallel or opposed configuration. Blade linkage shall be zero-maintenance, out of stream and totally concealed within the frame. Materials used in the construction of the dampers shall match the material of the duct in which they are being used. Acceptable manufacturers: Nailor Industries 1000 series; T.A. Morrison; NCA Manufacturing; Ruskin, Arrow United.

2.5 ROUND DAMPERS:

.1 Provide and install where shown on plans or schedules, low leakage round damper. Open and closed end-stops shall provide maximum 90º rotations. Materials used in the construction of the dampers shall match the material of the duct in which they are being used. Acceptable manufacturers: Nailor Industries 1000 series; T.A. Morrison; NCA Manufacturing; Ruskin, Arrow United.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 Dampers shall be vibration free.

.6 Ensure damper operators are observable and accessible.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 General instructions for HVAC Services

.2 Section 23 07 13 Duct Insulation

.3 Section 23 73 11 Packaged Air Handling Units

.4 Section 23 05 93 Testing adjusting and balancing for HVAC

.5 Section 23 36 00 Air Terminal Units

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

.2 ASHRAE Handbook Series Fundamentals: Ch. 2. Duct Design

.3 ASHRAE Handbook Series Equipment: Ch 6. Duct Construction

.4 National Fire Protection Association (NFPA)

.5 Sheet Metal and Air Conditioning Subcontractors National Association (SMACNA)

.6 Underwriters Laboratories Inc. (UL)

.7 American Society for Testing and Materials (ASTM).SPEC NOTE: Edit the following paragraphs for this specific project

.8 Sheet Metal and Air Conditioning National Association (SMACNA)

.9 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2013. ASTM International

.10 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for all motorized dampers including actuator and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MOTORIZED DAMPERS

.1 Dampers to be automatic (motorized) as shown in the Damper Schedule and Drawings and installed in louvre frames, wall sleeves or transition boxes as required.

.2 All internal duct dampers shall be constructed from aluminum. Blades to be parallel action, light gauge, shaped to ensure weather resistant seal when closed. Tie rods to be installed to provide uniform movement of the blades. Hinge rods to have locks on the ends. Hinge rod bearings to be self-aligning, machine bronze.

.3 Dampers installed behind exterior louvres, building walls or roof to be of insulated construction. Damper blades are double wall extruded aluminium section with cavity insulation of polyurethane foam and thermal break between walls. Frame cavity to be insulated with 19 mm thick polystyrene foam. Provide continuous weather-stripping around inner frame edge and blades tips to provide a weather tight seal (less than 1% leakage). Insulated dampers to be Tamco Series 9000 by T.A. Morrison, Ruskin, Ventex, American Warming & Ventilating, Arrow United, Nailor.

.4 Dampers to be front-mount or rear-mount according to the airflow and as required.

.5 Electric motor operators to be proportional or 2-position, spring return to close on power failure suitable for 120 V service. Mount the electric motor on the damper frame and provide all brackets, reinforcing, etc., necessary. Provide auxiliary end switches for signalling fan start-up. Refer to “Controls Section” for specific damper control function. Electric motor operators to be Belimo or equivalent.

.6 Dampers to have satin anodized finish unless otherwise specified or noted on the Drawings, and include an approved bird screen securely fastened to the panel.

2.2 RELIEF DAMPERS

.1 Automatic multi-leaf dampers with ball bearing centre pivoted and counter-weights set to open at indicated pressure.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for damper installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

.3 Seal multiple damper modules with silicon sealant.

.4 Install access door adjacent to each damper.

.5 Ensure dampers are observable and accessible.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 General Instructions for HVAC Services

.2 Section 23 05 93 Testing Adjusting and Balancing for HVAC

.3 Section 23 09 33 HVAC Controls System

.4 Section 23 33 15 Damper Operating

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)

.1 ANSI/AMCA Standard 99-2010, Standards Handbook

.2 ANSI/AMCA Standard 210-2007/(ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

.3 ANSI/AMCA Standard 300-2008, Reverberant Room Method for Sound Testing of Fans

.4 ANSI/AMCA Standard 301-1990, Methods for Calculating Fan Sound Ratings from Laboratory Test Data

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for exhaust fans and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings

.1 Submit drawings complete with performance data, product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide:

.1 Fan performance curves showing point of operation, power and efficiency.

.2 Sound rating data at point of operation.

.3 Indicate:

.1 Motors details.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer’s recommendations and in designated area.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Performance Requirements

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.

.2 Capacity: As indicated on schedule.

.3 Fans: statically and dynamically balanced, constructed in conformity with ANSI/AMCA Standard 99.

.4 Sound ratings: comply with ANSI/AMCA Standard 301, tested to ANSI/AMCA Standard 300.

.5 Performance ratings: based on tests performed in accordance with ANSI/AMCA Standard 210.

2.2 PROPELLER FANS

.1 Direct Drive Propeller fans shall be tested and certified in accordance with ANSI/ASHRAE 51-1985 and ANSI/AMCA 210-85 test codes and guaranteed by the manufacturer to deliver at the rated published performance level. In addition, each unit shall be factory run tested prior to shipment. The Direct Drive Propeller fans must be licensed to bear the AMCA Certified Rating Seal for air performance.

.2 Construction: Fan casing shall be constructed of mild steel with an integral deep spun orifice panel. The Direct Drive fans shall be constructed with a welded reinforced motor base plate which is supported by a welded spider type frame. This construction allows for mounting the unit from the flanged front entrance orifice.

.3 Propellers: The precision “Macheta” tipped airfoil fan blades and hub shall be cast of A319 aluminum alloy. The propeller shall be mounted directly on the motor shaft with knurled cup point setscrews on sizes up to 16” diameter and split taper lock bushings on sizes 18” and larger.

.4 Balancing: The propeller assembly shall be statically and dynamically balanced in accordance with ANSI / AMCA 204 - 96 “Balance Quality and Vibration Levels for Fans” To Fan Application Category BV - 3, Balance Quality Grade G6.3. In addition, direct drive fan propellers shall be balanced on the motor shaft after final assembly in the fan casing, in the manufacturing facility.

.5 Motors: Fan motors shall be foot-mounted NEMA Design B, standard industrial continuous duty, ball bearing, TEFC, variable torque type suitable for operation on voltage, phase and hertz, as listed in the fan schedule. Motor bearings shall have a minimum L-10 life, as defined by AFBMA, of at least 40,000 hours (200,000 hours average life).

.6 Finish: The unit, after fabrication, shall be cleaned and chemically pretreated by a phosphatizing process and shall be painted inside and outside with an Air Dry Epoxy.

.7 Accessories: Include the following accessories:

.1 NEMA 12 motor starter / control panel.

.2 Inlet Screen complete with custom sized hinged access door.

.3 Back draft damper.

.4 Acceptable Manufacturers:

.1 Aerovent, Loren Cook, Greenheck, Twin City, Carnes, ACME.

2.3 CONTROLS

.1 Exhaust fan controls shall be as per controls specification. If fan controls are not detailed in controls specifications, provide line voltage reverse acting thermostat for fan operation.

.2 Coordinate with HVAC control contractor.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for HVAC fans installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 FAN INSTALLATION

.1 Install fans as recommended by the manufacturer and to the satisfaction of engineer.

.2 Provide electrical connection and controls for the fan.

.3 Coordinate with electrical for power connection.

.4 Motorized dampers shall be installed with the fan as indicated on the drawing.

.5 Secure the units in place, level and plumb. Coordinate installation with other trades. Coordinate location of control panel and access panels before installing.

.6 No sound will accepted due to vibration and faulty installation.

3.3 ANCHOR BOLTS AND TEMPLATES

.1 Size anchor bolts to withstand seismic acceleration and velocity forces.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 General Instructions for HVAC Services

.2 Section 23 05 93 Testing adjusting and balancing for HVAC

.3 Section 23 09 33 HVAC Controls system

.4 Section 23 31 13 01 HVAC Ductwork

.5 Section 23 73 11 Packaged Air Handling Units

1.2 COORDINATION

.1 VAV control to be integrated with Packaged Air handling Unit control. Coordinate with controls and packaged air handling unit manufacturer for integration.

.2 If required, all VAV controls shall be supplied for HVAC controls manufacturer.

1.3 REFERENCE STANDARDS

.1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)

.1 ANSI/AMCA Standard 210-2007/ (ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

.2 Ontario Building Code – OBC 12

.3 National Fire Protection Association (NFPA)

.1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems

.4 Underwriter's Laboratories (UL)

.1 UL 181 Factory-Made Air Ducts and Air Connectors

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for air terminal units and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings

.1 Indicate the following:

.1 Capacity

.2 Pressure drop

.3 Noise rating

.4 Mechanical contractor shall coordinate between VAV box controls and building controls supplier.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for air terminal units for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect air terminal units from all physical damages.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 VARIABLE VOLUME BOXES

.1 Terminal units of the same type to be product of one manufacturer.

.2 VAV terminals to be pressure independent with thermostatic controls, performance as indicated in the VAV terminal schedule.

.3 Entire unit to be designed and built as a single unit, with a primary variable air volume damper that accurately controls flow rate in response to the demands from the controls system.

.4 Unit casing to be 22 ga. galvanized steel with a round or flat oval inlet and outlet collar for field connection as indicated on the drawing. Casing leakage not to exceed 1% of flow rate at 1” wg (250 Pa) on low pressure side of damper, 2% at 3” wg (750 Pa) on higher pressure side.

.5 Damper assemblies to be fabricated from 16 ga galvanized steel, multiple opposed blades arranged to close at 45° from full open position to minimize turbulence and provide close to linear operation. Damper blades to be secured to shafts with set screws to ensure no slippage, with shafts pivoting in corrosion-free bearings.

.6 VAV terminals shall be capable of providing the specified duties with an inlet static pressure of 0.2” wg (50 Pa) at inlet velocities of 0 to 2000 fpm.

.7 Each terminal shall be complete, with factory-mounted actuator and controls.

.8 Each unit to be internally lined with ¾” (20 mm) fibreglass insulation with edges sealed against erosion, and meeting NFPA 90A and UL 181 Standards.

.9 Maximum radiated noise shall not exceed NC 30. Maximum space sound level must be maintained at NC 35.

.10 All units to be ARI certified, and labelled accordingly.

.11 Acceptable Material

.1 Daikin

.2 EH Price

.3 Titus

.4 Tuttle & Bailey

2.2 CONSTANT VOLUME BOXE

.1 Maintains constant supply air flow at all time.

.2 Sizes, capacities, pressure loss, and discharge sound pressure level: as indicated.

.3 Casing: constructed of 22 gauge, Each unit to be internally lined with ¾" (20 mm) fibreglass insulation with edges sealed against erosion, and meeting NFPA 90A and UL 181 Standards.

.4 Unit to be installed to supply constant volume of air on clerestory and monitor glazing.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturers recommendations.

.2 Support independently of ductwork.

.3 Install with at least 1000 mm of flexible inlet ducting and minimum of four duct diameters of straight inlet duct, same size as inlet.

.4 Locate controls, dampers and access panels for easy access.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 General Instructions for HVAC Services

.2 Section 23 05 93 Testing adjusting and balancing for HVAC

.3 Section 23 09 33 HVAC Controls System

.4 Section 23 36 00 Air Terminal Units

.5 Section 23 73 11 Packaged Air Handling Units

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

.2 ASHRAE Handbook Series Fundamentals: Ch. 2. Duct Design

.3 ASHRAE Handbook Series Equipment: Ch 6. Duct Construction

.4 National Fire Protection Association (NFPA)

.5 Sheet Metal and Air Conditioning Subcontractors National Association (SMACNA)

.6 Underwriters Laboratories Inc. (UL)

.7 American Society for Testing and Materials (ASTM)

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for Square diffusers, slot diffusers, registers and grilles and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Indicate the following:

.1 Capacity

.2 Throw and terminal velocity

.3 Noise criteria

.4 Pressure drop

.5 Neck velocity

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.

