Ontario

MINISTRY OF TRANSPORTATION

TENDER CLOSING DATE IS 3:00:00 P.M. LOCAL (TORONTO) TIME January 16, 2025

TENDER

FOR **Grading, Drainage, Granular Base, Hot Mix Paving, Electrical and Structures**

(A) NECESSARY AVAILABLE FINANCIAL RATING IS $ 9,000,000 in (GR) or (S)

NECESSARY AVAILABLE MAXIMUM WORKLOAD RATING IS $14,000,000

AT HWY. 35

Fenelon Falls Maintenance Patrol Yard (MPY 249) Southeast Quadrant of Glenarm Road and Country Lane

0 km Eastern Region

UNDER CONTRACT NO. 2023-4010

(B) THIS CONTRACT IS APPLICABLE TO QUALIFIED CONTRACTORS ONLY

TABLE OF CONTENTS

TENDER ITEM LIST

Site Work

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
1	0201-0015	Clearing	m2 (P)	1,035		
2	0201-0075	Grubbing	m2 (P)	1,035		
3	0206-0010	Earth Excavation, Grading	m3 (P)	11,075		
4	0305-0015	Granular Sealing (m2)	m2 (P)	625		
5	0308-0010	Tack Coat	m2 (P)	9,623		
6	0313-1373	Superpave 12.5	t	1,291		
7	0313-1376	Superpave 19.0	t	1,291		
8	0314-0071	Granular A	t	32,237		
9	0314-0130	Granular B, Type I	t	929		
10	0314-0190	Granular B, Type II	t	7,085		
11	0314-0390	Granular B, Type III	t	14,260		
12	0351-0010	Concrete Sidewalk	m2 (P)	287		
13	0351-0012	Tactile Walking Surface Indicators for Concrete Sidewalk Ramps	each set (P)	1		
14	0353-0011 SP	Concrete Curb and Gutter	m (P)	93		
15	0355-0010	Interlocking Concrete Pavers	m2 (P)	137		
16	0399-3415	Clear Stone	t	90		
17	0405-0010	Pipe Subdrains	m (P)	335		
18	0405-0015	Closed-Circuit Television (CCTV) Inspection	m	59		
19	0407-0020 SP	600 mm x 1200 mm Maintenance Holes, Catch Basins, and Ditch Inlets	each (P)	1		
20	0407-0040	1200 mm Maintenance Holes, Catch Basins, and Ditch Inlets	each (P)	2		
21	0410-0200	200 mm Pipe Sewer	m (P)	43		
22	0410-0300	300 mm Pipe Sewer	m (P)	16		
23	0410-4500	Concrete Appurtenances (for Pipe Sewers)	m3 (P)	4.3		
24	0421-0505	500 mm Pipe Culvert	m (P)	25		
25	0421-0605	600 mm Pipe Culvert	m (P)	41		
26	0441-0050	Service Connection Pipe	m (P)	35		
27	0510-3137	Removal of Asphalt Pavement, Partial-Depth	m2 (P)	15		
28	0510-4210	Removal of Pipes and Culverts	m (P)	11		
29	0510-5401	Removal of Fence	m (P)	297		
30	0511-0145	Rip-Rap	m2 (P)	511		
31	0511-0150	Geotextile	m2 (P)	2,624		
32	0703-0020	Small Signs, Ground Mounted, New	each (P)	8		
33	0704-0025	Post Mounted Delineators	each (P)	10		
34	0706-0015	Temporary Traffic Control Signs	lump sum	100 %		
35	0706-0045	Road Closing/Restriction Notice Signs (TC-64)	each (P)	3		
36	0709-0010 SP	Intermediate Signs, Ground Mounted, New	each (P)	1		
37	0710-0230 SP	Final Pavement Marking, Group 1	m (P)	961		