.2 Extra Materials

.1 Include:

.1 Keys for volume control adjustment.

.2 Keys for air flow pattern adjustment.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements

.1 Store materials indoors in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect diffuser, registers and grilles from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Performance Requirements

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

2.2 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity.

.2 All air terminal must be sized to maintain a noise level of NC 35 inside the space. Air terminals shall be accordingly sized.

.3 Frames

.1 Full perimeter gaskets.

.2 Plaster frames and as specified where set into plaster or gypsum board.

.3 Concealed fasteners.

.4 Concealed manual volume control damper operators.

.5 Colour: White (Standard)

.6 For circular pipe diffuser color shall be picked up by the architect.

2.3 MANUFACTURED UNITS

.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

.2 Approved manufacturer(s): EH Price. Titus, Nailor Industries, Tuttle & Bailey and Krueger are also acceptable

2.4 DIFFUSERS

.1 All Diffusers and grilles shall be of extruded aluminium construction with baked enamel finish of white colour.

.2 Provide diffusers with round necks, square cones and suitable for installation in 610x610 T-bar modular ceiling system. The air discharge pattern to be radial around the full perimeter of the air diffuser. Provide diffusers with a control grid and opposed blade damper with lever operator for regulation through face of diffuser.

2.5 GRILLE

.1 The manufacturer shall provide published performance data for the grille. The grille shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

.2 Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

.3 Schedule of grille shall be as per drawing.

2.6 CIRCULAR PIPE DIFFUSER.

.1 Diffusers shall be designed to operate under variable airflow conditions, in heating or cooling modes. Manufacturer must demonstrate an acceptable level of diffuser performance with airflow reductions down to 25%.

.2 The diffuser shall ensure a high rate of induction even in variable air volume applications, while maintaining an acceptable temperature differential in the discharge zone without generating any objectionable noise or drafts as outlined in ASHRAE Standard 55. Sound power levels shall not be greater than 35 dBA.

.3 All diffuser outlets shall be pre-balanced at the factory and shall not require balancing on-site.

.4 Diffuser shall be manufactured from galvanized steel.

.5 Diffuser shall be sized and selected by the manufacturer for the flow and throw required. Size on drawing is for reference only.

.6 Air flow shall be distributed throughout the glazing.

.7 Duct shall be coated outside with a baked polyester enamel paint, providing a smooth, easy-to-clean finish.

.8 Color shall be selected up by the architect.

.9 Model KRF as manufactured by Klimakontor (HTS Engineering, 416 661 3400)

2.7 LINEAR SLOT DIFFUSER

.1 The manufacturer shall provide published performance data for the slot diffusers. The diffusers shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

.2 Diffusers shall be constructed from extruded aluminum.

.3 Diffusers shall be jet slot type to blow air on glazing.

.4 Number of slots and size shall be as per the drawing and schedule.

.5 Diffusers shall be sized at NC25. The space noise level shall not exceed NC 35 due to noise from the diffuser.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for diffuser, register and grille installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative Consultant DCC Representative.

.2 Inform Departmental Representative Consultant DCC Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative DCC Representative Consultant.

3.2 INSTALLATION

.1 Install in accordance with manufacturer’s instructions.

.2 Install with oval head flat head stainless steel cadmium plated screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

.4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere as indicated.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 This section specifies Air Handling equipment providing treated air to the building.

.2 Provide roof top packaged air handling unit with variable fan speed to work with pressure independent VAV boxes.

.3 Unit shall be fully assembled and shipped to site in one piece.

.4 Balance and Vibration

.1 Fans specified in this section shall be balanced at the factory to operate without vibration throughout the full operating range specified.

.2 Provide vibration isolators for the supply fan.

.5 Contractor shall furnish a fully functional system with all required ductwork connections and any other required accessories.

.6 Supply, install, and satisfactorily operate a complete ventilating system to the full intent of the Drawings and Specification.

.7 600 V power wiring and connections will be provided under Division 26. Control wiring will be provided by Division 23, Section 23 09 33.

.8 Refer to Division 26 – Electrical for all material specifications (i.e. conduit, wiring, boxes, etc.) and for electrical installation/workmanship requirements.

.9 All electrical equipment must be CSA approved.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/Air-Conditioning, Heating and Refrigeration Institute (ANSI/AHRI)

.1 ANSI/AHRI 430-10, Performance Rating of Central Station Air-Handling Units

.2 American National Standards Institute/American Society of Heating, Refrigeration and Air Condition Engineers/Illuminating Engineering Society (ANSI/ASHRAE/IES)

.1 ANSI/ASHRAE 52.2-2012, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

.2 ANSI/ASHRAE/IES 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings

.3 Ontario Building Code 2012 and local Bylaws

.4 Where provisions of pertinent codes and standards conflict with these specifications and drawings or with each other, comply with the more stringent provisions. AMCA 300 - Reverberant Method for Sound Testing of Fans.

.5 AMCA 301 - Method for Publishing Sound Ratings for Air Moving Devices

.6 ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings

.7 ANSI/UL 900 - Test Performance of Air Filter Units

.8 ARI 260 - Standard for Sound Rating of Ducted Air Moving and Conditioning Equipment

.9 ARI 410 - Standard for Forced Circulation Air-Cooling and Air-Heating Coils

.10 ARI 430 - Standard for Central Station Air Handling Units

.11 ARI 1060 Air-To-Air Energy Recovery Ventilation Equipment

.12 ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans

.13 ASTMB 117 - Standard Practice for Operation Salt Spray Apparatus

.14 NEMA MG1 - Motors and Generators

.15 NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems

.16 SMACNA - HVAC Duct Construction Standards

.17 UL 1995 - Heating and Cooling Equipment

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature, performance data and data sheets for insulation and filters and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Mechanical contractor to coordinate between HVAC equipment and Controls supplier.

.4 Shop Drawings

.1 Indicate on drawings: Fan, filters, fan curves showing point of operation, motor drive, dampers, mixing box, and coil.

.2 Submit unit performance data including: Capacity, nominal and operating performance.

.3 Submit Mechanical Specifications for unit and accessories describing construction, components and options.

.4 Submit shop drawings indicating overall dimensions as well as installation, operation and services clearances. Indicate lift points and recommendations and centre of gravity. Indicate unit shipping, installation and operating weights including dimensions.

.5 Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

1.4 RELATED REQUIREMENTS

.1 Section 23 05 00 Common work results for HVAC

.2 Section 23 05 93 Testing Adjusting and Balancing for HVAC

.3 Section 23 09 33 HVAC Controls System

.4 Section 23 31 13 01 HVAC Ductwork

.5 Section 23 32 48 Acoustic Silencers

.6 Section 23 33 14 Damper Balancing

.7 Section 23 33 15 Damper Operating

.8 Section 23 36 00 Air Terminal Units

.9 Section 23 84 13 Humidifier

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: Submit operation and maintenance data for air handling equipment for incorporation into manual.

.3 Include following: Fan air volume, VAV control, OAT, total cooling, EWB, EDB, sensible cooling, motor, damper.

1.6 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Provide 1 spare set of spare filters.

.3 Provide list of individual manufacturer's recommended spare parts for equipment such as bearings and seals, and addresses of suppliers, together with list of specialized tools necessary for adjusting, repairing or replacing, for placement into operating manual.

.4 Spare filters: In addition to filters installed immediately prior to acceptance by Consultant, supply 1 complete set of filters for each filter unit or filter bank.

.5 Vendor / manufacturer shall provide name and address of certified mechanic who can reach site within three hours of any emergency requirement.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions for rigging, unloading, and transporting units.

.2 Deliver units to jobsite with fan motors, sheaves, and belts completely assembled and mounted in units.

.3 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address. Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry and well-ventilated area. Set equipment on temporary bases to avoid contact with the ground. Protect equipment from all damage and weather.

.2 Store and protect air handling equipment from nicks, scratches, and blemishes. Replace defective or damaged materials with new.

1.8 START-UP AND OPERATING REQUIREMENTS

.1 Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, bearings lubricated, condensate properly trapped, piping connections verified and leak-tested, belts aligned and tensioned, all shipping braces removed, bearing set screws torqued, and fan has been test run under observation.

PART 2 PRODUCTS

2.1 GENERAL

.1 Factory assembled components to form units supplying air at designed conditions, as indicated on the drawing and in equipment schedule.

.2 Fan speed shall vary depending upon the building load. ECM motor shall vary the speed of the fan.

.3 Units shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Cooling capacity, heating capacity and fan performance shall be AHRI certified. Complete unit shall be ETL- Canada listed.

.4 The unit shall undergo a complete factory run test prior to shipment. The factory test shall include final balancing of the supply and exhaust fan assemblies, a refrigeration circuit run test, a unit control system operations checkout, test and adjustment of the gas furnace, a unit refrigerant leak test and a final unit inspection.

.5 Certify ratings: to ANSI/AHRI 430 with AHRI seal.

.6 Unit shall be horizontal down discharge and return type, as indicated on the drawing, having air tight modular components, consisting of casing, fan section with motor and drive, mixing box, cooling coil, blender air mixing device, filter section, bypass section heating exchanger where indicated, dampers.

.7 Provide separate connection and partition within the unit for exhaust duct connection.

2.2 CASINGS

.1 Panels and access doors shall be constructed as a 1-inch (25-mm) nominal thick, thermal broke double wall assembly, injected with foam insulation for an R-value of not less than R-7. The outer casing shall be constructed of galvanized steel, phosphatized and painted with a polyester resin topcoat with a natural beige color. Finished panel surfaces must withstand a minimum 750-hour salt spray test in accordance with ASTM B117 standard for salt spray resistance.

.2 Unit base shall overhang the roof curb for water runoff and shall have a formed recess that seats on the roof curb gasketing to provide a positive weather tight seal.

.3 Service doors shall be provided for the fan section, filter section, control panel section, and heating vestibule in order to provide user access to unit components. All service access doors shall be mounted on multiple, stainless steel hinges and shall be secured by a latch system. Removable service panels secured by multiple mechanical fasteners are not acceptable.

.4 Unit cabinet shall be designed to operate at total static pressures up to 5 inches w.g.

.5 Provide 22 gauge Stainless Steel liner on the inside surface of the Air Handling Unit.

2.3 ACOUSTIC LINER

.1 Insulate internal surface of panels with 50mm neoprene coated rigid duct liner of 72 kg/m^3 density.

.2 Apply with 100% coverage of adhesive with clip pins.

.3 Cover heat exchanger section with 0.8 mm thick perforated galvanized sheet metal.

.4 Cover leading and trailing edges with sheet metal nosing and at edges around access doors and panels complete with 15 mm overlap.

2.4 DRAIN PANS

.1 Provide a stainless steel sloped primary drain pan under the cooling coil and beyond the leaving side of the coil and underneath the cooling coil connections. The drain pan shall have a minimum slope of 1/8" per foot and be connected to a stainless steel drain connection extending through the base. Polymer drain pans will not be accepted.

.2 Drain pans to be continuously welded 304 stainless steel and sloped within the unit to be fully drainable. Connect drain pans to exterior condensate drain connection with thin wall 25mm (1 in.) stainless steel pipe. Drain pan shall extend full length and width of the coil and shall include return bends and headers.

.3 Insulation: External foam type, minimum 13 mm thick.

.4 Drain connection: In bottom at low point.

.5 Installation: Slope without sag minimum 1% to ensure no standing water at any time or at any point.

2.5 FANS

.1 Supply and exhaust fans shall be single width, single inlet centrifugal Airfoil type. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. Fans shall be direct drive to eliminate all belt maintenance issues.

.2 Fan assemblies shall be statically and dynamically balanced for vibration free quiet operation. Provide slide out rails for servicing and maintenance of the fan.

.3 The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. Motor safeties shall include thermal overload protection and phase failure protection. Motors shall be premium efficiency.

.4 Fan shall be AMCA-rated for sound and performance. Fan shall be selected to operate in stable part of performance curve.

.1 Motor: Power to ANSI/ASHRAE/IES 90.1

.5 Maximum sound power levels, as indicated in the schedule.

2.6 VIBRATION ISOLATION

.1 Flexible connections at inlet and outlet of fan: to Section 23 33 00- Air Duct Accessories.

.2 Vibration isolators in accordance with manufacturer’s recommendations and equipment point loads.

2.7 VARIABLE VOLUME DEVICES

.1 The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop Air Handling Unit controller. Alternatively, provide Variable frequency drive to maintain the fan speed.

2.8 FILTER BOX

.1 Provide access to filter through hinged door with suitable hardware.

.2 Provide blank-off plates and gaskets to prevent air bypass.

.3 The filter section shall be provided with a 2 inch (50mm) prefilter rack and a 4 inch (100mm) final filter rack. A set of 2 inch (50mm) construction filters shall ship with the unit.

.4 Supply a spare set of (2 inch Merv 8-35%) (4 inch Merv 11-65) efficient filters for field installation by others.

2.9 MIXING BOX

.1 Material to match casing and produce uniformly mixed air temperature within plus or minus 5 degrees C of design across face of outlet.

.2 Dampers for mixing boxes: Provide series 1000 Tamco dampers or equal, parallel blade type, arranged to provide converging air streams for maximum mixing efficiency. Size dampers at 9.3 m/s (1700 ft/min) velocity or lower.

2.10 COILS

.1 Capacity: As indicated in the schedule. Manufacturer shall add fan heat to LAT on draw thru designs.

.2 Ratings: AHRI certified.

.3 Provide evaporator cooling coils constructed of seamless copper tubes and mechanically bonded to high efficiency aluminum plate fins, and pressure tested for operation up to 1400 kPa (200 psi) for water coils. Pressure test refrigerant coils to 2067 kPa (300 psi). Refer to drawings for piping connections and dimensional data.

.4 Each evaporator coil refrigerant circuit shall be fed with an electronically controlled expansion valve. All cooling coils shall have an interlaced coil circuiting that keeps the full coil face area active at all load conditions.

.5 Coils to be fully enclosed within unit casing. For multiple coil banks, each coil to be mounted in an angle iron rack to allow coils to slide out individually. A removable access panel of the same construction as unit casing panels to be provided to facilitate coil removable

.6 Coils shall be arranged to prevent trapping of oil.

.7 Provide liquid distributors to ensure even distribution of liquid refrigerant to all circuits.

.8 Provide silver solder or braze joints in refrigerant tubing.

.9 Evacuate and charge coil with nitrogen and seal before sending to site.

2.11 ECONOMIZER

.1 Unit shall be provided with an outdoor air economizer section. The economizer shall include outdoor, return, and exhaust air dampers. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include moisture eliminator filters to drain water away from the entering air stream.

.2 The economizer operation shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be opposed blade design. Damper blades shall be gasketed with side seals to provide an air leakage rate of 4 cfm / square foot of damper area at 1" differential pressure per ASHRAE 90.1 Energy Standard.

.3 A barometric exhaust damper shall be provided to exhaust air out of the back of the unit. A bird screen shall prevent infiltration of rain and foreign materials. Exhaust damper blades shall be lined with vinyl gasketing on contact edges.

.4 Control of the dampers shall be by a factory installed direct coupled actuator. Damper actuator shall be of the modulating, spring return type. A comparative enthalpy control shall be provided to sense and compare enthalpy in both the outdoor and return air streams to determine if outdoor air is suitable for "free" cooling. If outdoor air is suitable for "free" cooling, the outdoor air dampers shall modulate in response to the unit's temperature control system.

2.12 HEAT WHEEL (FOR RTU-1 ONLY)

.1 The rooftop unit shall be provided with an energy recovery wheel. Thermal performance shall be certified in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060.

.2 Heat recovery inlet shall be separate from the return air.

.3 The energy recovery wheel shall form an integral part of the rooftop unit with unitary construction. Field assembled heat recovery packages will not be accepted. Heat wheel sections shall be mounted on a sliding track so the entire energy recovery wheel cassette can be slid out to facilitate cleaning.

.4 Provide 2 inch Merv 7 filters in both the outdoor and return air sections to help protect the wheel from contaminants.

.5 The wheel shall be wound continuously with one flat and one structured layer in a parallel plate geometry. The layers shall be effectively captured in aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix. The matrix design shall have channels to reduce cross contamination between the outdoor air and the exhaust air. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. The total energy recovery wheel shall be coated with silica gel desiccant permanently bonded without the use of binders or adhesives. Coated segments shall be washable with detergent or alkaline coil cleaner and water.

.6 Wheel frame construction shall consist of a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel.

.7 The rooftop unit DDC controller shall provide frost control for the energy recovery wheel. When a frost condition is encountered the unit controller shall stop the wheel. When in the frost control mode the wheel shall be jogged periodically and not be allowed to stay in the stationary position.

2.13 GAS HEAT SECTION (FOR RTU-1 ONLY)

.1 The rooftop unit shall include a natural gas heating section consisting of a tubular design with in-shot gas burners. The heat exchanger tubes shall be constructed of stainless steel.

.2 The heat exchanger shall be complete with furnace controller and control valve capable of 10:1 modulating control.

.3 The module shall have an induced draft fan that will maintain a negative pressure in the heat exchanger tubes for the removal of the flue gases. An airflow safety switch shall prevent the heating module from turning on in the event of no airflow in the flue chamber.

.4 Gas heat sections shall include two flame roll-out safety protection switches and a high temperature limit switch that will shut the gas valve off upon detection of improper burner manifold operation.

2.14 CONDENSING SECTION

.1 Outdoor coils shall have seamless copper tubes, mechanically bonded to aluminum plate-type fins. The fins shall have full drawn collars to completely cover the tubes. A sub-cooling coil shall be an integral part of the main outdoor air coil.

.2 Fan motors shall be ECM type. The rooftop controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant circuit within acceptable limits. Mechanical cooling shall be provided to 0º F. Motor safeties shall include thermal overload protection and phase failure protection.

.3 The condenser fan shall be dynamically designed for low noise generation with low tip speeds. Fan blade shall be of a composite material.

.4 The unit shall have multiple scroll compressors. One of the compressors shall be inverter driven and the unit controller must control the speed of the compressor to maintain the discharge air temperature.

.5 The refrigeration circuit shall have both low and high pressure safety switches. Temperature sensors shall be provided for measuring suction and discharge temperature of the refrigerant.

.6 Refrigerant circuit shall have a bypass valve between the suction and discharge refrigerant lines for compressor startup under low head pressure conditions. When there is a call for mechanical cooling the bypass valve shall open to equalizing the suction and discharge pressures. When pressures are equalized the bypass valve shall close and the compressor shall be allowed to start.

.7 Each circuit shall be dehydrated and factory charged with Refrigerant 410A and oil.

2.15 ELECTRICAL

.1 Each unit shall be wired and tested at the factory before shipment. Wiring shall comply with CSA standards. All wiring shall be number coded per the electrical wiring diagrams. All electrical components shall be labeled according to the electrical diagram and be CSA recognized.

.2 A terminal block shall be provided for the main power connection and a terminal board shall be provided for the low voltage control wiring. Knockouts shall be provided in the bottom of the main control panel for field wiring entrance. Branch short circuit protection, 115-volt control circuit transformer and fuse, system switches, and a high temperature sensor shall also be provided with the unit.

.3 Each compressor and condenser fan motor shall be furnished with contactors and internal thermal overload protection. Supply fan motors shall be supplied with external overload protection.

.4 Provide a disconnect switch to cut power to the entire unit before the control panel door can be opened.

2.16 CONTROLS

.1 Each unit shall be equipped with a McQuay MicroTech® III (or equivalent) microprocessor based control system. The unit control system shall include all required temperature and pressure sensors, input/output boards, main microprocessor and operator interface. The unit control system shall perform all unit control functions including scheduling, unit diagnostics and safeties.

.2 The DDC control system shall permit starting and stopping of the unit locally or remotely. A set of contacts shall be provided for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation.

.3 The unit control system shall have the ability to communicate with an independent Building Management System (BMS) via a direct BACnet communication connection. The independent BMS system shall have access to “read only’ variables and “read & and write” variables. Communications shall not require field mounting of any additional sensors or devices at the unit. The BMS system shall be capable of interacting with the individual rooftop controllers in the following ways:

.1 Monitor controller inputs, outputs, set points, parameters and alarms.

.2 Set controller set points and parameters.

.3 Clear alarms.

.4 Reset the cooling and heating discharge air temperature set point.

.5 Set the heat/cool changeover temperature.

.6 Set the representative zone temperature.

.4 It will be the responsibility of the Systems Integrating Contractor to integrate the rooftop data into the BMS control logic and interface stations.

.5 The controller shall have a 4 line x 20 character display with all information and instructions shown in plain English. A keypad shall allow information and controls to be accessed. The microprocessor shall have a programmable time clock, store current and past alarm conditions.

.6 The display shall provide the following information:

.1 Unit status including # of stages or % capacity for fans, heating, cooling and economizer.

.2 Supply, return, outdoor, and space air temperature.

.3 Duct and building static pressure; the control contractor is responsible for providing and installing sensing tubes.

.4 Inverter compressor speed and refrigeration circuit pressures and temperatures.

.5 Outside air damper position and economizer mode.

.6 Cooling and heating changeover status.

.7 Occupied, unoccupied, and dirty filter status.

.8 Date and time schedule.

.9 Alarm faults.

.7 The following set points shall be adjustable:

.1 Control mode (Off / Auto / Cool Only / Fan Only / Heat Only).

.2 Occupancy mode (Auto / Tenant Override / Occupied / Unoccupied).

.3 Changeover mode (return air, space temperature or network signal).

.4 Cooling and heating discharge air temperature control.

.5 Compressor lockouts and timers.

.6 Economizer changeover (enthalpy).

.7 Scheduling.

.8 Building static pressure control.

.8 When heat recovery units are specified, the control of the energy recovery wheel shall form an integral part of the rooftop unit's DDC controller. The DDC controller shall have visibility of the outdoor air temperature, leaving wheel temperature, return air temperature, and exhaust air temperature. These temperatures shall be displayed on the rooftop units LCD display. All of these temperatures shall be made available through the BACnet interface.

.9 The unit DDC controller shall provide building static pressure control. The unit controller shall provide proportional control of the exhaust fans from 25% to 100% of the supply air fan designed airflow to maintain the adjustable building pressure set point.

.10 Supply air reset options shall include; return air temperature, outdoor air temperature, space temperature, airflow (VAV), network signal, external signal (1-5 vdc or 0-20 mA).

.11 The controller shall be complete with night setback control. The controller shall use its internal time clock for scheduling and have an adjustable override timer. (The unit shall be supplied with a wall mounted space sensor with an override button for field installation).

2.17 ROOF CURB

.1 Each unit shall be provided with a prefabricated l4 gauge galvanized steel mounting curb designed and manufactured by the unit manufacturer for field assembly on the roof decking prior to unit shipment. The roof curb shall be a perimeter type with complete perimeter support of the air handling section and condensing section. The curb shall be a minimum of l4 inches high and include a nominal 2 x 4 inch wood strip. Gasketing shall be provided for field mounting between the unit base and roof curb. The roof curb shall be approved by the National Roofing Contractors Association.