38	0710-0232 SP	Final Pavement Marking, Group 3	m (P)	126		
39	0710-0242 SP	Final Pavement Marking Symbols, Group 3	each (P)	10		
40	0771-0010	Highway Fence	m (P)	300		
41	0771-0020	Brace Panels	each (P)	14		
42	0772-0011	Chain-Link Fence	m (P)	45		
43	0772-0013	Gates	each (P)	1		
44	0799-0010 SP	Bollards	each (P)	66		
45	0799-6015 SP	Ramp Closure Gates	each (P)	2		
46	0799-6016 SP	Concrete in Ramp Closure Gate Support Footings	each (P)	2		
47	0802-0020	Topsoil from Stockpiles	m3	3,684		
48	0803-0004	Seed	m2 (P)	10,061		
49	0804-0155 SP	Fibre Roll Flow Check Dams	each (P)	13		
50	0804-0165 SP	Rock Flow Check Dams	each (P)	3		
51	0805-0010 SP	Light-Duty Sediment Barriers	m (P)	253		
52	0805-0036 SP	Fibre Roll Barriers	m (P)	61		
53	0805-0040 SP	Heavy-Duty Sediment Barriers	m (P)	441		
54	0899-5402 SP	Shrub, 600 mm Height	each (P)	13		
55	0899-5409 SP	Coniferous Tree, 2.0 m Height	each (P)	39		
56	0899-5415 SP	Deciduous Tree, 50 mm Caliper	each (P)	8		
57	0899-5416 SP	Deciduous Tree, 60 mm Caliper	each (P)	59		

Site Electrical

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
58	0602-0025	Electrical Maintenance Holes	each (P)	8		
59	0602-0045	Electrical Handholes	each (P)	12		
60	0602-0050	Electrical Chamber Drains	m (P)	24		
61	0603-0035	Rigid Ducts, Concrete Encased	m (P)	267		
62	0603-0045	Rigid Ducts, Direct Buried	m (P)	868		
63	0604-0040 SP	High Voltage Cables, in Ducts	m (P)	164		
64	0604-0045 SP	Low Voltage Cables, in Ducts	m (P)	11,514		
65	0609-0020	Ground Wires	m (P)	2,273		
66	0609-0030	Ground Electrodes	each (P)	9		
67	0615-0110	Steel Poles, Base Mounted	each (P)	13		
68	0615-0120	Aluminum Poles, Base Mounted	each (P)	3		
69	0616-0020	Concrete Footings in Earth	each (P)	15		
70	0616-0040	Concrete Pads	each (P)	1		
71	0617-0022 SP	LED Roadway Lighting Luminaires and Bracket Assemblies	each (P)	14		

Facilities

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
72	0517-0010 SP	Dewatering System	lump sum	100 %		
73	0902-0010	Earth Excavation for Structure	m3 (P)	13,256		
74	9999-4010 SP	Water Well and Pump System	lump sum	100 %		
75	9999-9186 SP	Utility Building	lump sum	100 %		
76	9999-9900 SP	Garage/Administration Building	lump sum	100 %		

77	9999-9913 SP	Supply and Installation of New Salt Storage Structure	lump sum	100 %		
78	9999-9916 SP	Septic System	lump sum	100 %		

Bonds

Item	Spec. Code	Item Description	Unit	Quantity	Unit Price	Total
79	0599-0100 SP	Performance Bond	lump sum	100 %		
80	0599-0110 SP	Labour and Material Payment Bond	lump sum	100 %		

Total Tender:	

INSTRUCTIONS TO BIDDERS

1.0 DEFINITIONS

Agreement means the signed document between the Minister or delegated representative and the Contractor for the performance of the Work included in the Contract Documents.

Bidder means a person, sole proprietorship, firm, partnership, corporation, or any other business venture that submits a Bid to the Ministry.

Business Day means any Day which is not: a) A Saturday or a Sunday or b) A Day observed as a holiday under the laws of the Province of Ontario or the federal laws of Canada applicable to the Province of Ontario.