2.18 STARTUP SERVICE AND WARRANTY.

.1 Manufacturer shall furnish a factory trained service technician to perform the unit startup. Manufacturer shall provide instruction to the owner's personnel on the operation and maintenance of the unit. Factory technician to provide copy of start up log to owner and to demonstrate operation and maintenance to owners' representative. The warranty period shall commence at the date of initial startup and shall continue for a period of one (1) year not to exceed eighteen (18) months from shipment. Manufacturer's warranty shall include all parts and labour to install parts.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for air handling equipment installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied Consultant.

.4 Comply with manufacturer's requirements for the installation of all specified equipment.

.5 Locate equipment as shown on the drawings to provide best possible connection arrangement and accessibility for servicing. Provide clearances on all sides of equipment as required by Authorities having jurisdiction or manufacturer, whichever is greater.

3.2 INSTALLATION

.1 Provide appropriate protection apparatus.

.2 Install units in accordance with manufacturer's instructions and as indicated.

.3 Ensure adequate clearance for servicing and maintenance.

.4 Secure unit to its base for any seismic activity.

.5 Curb shall be secured to the building structure for any seismic activity.

3.3 FANS

.1 Install flexible connections at fan inlet and fan outlets.

.2 Install vibration isolators.

3.4 DRIP PANS

.1 Install deep seal P-traps on drip lines.

.1 Depth of water seal to be 1.5 times static pressure at this point.

3.5 STARTUP

.1 Unit startup to be performed by the equipment manufacturer. Coordinate with the manufacturer to comply with the equipment startup requirements.

.2 Provide checklist to the engineer confirming the installation of the equipment is completed and all electrical connections, controls and duct connection are completed as per the contract documents and as per the manufacturer recommendations.

.3 Coordinate with the TAB (testing and balancing) contractor to incorporate TAB requirements during installation.

3.6 CLEANING

.1 Progress Cleaning: Clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 General Instructions for HVAC Services

.2 Section 23 34 00 HVAC Fans

1.2 REFERENCE STANDARDS

.1 American society of Heating refrigeration and Air Conditioning Engineers. (ASHRAE)

.2 Canadian Standards Association (CSA)

.3 Ontario Building Codes – OBC 12

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for Electric forced air heaters and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's Instructions: provide to indicate special handling criteria, installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect air terminal units from all physical damages.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 ELECTRIC WALL HEATERS (EH-3, 4 & 5)

.1 Provide electric wall heaters in the Electrical and Mechanical Rooms as indicated on the drawing and equipment schedule.

.2 Heater shall be CSA certified.

.3 The electric wall heater shall be recessed in wall, white with epoxy power paint, 18-gauge steel louver with bottom inlet and top discharge. 1-4-kW durable tubular heating element with fins.

.4 Unit shall be complete automatic reset thermal cut out, over temperature warning light, fan override and thermostat.

.5 Electrical heater capacity shall be as per the schedule.

.6 Electrical power supply shall be 120V / 1Ph.

.7 Approved Manufacturer: Manufacturers: Indeeco, Ouellet ,Chromolox, Stelpro and Rufneck.

2.2 ELECTRIC UNIT HEATERS (EH-1A, EH-1B & EH-2)

.1 Entrance heater to be Aluminium mini architectural baseboard type as manufactured by Stelpro.

.2 Electrical heater capacity and electrical connection shall be as per the schedule.

.3 Electric unit heaters shall be with built-in controls. Heaters to be of the KW rating, voltage and phase specified in the schedule.

.4 Electrical power supply shall be 120V / 1Ph.

.5 Heater shall be CSA certified.

.6 Manufacturers: Stelpro. Heater manufactured by Indeeco, Ouellet and Rufneck meeting the finish and style and approved by the architect is acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install heaters in accordance with manufacturer's written recommendations.

.2 Make power and control connections.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by forced air heaters installation.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 General Instructions for HVAC services

.2 Section 23 09 33 HVAC Controls System

.3 Section 23 73 11 Packaged Air Handling Unit

.4 Section 23 31 13.01 HVAC Ductwork

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/Air-Conditioning, Heating and Refrigeration Institute (ANSI/AHRI)

.1 ANSI/AHRI 430-10, Performance Rating of Central Station Air-Handling Units

.2 American National Standards Institute/American Society of Heating, Refrigeration and Air Condition Engineers/Illuminating Engineering Society (ANSI/ASHRAE/IES)

.1 ANSI/ASHRAE 52.2-2012, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

.2 ANSI/ASHRAE/IES 90.1-2010, Energy Standard for Buildings Except Low-Rise Residential Buildings

.3 Ontario Building Code 2012 and local Bylaws.

.4 Where provisions of pertinent codes and standards conflict with these specifications and drawings or with each other, comply with the more stringent provisions. AMCA 300 - Reverberant Method for Sound Testing of Fans.

.5 AMCA 301 - Method for Publishing Sound Ratings for Air Moving Devices

.6 ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings

.7 ANSI/UL 900 - Test Performance of Air Filter Units

.8 ARI 260 - Standard for Sound Rating of Ducted Air Moving and Conditioning Equipment

.9 ARI 410 - Standard for Forced Circulation Air-Cooling and Air-Heating Coils

.10 ARI 430 - Standard for Central Station Air Handling Units

.11 ARI 1060 Air-To-Air Energy Recovery Ventilation Equipment

.12 ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans

.13 ASTMB 117 - Standard Practice for Operation Salt Spray Apparatus

.14 NEMA MG1 - Motors and Generators

.15 NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems

.16 SMACNA - HVAC Duct Construction Standards

.17 UL 1995 - Heating and Cooling Equipment

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature, performance data and data sheets for insulation and filters and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for humidifiers for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions for rigging, unloading, and transporting units.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address. Storage and Handling Requirements:

.3 Store materials in accordance with manufacturer's recommendations in clean, dry and well-ventilated area. Set equipment on temporary bases to avoid contact with the ground. Protect equipment from all damage and weather.

.4 Protect humidifier from nicks, scratches, and blemishes.

.5 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 DIRECT STEAM INJECTION TYPE

.1 Humidifier shall be free standing natural gas fired suitable for installation on the roof.

.2 Humidifier capacity shall be as per the equipment schedule.

.3 Humidifier outer casing shall be painted with weatherproof paint. Casing shall be minimum 18 gauge galvanized steel. Casing shall be insulated with minimum 1” thick fibreglass board insulation.

.4 Provide serviceable gaskets on access panels to ensure a tight seal.

.5 Heat exchanger shall be stainless steel.

.6 Humidifier shall be able to control RH to ±3% of the set value.

.7 Unit shall be designed and tested to meet ARI-640 humidification standard.

.8 Unit shall be CSA certified.

.9 Burner efficiency shall be minimum 80% with modulating gas valves.

.10 Unit shall have low NOx emission of less than 20 ppm.

.11 Blower shall be Variable-speed.

.12 Unit shall be complete with onboard diagnostic system.

.13 Provide Low-water sensing mechanism with redundant backup shuts down burners in a low water condition.

.14 Unit shall be designed to use tap water.

.15 Humidifier shall be complete with all necessary safety and interlocks for smooth operation.

.16 Provide high efficiency dispersion tubes in the duct. Dispersion tubes shall be able to supply 0.298 kg/h/m (0.20 lbs/hr/ft) steam

.17 Dispersion tube shall be sized by the manufacturer based on the steam flow.

.18 Dispersion tube shall be corrosion resistant stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for humidifiers installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate

.2 Inform engineer of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install in accordance with manufacturer’s instructions.

.2 Humidifier and evaporator media to be new and clean when project is accepted.

.3 Install humidistat as indicated in accessible location.

.4 Water service overflow drain: to manufacturers' recommendation.

.5 Install access doors or panels in adjacent ducting.

.6 Install capped drain connection at low point in duct.

3.3 FIELD QUALITY CONTROL

.1 Start-Up

.1 Have manufacturer of the product verify the installation.

.2 Unit shall be started in presence of the manufacturer or their representative.

.3 Manufacturer shall confirm in writing the unit is installed as per their recommendations.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings

1.2 REFERENCE STANDARDS

.1 CSA Group

.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (26th Edition), Safety Standard for Electrical Installations

.2 CSA C22.2

.3 CAN/CSA-C22.3 No.1-15, Overhead Systems

.4 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition

1.3 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for main electrical equipment.

.3 Submit for review single line electrical diagrams under Plexiglas, in glazed frames and/or laminated, locate as follows:

.1 Electrical distribution system in main electrical room.

.2 Electrical power generation and distribution systems in power plant rooms.

.4 Submit for review fire alarm riser diagram, plan and zoning of building in glazed frames at fire alarm control panel and annunciator.

.5 Shop Drawings

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Submit 600 x 600 mm minimum size drawings and product data to authority having jurisdiction.

.6 If changes are required, notify Consultant of these changes before they are made.

.6 Certificates

.1 Provide CSA certified material and equipment.

.2 Where CSA certified equipment is not available, submit such equipment to inspection authorities for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.

.7 Manufacturer's Field Reports: submit to Consultant manufacturer's written report, within 5 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for:

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
.3 Safety precautions.
.4 Procedures to be followed in event of equipment failure.
.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.4 Post instructions where directed.

.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates for control items in English.

2.2 MATERIALS AND EQUIPMENT

.1 Provide equipment in accordance with Section 01 61 00- Common Product Requirements.

.2 Equipment to be CSA certified. Where CSA certified equipment is not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring and conduit: in accordance with Section 26 29 03- Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of Consultant.

.2 Decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: lamicoid 3 mm matt white finish face, black core, mechanically attached with self-tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Consultant prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate or label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Identify equipment with Size 3 labels.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1_1_1955.

.2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y_1_1958 (ASA #61).

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

.3 Install equipment as indicated on Drawings.

.4 Locations of all existing services, features and appurtenances shown on the drawings are to be considered approximate only. Verify all locations in the field prior to construction.

3.3 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32- Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1400 mm

.2 Wall receptacles:

.1 General: 300 mm
.2 Above top of continuous baseboard heater: 200 mm
.3 Above top of counters or counter splash backs: 175 mm
.4 In mechanical rooms: 1400 mm

.3 Panelboards: as required by Code or as indicated

.4 Telephone and interphone outlets: 300 mm

.5 Wall mounted telephone and interphone outlets: 1500 mm

.6 Fire alarm stations: 1500 mm

.7 Fire alarm bells: 2100 mm

.8 Television outlets: 300 mm

.9 Wall mounted speakers: 2100 mm

.10 Clocks: 2100 mm

.11 Door bell pushbuttons: 1500 mm

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.8 FIELD QUALITY CONTROL

.1 Load Balance

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00- Quality Control.

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.5 Systems: fire alarm, communications.

.6 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
.3 Check resistance to ground before energizing.

.3 Carry out tests in presence of Consultant.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.9 SYSTEM STARTUP

.1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

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PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 CSA International

.1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings

.2 CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03)

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating)

.3 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded round copper conductors.

.2 Clamp for stranded round copper conductors.

.3 Clamp for stranded aluminum conductors (ACSR).

.4 Stud clamp bolts.

.5 Bolts for copper conductors.

.6 Bolts for aluminum conductors.

.7 Sized for conductors as indicated.

.4 Clamps or connectors for TECK cable, mineral insulated cable, flexible conduit, aluminum sheathed cable, non-metallic sheathed cable, armoured cable, as required to: CAN/CSA-C22.2 No.18.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors or cables and:

.1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.