Coercive Practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the procurement process or affect the execution of a contract.

Collusive Practice means scheme or arrangement between two or more Bidders, with or without the knowledge of the Ministry, designed to establish bid prices at artificial, non-competitive levels.

Contract means the undertaking by the Ministry and the Contractor to perform their respective duties, responsibilities, and obligations as prescribed in the Contract Documents.

Contract Documents means the Agreement, Tender, MTO General Conditions of Contract, Standard Specifications and Drawings, Special Provisions, Contract Drawings, Addenda incorporated into any aforementioned document, documents referenced in the aforementioned documents, and subsequent amendments to any of these documents made pursuant to the provisions of the Agreement.

Confidential Information refers to the confidential information of the Ministry (other than confidential information which is disclosed to the bidders in the normal course of the Tender) that is relevant to the services required by the Tender, or their pricing and the disclosure for which could result in prejudice to the Ministry or an Unfair Advantage to the Bidder.

Conflict of Interest means having an interest (whether personal, financial or otherwise), which interferes or may be perceived as interfering with the ability of the Bidder to submit a fair and objective Tender or Bid.

Contractor means the person, partnership, or corporation undertaking the Work as identified in the Agreement.

Contractor Registration Form or CRF means the Ministry approved form supplied by the Ministry and completed by the Bidder to submit information in support of a contractor’s basic financial rating.

Contract Tender Form or CTF means the Ministry approved form detailing the contract tender information for an advertised contract.

Corrupt Practice means the offering, promising, giving, receiving, or soliciting, directly or indirectly, anything of value or any other advantage to influence improperly the actions of a public official in the procurement process.

Day means a calendar day.

Fraudulent Practice means a misrepresentation or omission of facts in order to influence a procurement process or the execution of a contract.

Joint Bid means a Bid submitted for a Qualified Contract by companies that are not associated or related by common ownership and have not formed a corporation.

Joint Venture means a Bid submitted for a Contract by companies that are not associated or related by common ownership and have formed a corporation.

Itemized Bid Form means the Ministry approved form that the Bidder is to use to price the items specified in the tender documents to perform the Work.

Late Bid means a Bid received by the Ministry's Service Provider after the Tender Closing.

Late Bid Notification is a statement sent by the Ministry's Service Provider to a Bidder notifying the Bidder that their Bid is a Late Bid and will not be considered and is rejected.

MERX means the company engaged by the Ministry to provide electronic tendering services, which is a subsidiary of MDF Commerce Inc.

Ministry means the Ministry of Transportation of Ontario.

No Bid Statement means a 'No Bid' selection on a Summary Bid Submission Form submitted to the Ministry's Service Provider from a Bidder who has an approved Tender Registration Form, but who does not intend on submitting a Summary Bid Submission Form containing a summary Bid prior to the Tender Closing, or intends to withdraw a summary Bid submitted on a Summary Bid Submission Form submitted to the Ministry prior to Tender Closing.

Non-Qualified Contract means a Contract that does not require the Bidder to be a Rated Contractor.

Non-Qualified Contractor Registration Form or NQCRF means the Ministry approved form supplied by the Ministry and completed by the Non-Rated Contractor.

Non-Rated Contractor means a contractor who does not have a basic financial rating or maximum workload rating in accordance with the Ministry's Qualification Procedures for Contractors.

Non-Resident Contractor means any contractor outside Ontario and is not incorporated pursuant to the laws of Ontario and who has not maintained a permanent place of business in Ontario continuously for twelve months prior to Tender Opening.

Non-Qualified Tender Registration Form or NQTRF means the Ministry approved form supplied by the Ministry completed by the Bidder to notify the Ministry of its intention to submit a Bid on a Non-Qualified contract in accordance with the Instructions to Bidders.

Qualified Contract means a Contract that requires the Bidder to be a Rated Contractor.

Qualification Procedures for Contractors means the administrative routine established by the Ministry to determine that contractors have the financial, managerial, and technical capability to perform the work in accordance with the contract.