.3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

.4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results for Electrical

.2 Section 26 05 20 – Wire and Box Connectors (0-1000 V)

.3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings

1.2 REFERENCE STANDARDS

.1 ASTM B3, Standard Specification for Soft or Annealed Copper Wire

.2 ASTM B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

.3 ASTM D1047, Standard Specification for Poly (Vinyl Chloride) Jacket for Wire and Cable

.4 CAN/CSA C22.2 No.131, Type TECK 90 Cable

.5 CSA C22.2 No. 0.3, Test Methods for Electrical Wires and Cables

.6 CSA C22.2 No.38, Thermoset Insulated Wires and Cables

.7 CSA C22.2 No. 74, Cables and Cable Glands for use in Hazardous Locations

.8 CSA C22.2 No. 75, Thermoplastic-Insulated Wires and Cables

.9 CSA C22.2 No. 123, Aluminum Sheathed Cables

.10 CSA C22.2 No. 124, Mineral-Insulated Cable

.11 IEEE 1202, Standard for Flame-Propagation Testing of Wire and Cable

1.3 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00- Submittal Procedures.

PART 2 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG for power and 14 AWG for control.

.2 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE. All conductors installed outdoors underground in conduit shall be RWU90 XLPE.

.3 All branch circuits shall be installed with separate, dedicated neutrals.

.4 All wiring shall be rated at 75°C when connected to equipment rated 75°C.

.5 All wiring shall be listed for the application for which it is installed.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Conductors

.1 Grounding conductor: copper

.2 Circuit conductors: copper, size as indicated

.3 Insulation:

.1 Cross-linked polyethylene XLPE

.2 Rating: 600V

.4 Inner jacket: polyvinyl chloride material

.5 Armour: interlocking aluminum

.6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.

.7 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 1.5 m centres.

.3 Threaded rods: 6 mm diameter to support suspended channels.

.8 Connectors

.1 Watertight, explosion-proof approved for TECK cable.

2.3 MINERAL-INSULATED CABLES

.1 Conductors: solid bare soft-annealed copper, size as indicated.

.2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.

.3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V, 250°C.

.4 Overall jacket: PVC applied over the sheath and compliant to applicable Building Code classification for this project for direct burial and wet locations, as indicated.

.5 Two hour fire rating.

.6 Connectors: watertight, field installed, approved for MI cable.

.7 Termination kits: field installed approved for MI cable.

2.4 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Type: ACWU90 flame retardant jacket over thermoplastic armour and compliant to applicable Building Code classification for this project.

.5 Connectors: anti short connectors

2.5 ALUMINUM SHEATHED CABLE

.1 Conductors: copper, size as indicated

.2 Insulation: RA90 rated 600V

.3 Sheath: aluminum applied to form continuous corrugated sheath.

.4 Outer jacket: thermoplastic applied over sheath and to be compliant to applicable Building Code classification for this project.

.5 Fastenings for aluminum sheathed cable:

.1 One hole steel straps to secure surface cables 25 mm and smaller. Two hole steel straps for cables larger than 25 mm. Use aluminum strap only with single conductor cable.

.2 Channel type supports for two or more cables at 1.5 m.

.3 Threaded rods: 6 mm diameter to support suspended channels.

2.6 CONTROL CABLES

.1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic

.2 Sheath: thermoplastic jacket

.2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated:

.1 Insulation: TW 40 degrees C polyethylene PVC

.2 Shielding: tape coated with paramagnetic material wire braid over each conductor

.3 Overall covering: PVC jackets

.3 Type: 600 V 14 AWG stranded annealed copper conductors, sizes as indicated:

.1 Insulation: cross-linked polyethylene type RW90 (x-link)

.2 Shielding: metallized tape over conductors braid

.3 Overall covering: thermoplastic jacket with sheath of aluminum interlocked armour and jacket over sheath of PVC.

2.7 NON-METALLIC SHEATHED CABLE

.1 Non-metallic sheathed copper cable type: NMD90 nylon, size as indicated.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using method appropriate to site conditions and to the approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 All wiring shall be in conduit unless otherwise indicated.

.2 Install cable in trenches in accordance with Section 33 71 73.02 - Underground Electrical Service.

.3 Lay cable in cable trays in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.

.4 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.5 Cable Colour Coding: to Section 26 05 00- Common Work Results for Electrical.

.6 Conductor length for parallel feeders to be identical.

.7 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.8 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.9 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e., common neutrals not permitted.

.10 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 In underground ducts in accordance with Section 33 71 75 - Underground Electrical Service.

.3 In underfloor distribution system in accordance with Section 26 05 39 - Underfloor Raceways for Electrical Systems.

.4 In cellular floor raceways in accordance with Section 26 05 38 - Cellular Metal Floor Raceway Fittings.

.5 In surface and lighting fixture raceways in accordance with Section 26 05 33.01 - Surface and Lighting Fixture Raceways.

.6 In wireways and auxiliary gutters in accordance with Section 26 05 37 - Wireways and Auxiliary Gutters.

.7 Overhead service conductors in accordance with Section 33 71 73.01 - Overhead Electrical Service.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable exposed, securely supported by straps.

.3 Provide adequate protection and strain relief for cables between stub-up and devices.

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

.1 Install cable concealed, securely supported by straps.

.2 Support 2 hour fire rated cables at 1 m intervals.

.3 Make cable terminations by using factory-made kits.

.4 Cable terminations: use thermoplastic sleeving over bare conductors.

.5 Where cables are buried in cast concrete or masonry, sleeve for exit of cables.

.6 Do not splice cables unless indicated.

3.6 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.7 INSTALLATION OF ALUMINUM SHEATHED CABLE

.1 Group cables wherever possible on channels.

3.8 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit as indicated.

.2 Ground control cable shield.

3.9 INSTALLATION OF NON-METALLIC SHEATHED CABLE

.1 Install cables.

.2 Install straps and box connectors to cables as required.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 33 - Raceway and Boxes for Electrical Systems

1.2 REFERENCE STANDARDS

.1 CSA Group

.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (26th Edition), Safety Standard for Electrical Installations

.2 CSA C22.2 No.41-13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467)

.3 CSA C22.2 No.65-13, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for connectors and terminations and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates: obtain inspection certificate of compliance covering high voltage stress from Consultant and include it with as-built drawings and maintenance manuals.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for connectors and terminations for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.

.2 Store and protect connectors and terminations from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 CONNECTORS AND TERMINATIONS

.1 Copper short barrel compression connectors to CSA C22.2 No.65 as required sized for conductors.

.2 Contact aid for aluminum cables where applicable.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for connectors and terminations installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2No.41.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical

1.2 REFERENCE STANDARDS

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding

.2 CSA International

.1 CSA Z32-09, Electrical Safety and Essential Electrical Systems in Health Care Facilities

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00- Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect grounding equipment from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as indicated to electrically conductive underground water pipe.

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as indicated.

.3 Rod electrodes: stainless steel 19 mm diameter by minimum 3 m long.

.4 Plate electrodes: galvanized steel, surface area 0.2 m², minimum 6 mm thick.

.5 Grounding conductors: bare stranded copper, soft annealed size as indicated.

.6 Insulated grounding conductors: green, copper conductors, size as indicated.

.7 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.8 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings
- .2 Protective type clamps
- .3 Bolted type conductor connectors
- .4 Thermit welded type conductor connectors
- .5 Bonding jumpers, straps
- .6 Pressure wire connectors

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Consultant.
- .2 Inform Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process, permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install separate ground conductor to outdoor lighting standards.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Bond single conductor, metallic armoured cables to cabinet at supply end.

.12 Ground secondary service pedestals.

3.3 MAINTENANCE HOLES

.1 Install conveniently located grounding stud, electrode, size as indicated stranded copper conductor in each maintenance hole.

.2 Install ground rod in each maintenance hole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements.

3.4 ELECTRODES

.1 Make ground connections to continuously conductive underground water pipe on street side of water meter.

.2 Install water metre shunt.

.3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.

.4 Install rod and plate electrodes and make grounding connections as indicated.

.5 Bond separate, multiple electrodes together.

.6 Use size 2/0 AWG copper conductors for connections to electrodes.

.7 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.5 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary system.

3.6 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.7 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.

.2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0 AWG.

3.8 HOSPITALS

.1 Grounding in hospital operating rooms: to CSA Z32.

.2 Connect equipment and leakage current devices to building ground system and supplementary grounding electrodes.

.3 Install ground bus for conductive floor tile. Make connections from tile system to bus in accordance with tile manufacturer's instructions. Ground resistance to CSA Z32.

.4 Install isolated grounding system where required.

3.9 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, security systems, intercommunication systems as follows:

.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

.2 Sound, fire alarm, security systems, intercommunication systems as indicated.

3.10 PERMAFROST

.1 Bond non-current carrying metal parts together.

.1 Hot water heating system

.2 Main water pipe

.3 Main building drain

.4 Oil line

.5 Telephone, radio/TV, emergency and fire alarm lead-in or service conduits, near panels.

.6 Make connections to pipes on building side of main valves and tanks. Connect jumpers across boilers to supply and return hot water heating pipes.

.2 Drive three-19 mm diameter x 3 m copper clad ground rods at least 1.8 m apart in original undisturbed ground. If rods will not penetrate permafrost, drive at angle not more than 60 degrees from vertical, and in same direction. Rods must be driven, not trenched.

.3 Install ground wire from service neutral bar to rods and where buried use bare copper not smaller than size 1 AWG strand or size 4 AWG solid, and at least 640mm below ground. Bond ground conductor, or short tap from it, to outside metal sheathing of building close to power service conduit. Use lug or cast clamp, with bronze or plated bolt, nut and washers (not sheet metal screw or wood screw). Remove paint from sheathing for good contact. Conduit is required only on outside wall of building. Indoors, run bare and fasten as specified for equipotential bonding wire.

.4 Install electrode interconnections where metal parts, circuits or grounding conductors and/or electrodes are in proximity to lightning rod conductors.

3.11 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

3.12 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect hangers and supports from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41mm, 2.5mm thick, set in poured concrete walls and ceilings, suspended or surface mounted as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Consultant.

3.2 INSTALLATION

.1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended Support Systems

.1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 2 m on centre.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 26 05 00 - Common Work Results for Electrical

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-15, Canadian Electrical Code, Part 1, 26th Edition

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide shop drawings: in accordance with Section 01 33 00- Submittal Procedures.

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Territory or Province, Canada.

PART 2 PRODUCTS

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: main and branch lugs and connection blocks to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat covers.

2.3 CABINETS

.1 Construction: welded sheet steel, hinged door, handle lock, 2 keys, latch and catch.

.2 Type E Empty: flush overlapping return flange sides mounting as indicated.

.3 Type T Terminal: flush overlapping return flange mounting as indicated containing 19 mm G1S fir plywood backboard.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00- Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name, voltage and phase, or as indicated.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-15, Canadian Electrical Code, Part 1, 26th Edition

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures

.2 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirement

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

.2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.5 Extension and plaster rings for flush mounting devices in finished tile or plaster walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi-gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 FLOOR BOXES

.1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex receptacles. Minimum depth: 73 mm for receptacles and communication outlets.

.2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16, 21 and 27mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

.1 Cast aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

.1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.8 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

2.9 SERVICE FITTINGS

.1 'High tension' receptacle fitting made of 2 piece die-cast aluminum with brushed aluminum housing finish for 1 duplex receptacle. Bottom plate with two knockouts for centered or offset installation. 12 x 102 mm extension piece as indicated.

.2 Pedestal type 'low tension' fitting made of 2 piece die cast aluminum with brushed aluminum housing finish to accommodate two amphenol jack connectors.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada

.2 CSA C22.2 No. 45, Rigid Metal Conduit

.3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit

.4 CSA C22.2 No. 83, Electrical Metallic Tubing

.5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit

.6 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.1 Submit cable manufacturing data.

.3 Quality Assurance Submittals

.1 Test reports: submit certified test reports.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Place materials defined as hazardous or toxic waste in designated containers.

.2 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

.1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

.4 Reel and mark shielded cables rated 1200 volts and above.