Preferred Bidder means the Bidder that has been successful in the bidding process for the Contract as determined by the Ministry.

Registry, Appraisal and Qualification System or RAQS means an electronic procurement portal for contractors hosted by MERX where the Ministry tenders its transportation infrastructure contracts.

Rated Contractor means a Contractor, or a Contractor's subsidiary company that is included in the executed Memorandum of Agreement, that has been granted a basic financial rating or maximum workload rating in accordance with the Ministry's Qualification Procedures for Contractors.

Service Provider means the company appointed by the Ministry to provide electronic tendering services on behalf of the Ministry.

Summary Bid Submission Form means the electronic form obtained from the Ministry's Service Provider prior to Tender Closing that the Bidder is to use to summarize the lump sum offer to perform the Work.

Tender or Bid can be used interchangeably and means the offer submitted by a Bidder to perform the work required of the Tender Documents at the prices set out in the offer, which offer shall be set out in the forms approved by the Ministry and in accordance with the procedures more particularly described in these Instructions to Bidders. More particularly, the forms shall include, among other things, the Summary Bid Submission Form and the Itemized Bid Form.

Tender Closing or **Tender Opening** can be used interchangeably and mean the last date and time that the Ministry will receive Bids.

Tender Documents means the Tender, MTO General Conditions of Contract, Standard Specifications and Drawings, Special Provisions, Contract Drawings, Addenda incorporated into any aforementioned document, and documents referenced in the aforementioned documents, but excludes the Qualification Procedures for Contractors.

Tender Registration Form or TRF means the Ministry approved form supplied by the Ministry completed by the Bidder to notify the Ministry of its intention to submit a bid on a Qualified or Non-Qualified Contract in accordance with the Instructions to Bidders.

Unbalanced Bid means a Bid containing a lump sum or unit prices, which does not reflect reasonable actual costs to do the work as described in the Tender Documents, plus a reasonable proportionate share of the Bidder's anticipated profit, overhead costs, and other indirect costs which are anticipated for the performance of the work.

Unfair Advantage means the Bidder, any of its subcontractors, employees or former employees, had access to information related to the bid solicitation that was not available to all Bidders

Work means the total construction and related services required by the Contract Documents.

2.0 COMPLIANCE WITH INSTRUCTIONS

2.1 Bidders shall comply with these Instructions to Bidders. Failure to do so may result in the rejection of their Bids.

2.2 Bidders shall respond to Tenders in an honest, fair and accountable manner, including by complying with all applicable laws and regulations regarding fair competition as well as recognized standards of good procurement practice.

2.3 Bidders shall not engage in Corrupt, Fraudulent, Collusive, or Coercive Practices in bidding for a Contract.

2.4 The Ministry will not award a Contract to a Bidder that has engaged in Corrupt, Fraudulent, Collusive or Coercive Practices.

3.0 CONFLICT OF INTEREST

3.1 A Bidder must ensure that its employees, officers, advisers, agents, former employees or subcontractors do not place themselves in a position that may, or does give rise to an actual, potential or perceived Conflict of Interest between the interests of the Ministry and the Bidder's interests during the procurement process. This may include having access to Confidential Information related to the Tender or Bid that was not available to other Bidders and that would, in Ministry's opinion, give or appear to give the Bidder an Unfair Advantage.

3.2 The Bidder must declare prior to Tender Closing any situation that may be a Conflict of Interest. This declaration shall be submitted to the ministry as an attachment to their Summary Bid Form submission.

3.3 The Ministry shall have the right to rescind any Contract with the Preferred Bidder in the event that the Ministry, in his/her sole discretion, determines that the Preferred Bidder has made misrepresentation regarding any of the above, in addition to or in lieu of any other remedies that the Ministry has in law or in equity.

4.0 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT

4.1 The Freedom of Information and Protection of Privacy Act applies to the information provided to the Ministry by a Bidder.