2.2 CONDUITS

.1 Paint all exposed conduit to match surface that it's mounted to.

.2 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel, hot dipped galvanized steel, and aluminum threaded.

.3 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.4 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.5 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.6 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

.7 FRE conduit: to CSA C22.2.

.8 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 53 mm and smaller.

.1 Two hole steel straps for conduits larger than 53 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 2 m on centre.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 27 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

.1 Polypropylene

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and unfinished areas.

.3 Surface mount conduits except where specified otherwise.

.4 Use rigid galvanized steel threaded conduit except where specified otherwise.

.5 Use epoxy coated conduit in corrosive or in outdoor, high moisture areas.

.6 Use electrical metallic tubing (EMT) indoors above 2.4 m not subject to mechanical injury.

.7 Use rigid PVC conduit in cast concrete and underground.

.8 Use flexible metal conduit for work in movable metal partitions, connection to motors in dry areas or connection to surface or recessed fluorescent fixtures.

.9 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.10 Use explosion proof flexible connection for connection to explosion proof motors.

.11 Install conduit sealing fittings in hazardous areas.

.1 Fill with compound.

.12 Minimum conduit size for lighting and power circuits: 21 mm.

.13 Install EMT or rigid metal conduit from computer room branch circuit panel to outlet boxes located in sub floor.

.14 Install EMT or rigid metal conduit from computer room branch circuit panel to junction box in sub-floor immediately below panel.

.1 Run flexible conduit from junction box to outlet boxes for each computer in sub-floor.

.15 Bend Conduit Cold

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.16 Mechanically bend steel conduit over 21 mm diameter.

.17 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.18 Install fish cord in empty conduits.

.19 Run 2-27 mm spare conduits up to ceiling space and 2-27 mm spare conduits down to ceiling space from each flush panel.

.1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface or flush concrete type box.

.20 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.21 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel.

.1 Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.

.1 Use cold mastic between sleeve and conduit.

.5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.

.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 27 mm and larger below slab and encase in 75 mm concrete envelope.

.1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical

.2 CSA International

.1 CAN/CSA-C22.2 No.47, Air-Cooled Transformers (Dry Type)

.2 CSA C9-02, Dry-Type Transformers

.3 CAN/CSA-C802.2-12, Minimum Efficiency Values for Dry Type Transformers

.3 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for dry type transformers and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for dry type transformers for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect dry type transformers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 DESIGN DESCRIPTION

.1 Design

.1 Type: ANN

.2 3-phase, voltage and sizes as indicated.

.3 Voltage taps: standard

.4 Insulation: Class 220°C

.5 Basic Impulse Level (BIL): standard

.6 Hipot: standard

.7 Average sound level: standard

.8 Impedance at 17 degrees C: standard

.9 Enclosure: CSA type 2, sprinkler proof with removable metal front panel

.10 Mounting: wall or floor, as indicated

.11 Finish: in accordance with Section 26 05 00- Common Work Results for Electrical

.12 Copper dings.

.13 Winding configuration to be as noted on drawings.

.14 Harmonic Mitigating Phase Shifting transformers as indicated on drawings.

.15 KL-Rated Transformers as indicated on drawings.

.16 Voltage Regulation to be 4% or better.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Label size: 7

.3 Nameplate wording: as indicated on drawings

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for dry type transformers installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Consultant.

3.2 INSTALLATION

.1 Mount dry type transformers up to 75 kVA as indicated.

.2 Mount dry type transformers above 75 kVA on floor.

.3 Ensure adequate clearance around transformer for ventilation.

.4 Install transformers in level upright position.

.5 Remove shipping supports only after transformer is installed and just before putting into service.

.6 Loosen isolation pad bolts until no compression is visible.

.7 Make primary and secondary connections in accordance with wiring diagram.

.8 Energize transformers after installation is complete.

.9 Make conduit entry into bottom 1/3 of transformer enclosure.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by dry type transformers installation.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical

.2 Section 26 28 16.02 - Moulded Case Circuit Breakers

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.29-11, Panelboards and Enclosed Panelboards

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province or Territory, Canada.

.2 Include on drawings:

.1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, in dry location, and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.

.2 Store and protect panelboards from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250V panelboards: bus and breakers rated for 225A.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Minimum of 2 flush locks for each panel board.

.6 Two keys for each panelboard and key panelboards alike.

.7 Copper bus with neutral of double ampere rating of mains.

.8 Mains: suitable for bolt-on breakers.

.9 Trim with concealed front bolts and hinges.

.10 Trim and door finish: baked enamel.

.11 Isolated ground bus.

.12 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15A to 30A breakers installed as indicated. Turn over unused lock-on devices to Consultant.

.5 Lock-on devices for receptacles, clock outlet, fire alarm, emergency, door supervisory, intercom, stairway, exit, and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

.5 Circuits supplying Patient Care Areas must be entered in circuit directory with Bold Font.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for panelboards installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 Where panels of different systems (i.e., Standard and Vital Power) supply a common patient care area, ground busses in panels to be interconnect with a minimum #6 AWG ground conductor.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices

.2 CAN/CSA C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D)

.3 CSA C22.2 No.55, Special Use Switches

.4 CSA C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00- Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.

.2 Store and protect wiring devices from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 SWITCHES

.1 15A, 120 V, single pole, three-way, four-way switches.

.2 Manually-operated general purpose AC switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.

.2 Silver alloy contacts.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 Ivory toggle.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads or heating loads.

.4 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:

.1 Ivory urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:

.1 Ivory urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.3 SPECIAL WIRING DEVICES

.1 Special Wiring Devices

.1 Clock hanger outlets, 15 A, 125 V, 3 wire, grounding type, suitable for No. 10 AWG for installation in flush outlet box.

.2 Electric shaver outlets, 15 A, 125 V, AC with 20 VA isolating transformer with stainless steel cover plate marked RAZOR ONLY.

.3 Pilot lights as indicated, with neon type 0.04 W, 125 V lamp and red plastic lense jewel flush type.

2.4 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No.42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Stainless steel, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.4 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.5 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Switches

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height as indicated in accordance with Section 26 05 00-Common Work Results for Electrical.

.2 Receptacles

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height as indicated in accordance with Section 26 05 00-Common Work Results for Electrical.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.4 Install GFI type receptacles as indicated.

.3 Cover plates

.1 Install suitable common cover plates where wiring devices are grouped.

.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.248.12, Low Voltage Fuses Part 12: Class R (Bi-National Standard with, UL 248-12 (1st Edition)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Provide fuse performance data characteristics for each fuse type and size, if requested.

.3 Shop Drawings

.1 Provide shop drawings in accordance with Section 01 33 00- Submittal Procedures.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Territory and Province, Canada.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Store fuses in original containers in storage cabinet and moisture free location.

1.5 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.

.2 Three spare fuses of each type and size installed above 600A.

.3 Six spare fuses of each type and size installed up to and including 600A.

PART 2 PRODUCTS

2.1 FUSES - GENERAL

.1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.

.2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

.1 Class L fuses.

.1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Type L2, fast acting.

.2 Class J fuses.

.1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Type J2, fast acting.

.3 Class R -R fuses.

.1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.

.2 Type R2, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.

.4 Class C fuses.

2.3 FUSE STORAGE CABINET

.1 Fuse storage cabinet, manufactured from 2.0mm thick aluminum 750mm high, 600mm wide, 300mm deep, hinged, lockable front access door finished in accordance with Section 26 05 00- Common Work Results for Electrical.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.

.1 Install rejection clips for Class R fuses.

.3 Ensure correct fuses fitted to assigned electrical circuit.

.4 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.

.5 Install spare fuses in fuse storage cabinet.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 24 16.01 - Panelboards Breaker Type

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Include time-current characteristic curves for breakers with ampacity of 600 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store circuit breakers off ground in dry location indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect circuit breakers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Ground-fault circuit-interrupters, Circuit breakers, Moulded-case circuit breakers, accessory high-fault protectors, fused circuit breakers: to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Plug-in moulded case circuit breakers: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.4 Common-trip breakers: with single handle for multi-pole applications.

.5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.6 Circuit breakers with interchangeable trips as indicated.

.7 Circuit breakers to have minimum 10,000 A symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS (DESIGN A)

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS (DESIGN B)

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 CURRENT LIMITING AND SERIES RATED THERMAL MAGNETIC BREAKERS (DESIGN C)

.1 Thermal magnetic breakers with current limiters.

.1 Time current limiting characteristics of fuses limiters coordinated with time current tripping characteristics of circuit breaker.

.2 Co-ordination to result in interruption by breaker of fault-level currents up to interrupting capacity of breaker.

.2 Series rated breakers to be manufacturer tested and listed. Breakers to be applied following manufacturer's guidelines and accepted best practice.

.1 Breakers applied following manufacturer's guidelines and accepted best practice.

2.5 SOLID STATE TRIP BREAKERS (DESIGN D)

.1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and instantaneous short time long time tripping for phase and ground fault short circuit protection.

2.6 OPTIONAL FEATURES

.1 Include:

.1 Shunt trip

.2 Auxiliary switch

.3 Motor-operated mechanism c/w time delay unit

.4 Under-voltage release

.5 On-off locking device

.6 Handle mechanism

2.7 ENCLOSURE

.1 Mounted in NEMA 1 type enclosure, sprinkler proof as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical

.2 Section 26 28 13.01 - Fuses - Low Voltage

1.2 REFERENCE STANDARDS

.1 CSA Group

.1 CAN/CSA-C22.2 No.4-04(R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98)

.2 CSA C22.2 No.39-13, Fuseholder Assemblies

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Horsepower rated non-fusible and fusible disconnect switch in CSA enclosure size to CAN/CSA-C22.2 No.4 as indicated.

.2 Provision for padlocking in off switch position by 3 locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, in accordance with Section 26 28 13.01- Fuses - Low Voltage.

.5 Fuseholders: relocatable and suitable without adaptors, for type and size of fuse indicated in accordance with CSA C22.2 No.39.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00- Common Work Results for Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)

.1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast

.2 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

.3 ASTM International Inc.

.1 ASTM F1137, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners

.4 Canadian Standards Association (CSA International)

.5 ICES-005, Radio Frequency Lighting Devices

.6 Underwriters' Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review and approval Consultant.

.3 Photometric data to include: spacing criterion and VCP Table where applicable.

.3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.

.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures, and maintenance.

1.3 QUALITY ASSURANCE

.1 Provide mock-ups in accordance with Section 01 45 00 - Quality Control.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

.3 Divert unused metal materials from landfill to metal recycling facility.

.4 Disposal and recycling of fluorescent lamps as per local regulations.

.5 Disposal of old PCB filled ballasts.

PART 2 PRODUCTS

2.1 LED FIXTURES WITH INTEGRAL DRIVERS

.1 As indicated in luminaire schedule.

.2 Die-cast aluminum housing with corrosion resistant hardware, die-cast aluminum heatsink.

.3 The fixture shall meet LM 79 rating and the chips shall meet LM 80 rating at 40°C ambient, LED B50 and L70 lifetime graph shall be provided.

.4 Lighting efficiency shall not be achieved by overdriving the LEDs.

.5 Colour temperature of LED light fixtures shall be uniform throughout the area (3500K for indoors, 4000K for outdoors +/-250K), CRI is 80 minimum.

.6 High efficiency electronic LED driver, 50-60Hz, dimmable 0-10V, built-in surge suppression, short circuit protection.

.7 Life expectancy of 60,000 hours with 70% lumen maintenance (L70). Warranty 5 years minimum.

2.2 LAMPS

.1 Incandescent lamps to be - clear, A19, 100 Watt with 1000 hour lamp life, rough-service rated; or as indicated.

.2 Tungsten halogen lamps to be - clear, T-3, 300 Watt, RSC base, 2000 hour lamp life, 5000 lumens; or as indicated.

.3 Fluorescent lamps to be - T8, 32 Watt, medium bi-pin, rapid-start, 4100 K, 30,000 hour lamp life, 2950 initial lumens, CRI 80; or as indicated.

.4 Metal halide lamps to be - clear, BT37, 400 Watt, mogul base, horizontal burn, 4100 K, 15,000 hour lamp life, 36,000 initial lumens, CRI 65, open or enclosed type to suit the luminaire; or as indicated.

.5 Low pressure sodium lamps to be - clear, T21, 135 Watt, BY22d base, horizontal burn,16,000 hour lamp life, 22,000 initial lumens; or as indicated.

.6 High pressure sodium lamps to be - clear, ED18, 400 Watt, mogul base, 30,000 hour lamp life, 54,000 initial lumens; or as indicated.

.7 Compact fluorescent lamps to be - 18 Watt, G24q-2 base, 12,000 hour lamp life, 12,000 initial lumens, 4100 K, CRI 80; or as indicated.

2.3 BALLASTS

.1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic dimmable.

.1 Rating: voltage as indicated, 60 Hz, for use with 2-32W, rapid start lamps.

.2 Totally encased and designed for 40 degrees Celsius ambient temperature.

.3 Power factor: minimum 95% with 95% of rated lamp lumens.

.4 Current crest factor: 1.7 maximum.

.5 Harmonics: 10% maximum THD.

.6 Operating frequency of electronic ballast: 20kHz minimum.

.7 Total circuit power: 62 Watts.

.8 Ballast factor: greater than 0.90.

.9 Sound rated: Class A.

.10 Mounting: integral with luminaire.

.2 Metal halide ballast:

.1 Rating: voltage as indicated, for use with 1-400W metal halide lamp. Provide circuitry for quartz re-strike standby light where indicated.

.2 Totally encased and designed for 40 degrees Celsius ambient temperature.

.3 Power factor: minimum 95% with 95% of rated lamp lumens.

.4 Type: solid state.

.5 Input voltage range: plus or minus 10% of nominal.

.6 Minimum starting temperature: minus 30 degrees Celsius at 90% line voltage.

.7 Mounting: integral with luminaire.

.8 Current crest factor: 1.7 maximum current.

.3 High pressure sodium ballast: to ANSI C82.4 design

.1 Rating: voltage as indicated, for use with 1-400W high pressure sodium lamp.

.2 Totally encased and designed for 40 degrees Celsius ambient temperature.

.3 Power factor: minimum 95% with 95% of rated lamp lumens.

.4 Type: solid state.

.5 Input voltage range: plus 10% to minus 10% of nominal.

.6 Minimum starting temperature: minus 40 degrees Celsius at 90% line voltage.

.7 Mounting: integral with luminaire.

.8 Current crest factor: 1.7 maximum current.

.4 Low pressure sodium ballast:

.1 Rating: voltage as indicated, for use with 1-35W low pressure sodium lamp.

.2 Totally encased and designed for 40 degrees Celsius ambient temperature.

.3 Power factor: minimum 95% with 95% of rated lamp lumens.

.4 Type: constant wattage.

.5 Input voltage range: plus or minus 20% of nominal.

.6 Minimum starting temperature: minus 34 degrees Celsius at 90% line voltage.

.7 Mounting: integral with luminaire.

2.4 FINISHES

.1 Light fixture finish and construction to meet ULC listing and CSA certification related to intended installation.

2.5 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule.

2.6 LUMINAIRES

.1 As indicated in luminaire schedule.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 21 - Wires and Cables (0-1000 V)

.2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings

1.2 REFERENCE STANDARDS

.1 CSA International

.1 CSA C22.2 No.141-10, Emergency Lighting Equipment

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's instructions, printed product literature and data sheets for emergency lighting and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements

.1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect emergency lighting from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.6 WARRANTY

.1 For batteries in this Section 26 52 00 - Emergency Lighting, 12 months warranty period is extended to 120 months.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Emergency lighting equipment: to CSA C22.2 No.141

.2 Supply voltage: 120V AC

.3 Output voltage: 12V DC

.4 Operating time: 30 minutes

.5 Battery: sealed, maintenance free

.6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

.7 Solid state transfer circuit.

.8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.9 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.

.10 Lamp heads: integral on unit 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED, voltage and wattage as indicated.

.11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.12 Finish: Baked, white.

.13 Auxiliary equipment

- .1 Ammeter
- .2 Voltmeter
- .3 Test switch
- .4 Time delay relay
- .5 Battery disconnect device
- .6 AC input and DC output terminal blocks inside cabinet
- .7 Shelf and Bracket
- .8 Cord and single twist-lock plug connection for AC
- .9 RFI suppressors

2.2 WIRING OF REMOTE HEADS

.1 Conduit: type EMT. Section 26 05 34- Conduits, Conduit Fastenings and Conduit Fittings.

.2 Conductors: low voltage cable in accordance with Section 26 05 21- Wires and Cables (0-1000 V) and manufacturer's recommendations.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for emergency lighting installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Install unit equipment and remote mounted fixtures.

.2 Direct heads.

.3 Connect exit lights to unit equipment.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by emergency lighting installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 02 81 01 - Hazardous Materials

1.2 REFERENCE STANDARDS

.1 CSA Group

.1 CSA C22.2 No.141, Emergency Lighting Equipment

.2 CSA C860, Performance of Internally-Lighted Exit Signs

.2 National Fire Protection Association (NFPA)

.1 NFPA 101-2015, Life Safety Code

.3 International Organization for Standardization (ISO)

.1 ISO 3864-1 2011, Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs and safety markings

.2 ISO 7010 2011, Safety colours and safety signs - Registered safety signs

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01 - Hazardous Materials.

.4 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures, and maintenance.

PART 2 PRODUCTS

2.1 STANDARD UNITS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860.

.2 Housing: cold rolled steel minimum 1.0mm thick, satin aluminum enamel finish.

.3 Face and back plates: extruded aluminum.

.4 Lamps: multiple LED-12W, 120V, over 500,000 hours.

.5 Operation: designed for over 100,000 hours of continuous operation without relamping.

.6 Letters: 150 mm high x 19 mm, with 13 mm thick stroke, red on die-cast aluminum face, reading EXIT.

.7 Downlight: translucent acrylic in bottom of unit.

.8 Third lamp socket for emergency lamp lighting circuit.

.9 Graphics: Green pictogram and white graphical symbol and directional arrows to ISO 3864-1. Dimensions to ISO 7010.

.10 Face plate to remain captive for relamping.

2.2 SELF-POWERED UNITS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860.

.2 Housing: cold rolled steel minimum 1.0mm thick, satin aluminum enamel finish.

.3 Face and back plates: extruded aluminum.

.4 Lamps: multiple LED-12W, 120V, over 500,000 hours.

.5 Operation: designed for over 100,000 hours of continuous operation without relamping.

.6 Letters: 150 mm high x 19 mm, with 13 mm thick stroke, red on die-cast aluminum face, reading EXIT.

.7 Downlight: translucent acrylic in bottom of unit.

.8 Third lamp socket for emergency lamp lighting circuit.

.9 Face plate to remain captive for relamping.

.10 Supply voltage: 120 V, ac.

.11 Output voltage: 12 or 24 V dc.

.12 Operating time: 30 minimum.

.13 Recharge time: 12 hours.

.14 Battery: sealed, maintenance free.

.15 Charger: solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.

.16 Solid state transfer circuit.

.17 Signal lights: solid state, for 'AC Power ON' condition.

.18 Lamp heads: integral on unit, 345 degrees horizontal and 180 degrees vertical adjustment.

.19 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.20 Cabinet: finish: standard.

.21 Auxiliary Equipment

.1 Lamp disconnect switch.

.2 Test switch.

.3 AC/DC output terminal blocks inside cabinet.

.4 RFI suppressor.

.5 Cord and single twist-lock plug connection for AC power supply.

2.3 SELF-LUMINOUS SIGNS

.1 Exit lights

.1 No power source or wiring required, spark free.

.2 Constructed: metal and plastic.

.3 Source of energy: tritium gas emits constant low energy beta particles to excite phosphor coating on inside of tube.

.4 Viewing distance: in accordance with NFPA.

.5 Dispose of lights at end of lifespan as Hazardous Waste in accordance with Section 02 81 01 - Hazardous Materials.

2.4 DESIGN (X1)

.1 Recessed, wall, ceiling, end to wall mounting as indicated.

.2 Double or single face with face plate to remain captive for relamping.

.3 Arrow: left, right, both directions as indicated.

.4 Wireguard.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.

.2 Connect fixtures to exit light circuits.

.3 Connect emergency lamp sockets to emergency circuits.

.4 Lock exit light circuit breaker in on position.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 02 41 13.13

1.2 MEASUREMENT PROCEDURES

.1 Measure reshaping subgrade in square metres reshaped.

1.3 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) 600 kN-m/m³.

.2 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations (including Addendum 2007).

.2 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations 2009.

.3 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Commercial Interiors.

.4 LEED Canada-EB: O& M-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for Existing Buildings: Operations and Maintenance 2009.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Sustainable Design Submittals

.1 LEED Canada submittals: in accordance with Section 01 35 21- LEED Requirements.

.2 Construction Waste Management

.1 Submit project [Waste Management Plan] [Waste Reduction Workplan] highlighting recycling and salvage requirements.

.2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for roadway subgrade reshaping installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of the Geotechnical Consultant and Consultant.

.2 Inform Geotechnical Consultant and Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 FINE GRADING

.1 Fine grading subgrade to full width as shown on the Contract Drawings.

3.3 COMPACTING

.1 Compact to minimum 98% SPMDD.

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted subgrade surface.

.3 Apply water as necessary during compaction to obtain specified density.

.4 If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected to value approved by the Geotechnical Engineer.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect and maintain reshaped surface in condition conforming to this Section until succeeding material is applied or until after receipt of written acceptance from Consultantacceptance.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 32 92 23 Sodding

1.2 MEASUREMENT REQUIREMENTS

.1 Preparation of sub-grade for placing of topsoil will be measured in square metres of area prepared.

.2 Measure supplying, placing and spreading topsoil in cubic metres as determined from actual surface area covered and depth of topsoil specified.

.1 Specified depth of topsoil: measured and approved by the Consultant after settlement and consolidation as specified.

1.3 REFERENCE STANDARDS

.1 Agriculture and Agri-Food Canada

.1 The Canadian System of Soil Classification, Third Edition, 1998

.2 Canadian Council of Ministers of the Environment

.1 PN1340-2005, Guidelines for Compost Quality

.3 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).

.2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

.4 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 DEFINITIONS

.1 Compost

.1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.

.2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.

.3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below (25) (50)), and contain no toxic or growth inhibiting contaminates.

.4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 LEED Submittals

.1 Submit erosion and sedimentation control plan for Credit SSp1 in accordance with LEED Canada-NC.

.3 Quality Control Submittals

.1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 QUALITY ASSURANCE

.1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 TOPSOIL

.1 Topsoil: mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.

.1 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.

.2 Contain no toxic elements or growth inhibiting materials.

.3 Finished surface free from:

.1 Debris and stones over 50 mm diameter.
.2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

.1 Fertilizer

.1 Fertility: major soil nutrients present in following amounts:

.2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.

.3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.

.4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.

.5 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

.6 Ph value: 6.5 to 8.0.

.2 Peatmoss

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous, brown in colour.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded particle minimum size: 5mm.

.3 Sand: washed coarse silica sand, medium to course textured.

.4 Organic matter: compost Category A, B in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

.5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.

.6 Limestone

.1 Ground agricultural limestone.

.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.7 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

2.3 SOURCE QUALITY CONTROL

.1 Advise Consultant of sources of topsoil to be utilized with sufficient lead time for testing.