4.2 The Bidder should identify any information in its Bid or any accompanying documents supplied in confidence for which confidentiality is to be maintained by the Ministry, except as otherwise required by law or order of a court.

4.3 Bidders are advised that their Bids will, as necessary, be disclosed on a confidential basis to the Ministry’s advisers for the purpose of evaluating or participating in the evaluation of their Bids.

5.0 ACCESSIBILITY OBLIGATIONS

5.1 The Province of Ontario is committed to the highest possible standard for accessibility. Contractor(s) are responsible for complying with the requirements under the Ontario Human Rights Code, the Ontarians with Disabilities Act, 2001 and Accessibility for Ontarians with Disabilities Act, 2005 (“AODA”) and its regulations. In circumstances where Contractors are providing a service to the public on behalf of the Ministry, they may need to follow Ministry direction to ensure Ministry compliance with the AODA and its regulations (such as the Integrated Accessibility Standards Regulation). The Contractor is responsible for applying the Integrated Accessibility Standards Regulation and effective dates and timelines as they pertain to the Government of Ontario, as directed by the Ministry.

6.0 ENQUIRIES DURING TENDERING PERIOD

6.1 Enquiries shall be submitted electronically through the RAQS. All public enquiries and responses to enquiries will be posted through the RAQS.

6.2 Unless addressed through an addendum to the Tender Documents issued by the Ministry, all responses to Bid enquiries shall not be incorporated as part of the Contract or in any way change the Contract.

6.3 Bidders shall not make verbal enquiries of Ministry personnel. Information given orally by Ministry personnel shall not be binding on the Ministry, nor shall it be construed as a factor in the Bid evaluation. Any attempt on the part of any Bidder or any of its employees, officers, agents, advisers or subcontractors to contact any member of the Ministry with respect to the Tender other than as described above in this section may lead to disqualification.

7.0 JOINT VENTURES OR JOINT BIDS

7.1 Rated Contractors are permitted to Bid on tenders as a Joint Venture/Joint Bid. All participants in the Joint Venture/Joint Bid shall, on a joint and several basis, absolutely, unconditionally and irrevocably be responsible for all obligations described in the Tender Documents.

7.2 Rated Contractors shall notify the Ministry of their intent to form a Joint Venture or submit a Joint Bid in accordance with the Ministry's Qualification Procedures for Contractors. Upon approval by the Ministry, the lead Contractor must submit the TRF on behalf of the Joint Venture or Joint Bid.

7.3 The lead Contractor shall sign the Contract on behalf of the Joint Venture upon award of the Tender. In the case of a Joint Bid, the Contract shall be signed by the Rated Contractors in the Joint Bid.

8.0 TENDER REGISTRATION

8.1 An approved NQTRF or TRF is required for the submission of a Bid in respect of the Work.

8.2 A Non-Rated Contractor must have an approved NQCRF and a Ministry approved NQTRF for the submission of a Bid for a Non-Qualified Contract.

8.3 A Rated Contractor must have an approved CRF and either a Ministry approved NQTRF or a TRF for the submission of a Bid for a Non-Qualified Contract or a Qualified Contract.

9.0 ELECTRONIC BID SUBMISSION PROCEDURES

9.1 All Bidders shall have a valid user ID and password to access the RAQS website. Only a Bidder with an approved TRF or NQTRF for the advertised Tender can submit a Bid.

9.2 The Bidder's TRF or NQTRF shall be completed as of the date and time specified on the Contract Tender Form. The Ministry will not review any TRF's or NQTRF's received after that date and time.

9.3 Bidders shall complete an on-line Summary Bid Submission Form. Only a Bidder with an approved TRF or NQTRF for the advertised Tender can complete and submit a Summary Bid Submission Form to the Ministry.

9.4 Bidders shall include their Declaration of a Conflict of Interest form, (if applicable).as an attachment(s) to their Summary Bid Submission Form:

9.5 All Bids shall be received by the Ministry before the Tender Closing date and time specified in the Contract Tender Form.