.2 Contractor is responsible for amendments to supply topsoil as specified.

.3 Soil testing by recognized testing facility for PH, P and K, and organic matter.

.4 Testing of topsoil will be carried out by testing laboratory designated by Consultant.

.1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

PART 3 EXECUTION

3.1 PREPARATION OF EXISTION GRADE

.1 Verify that grades are correct.

.1 If discrepancies occur, notify Consultant and do not commence work until instructed by the Consultant.

.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.

.1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

.2 Remove debris which protrudes more than 75 mm above surface.

.3 Dispose of removed material off site.

.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.

.1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

.1 Place topsoil after the Consultant has accepted subgrade.

.2 Spread topsoil in uniform layers not exceeding 150 mm.

.3 For sodded areas keep topsoil 15 mm below finished grade.

.4 Spread topsoil as indicated to following minimum depths after settlement.

.1 150 mm for seeded areas.

.2 150 mm for sodded areas.

.3 300 mm for flower beds.

.4 500 mm for shrub beds.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.3 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage.

.1 Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by the Consultant.

.1 Leave surfaces smooth, uniform and firm against deep footprinting.

3.4 ACCEPTANCE

.1 The Consultant will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.5 SURPLUS MATERIAL

.1 Dispose of materials except topsoil not required off site where directed by Consultant.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11- Cleaning.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

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PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/American Nursery and Landscape Association (ANLA)

.1 ANSI A300 Part 1-2008, Pruning

.2 ANSI/ANLA Z60.1-04, Nursery Stock

.2 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007)

.2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors

.3 TPI (Turfgrass Producers International) Guideline Specifications to Turfgrass Sodding

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meeting: conduct meeting in accordance with Section 01 31 19 - Project Meetings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data

.1 Provide manufacturer's printed product literature and datasheets for products and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 02 81 01 - Hazardous Materials.

.3 Sustainable Design Submittals

.1 LEED Submittals: in accordance with Section 01 35 21- LEED Requirements.

1.4 CLOSEOUT SUBMITTALS

.1 Operational and Maintenance Data

.1 Maintenance Data: include grass maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

.2 Maintain grassed areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

.3 Maintain plant life immediately after placement until plants are well established and exhibit a vigorous growing condition.

.4 Maintenance to include

.1 Cultivation and weeding plant beds and tree pits.
.2 Irrigating sufficient to saturate root system.
.3 Maintaining wrapping, guys, turnbuckles, and stakes.
.4 Replacement of mulch.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements

.1 Comply with regulatory agencies for grass, herbicide composition.

.2 Plant Materials: described by ASTM Z60.1 certified by Ontario department of agriculture; free of disease or hazardous insects.

.2 Sod: Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding upper two corners.

.3 Tree Pruning

.1 Tree Pruner Qualifications: company specializing in pruning trees with proof of Arborist Certification.

.2 Tree Pruning: NAA - Pruning Standards for Shade Trees.

.3 Stating proof of insurance coverage for scaling trees.

PART 2 PRODUCTS

2.1 LANDSCAPE GRADING

.1 Topsoil

.1 Conforming to Ontario's standards.

.2 Topsoil - Re-used:

.1 Graded.
.2 Free of roots, rocks larger than 12 mm, subsoil, debris, large weeds and foreign matter.

.2 Water: clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

.3 Peat Moss: shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials.

.4 Bone Meal: raw, finely ground, commercial grade, minimum of 3% nitrogen and 20% phosphorous.

.5 Mulching Material: wood ground bark shavings cellulose fibre dust, free of growth or germination inhibiting ingredients.

.6 Erosion Fabric: jute matting, open weave.

.7 Stakes: softwood lumber, chisel pointed.

2.2 GRASS MATERIALS

.1 Seed Mixture (as per Landscape Plans)

.2 Sod

.1 Nursery Sod.

PART 3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation is established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after permanent vegetation is established.

3.3 LANDSCAPE GRADING

.1 Eliminate uneven areas and low spots.

.2 Remove

.1 Debris, roots, branches, stones, in excess of 25 mm in size.

.2 Subsoil contaminated with petroleum products.

.3 Scarify surface to depth of 75 mm.

.4 Pulverize lumped soil with weighted drag bar.

3.4 PLACING TOPSOIL

.1 Place topsoil in areas as shown on the Contract Drawings to nominal depth of 150 mm.

.2 Maintain profiles and contour of subgrade.

.1 Account for settlement of compacted soils.

.3 Remove roots, weeds, rocks, and foreign material from top soil while spreading.

.4 Lightly compact placed topsoil.

.5 Top Soil Thickness

.1 Seeded Grass: 150 mm

.2 Sod: 150 mm

.6 Position Tolerance: top of topsoil, plus or minus 13 mm.

.7 Install edging at periphery of grass areas, in straight lines, to consistent depth.

3.5 GRASS PLACEMENT

.1 Seed Placement

.1 Do not seed areas in excess of that which can be mulched on same day.

.2 Do not sow immediately following rain, when ground is too dry, or during windy periods.

.3 Roll seeded area with roller.

.4 Immediately following seeding and compacting, apply mulch. Maintain clear of shrubs and trees.

.5 Apply water with fine spray immediately after each area has been mulched.

.2 Sod Placement

.1 Machine cut sod and load on pallets to ASPA Guidelines.

.2 Lightly moisten prepared surface immediately prior to laying sod.

.3 Lay sod immediately after delivery to site to prevent deterioration.

.4 Lay sod tight with no open joints visible, and no overlapping; stagger end joints.

.5 On slopes 1:2 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs. Drive pegs flush with soil portion of sod.

.6 Water sodded areas immediately after installation.

.7 Turn corner of sod to ensure moisture penetrating soil below.

.8 After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities.

.3 Maintenance

.1 Mow grass at regular intervals to maintain height at 45 mm minimum and 65 mm maximum. Do not cut more than 1/3 of grass blade when mowing.

.2 Trim edges and hand clip where necessary.

.3 Immediately remove clippings after mowing and trimming.

.4 Water to prevent grass and soil from drying out.

.5 Roll surface to remove minor depressions or irregularities.

.6 Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

.7 Immediately reseed areas which show bare spots.

3.6 TREE, PLANT AND GROUND COVER PLACEMENT

.1 Spread topsoil minimum depth of 150 mm over area to be planted. Rake smooth.

.2 Place topsoil during dry weather and on dry unfrozen subgrade.

.3 Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

.4 Mix fertilizer thoroughly into upper 50 mm of topsoil.

.5 Lightly water to aid dissipation of fertilizer.

3.7 FIELD QUALITY CONTROL

.1 Field Tests: required.

.2 Field Inspection: required.

3.8 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

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PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 32 91 19.13 Topsoil Placement and Grading

1.2 MEASUREMENT AND PAYMENT

.1 Payment for sodding will be made at unit price bid of actual area surface measurements taken and computed by Consultant for:

.1 Turf Grass Nursery Sod.

.2 Commercial Grade Turf Grass Nursery Sod per square metre.

.3 Sod that has not been grown as Turf Grass Nursery Sod crop.

1.3 REFERENCE STANDARDS

.1 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

.1 Schedule sod laying to coincide with preparation of soil surface.

.2 Schedule sod installation when frost is not present in ground.

.3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 31 19- Project Meetings.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements.

.3 Samples.

.1 Submit:

.1 Sod for each type specified.
.1 Install approved samples in 1 square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
.2 Bio-degradable geotextile fabric.
.3 0.5 kg container of each type of fertilizer used.

.2 Obtain approval of samples by Consultant.

.4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements of seed mix, seed purity, and sod quality.

.5 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties of seed mix, seed purity, and sod quality.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

.2 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store materials in accordance with supplier's recommendations.

.2 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.

.1 Turf Grass Nursery Sod types:

.1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
.2 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivar(s).
.3 Number One Named Cultivars: Nursery Sod grown from certified seed.

.2 Turf Grass Nursery Sod quality:

.1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.
.2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
.3 Mowing height limit: 35 to 65 mm.
.4 Soil portion of sod: 6 to 15 mm in thickness.

.2 Commercial Grade Turf Grass Nursery:

.1 Mow sod at height directed by the Consultant within 36 hours prior to lifting, and remove clippings.

.2 Not more than 5 broadleaf weeds and up to 20% native grasses per 40 square metres.

.3 Sod establishment support:

.1 Geotextile fabric: biodegradable

.2 Wooden pegs: 17 x 8 x 200 mm.

.3 Biodegradable starch pegs: 17 x 8 x 200 mm.

.4 Water:

.1 Supplied by the Contractor at designated source.

.5 Fertilizer:

.1 To Canada "Fertilizers Act" and Fertilizers Regulations.

.2 Complete, synthetic, slow release with 65 % of nitrogen content in water-insoluble form.

2.2 SOURCE QUALITY CONTROL

.1 Obtain written approval from Consultant of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from Consultant.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sod installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 PREPARATION

.1 Verify that grades are correct and prepared in accordance with Section 32 91 19.13-Topsoil Placement and Grading. If discrepancies occur, notify Consultant and commence work when instructed by Consultant.

.2 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.

.3 Fine grade surface free of humps and hollows to smooth, even grade, elevations indicated, to tolerance of plus or minus 15 mm for Commercial Grade Turf Grass Nursery, surface to drain naturally.

.4 Remove and dispose of weeds; debris; stones 50 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; off site in location as directed by Consultant in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

3.3 SOD PLACEMENT

.1 Ensure sod placement is done under supervision of certified Landscape Planting Supervisor.

.2 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.

.3 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

.4 Roll sod as directed by Consultant. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.4 SOD PLACEMENT ON SLOPES AND PEGGING

.1 Install and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.

.2 Start laying sod at bottom of slopes.

.3 Peg sod on slopes steeper than 3 horizontal to 1 vertical, within 1 m of catch basins and within 1 m of drainage channels and ditches to following pattern:

.1 100 mm below top edge at 200 mm on centre for first sod sections along contours of slopes.

.2 Not less than 3-6 pegs per square metre.

.3 Not less than 6-9 pegs per square metre in drainage structures. Adjust pattern as directed by Consultant.

.4 Drive pegs to 20 mm above soil surface of sod sections.

3.5 FERTILIZING PROGRAM

.1 Fertilize during establishment and warranty periods.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.

.1 Leave Work area clean at end of each day.

.2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

.1 Clean and reinstate areas affected by Work.

.2 Remove recycling and compost containers and bins from site and dispose of materials at appropriate facility.

.3 Divert unused fertilizer from landfill to official hazardous material collections site approved by Consultant.

3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following operations from time of installation until acceptance.

.1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

.2 Cut grass to 50 mm when or prior to it reaching height of 75 mm.

.3 Maintain sodded areas weed free 95%.

.4 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

3.8 ACCEPTANCE

.1 Turf Grass Nursery Sod areas will be accepted by Consultant provided that:

.1 Sodded areas are properly established.

.2 Sod is free of bare and dead spots.

.3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.

.4 Sodded areas have been cut minimum 2 times prior to acceptance.

.2 Sodded Commercial Grade Turf Grass Nursery Sod areas will be accepted by Consultant provided that:

.1 Sodded areas are properly established.

.2 Extent of surface soil visible when grass has been cut to height of 60 mm is acceptable.

.3 Sod is free of bare or dead spots and extent of weeds apparent in grass is acceptable.

.4 Sodded areas have been cut minimum 2 times prior to acceptance.

.5 Fertilizing in accordance with fertilizer program has been carried out at least once.

.3 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

.4 When environmental conditions allow, all sodded areas showing shrinkage cracks shall be top-dressed and seeded with a seed mix matching the original.

.5 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.9 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:

.1 Water sodded Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.

.2 Repair and resod dead or bare spots to satisfaction of Consultant.

END OF SECTION

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