9.6 Bidders may submit a revised on-line Summary Bid Submission Form up until Tender Closing. The Ministry will only consider the last Summary Bid Submission Form received by the Ministry prior to Tender Closing. A No Bid Statement may be received from any Bidder on-line up until Tender Closing.

9.7 Upon successfully submitting an on-line Summary Bid Submission Form, Bidders will receive an on-line notification for information purposes that the Ministry has received their Summary Bid Submission Form.

9.8 After Tender Closing, Bidders will receive an electronic notification from the Ministry's Service Provider, advising them that Tender Closing has occurred.

9.9 The Ministry's Service Provider will notify all Bidders electronically and will publish a Bidders list showing tender results on the RAQS website.

9.10 The three (3) lowest Bidders are required to submit the Itemized Bid Form and the List of persons who participated in the preparation of the Tender within 24 hours after the Bids are published. Failure to submit the requested information within the specified time may result in rejection of the Bid and/or may be referred to the Qualification Committee. The Itemized Bid Form shall not be changed once submitted.

10.0 COMPUTER SYSTEM FAILURE

10.1 The Ministry will only accept Bids submitted electronically through RAQS. Any Bid received through any other format will not be considered and is deemed rejected without consideration.

10.2 The Ministry accepts no responsibility for any reason whatsoever, including computer system failures of either the Bidder or the Ministry's Service Provider, if the Bidder is unable to submit its Bid before Tender Closing, and the Bidder agrees that the Ministry shall have no liability for delays caused by internet/network traffic, degraded operation or failure of any computer system element, including, but not limited to: any computer system, power supply, telephone or data connection or system or software or browser of any type whatsoever.

10.3 It is the sole responsibility of the Bidder to ensure that it can access and exchange data with the Ministry Service Provider's computer systems electronically and that it allows sufficient time to successfully access and share data with the Ministry Service Provider's computer systems, having regard to the possibility of delays caused by internet/network traffic. Bidders are solely responsible to ensure that they plan their access to the Ministry Service Provider's computer/servers, so that the Bidders can reach the Ministry Service Provider's computers/servers before Tender Closing.

11.0 UNBALANCED TENDERS AND DISCREPANCIES

11.1 Bidders that submit Tenders containing a lump sum or unit prices that appear to be an Unbalanced Bid may be referred to the Ministry's Qualification Committee. A Bid that has been determined to be a mathematically or materially Unbalanced Bid may be rejected by the Ministry.

11.2 The Ministry will not allow any Bidder to adjust the total Tender amount after Tender Closing.

11.3 In the event of a mathematical error or discrepancy in the Itemized Bid Form, the Ministry may request the Bidder to resubmit the Itemized Bid Form without changing the total Tender amount.

12.0 ACCEPTANCE OR REJECTIONS OF TENDERS

12.1 The Ministry reserves the right to reject any or all Tenders, and to waive formalities as the interests of the Ministry may require without stating reasons, therefore, the lowest or any Tender may not necessarily be accepted.

12.2 The Ministry shall not be liable for any costs, expenses, loss or damage incurred, sustained or suffered by any Bidder prior, or subsequent to, or by reason of the acceptance or the non-acceptance by the Ministry of any Tender, or by reason of any delay in the acceptance of a Tender, except as provided in the Tender Documents.

12.3 The Tender shall be irrevocable for a period of 30 Days following the date of Tender Closing.

13.0 CONTRACT AWARD PROCEDURES

13.1 The Ministry will notify the Preferred Bidder in writing that the Tender has been accepted within 30 Days of the Tender Closing.

13.2 The Ministry will send the contract agreement and other such forms and documents as are necessary

to the Preferred Bidder for execution.

13.3 The Preferred Bidder shall fully execute and return the contract agreement and other such forms and documents, including the required Statutory Bonds, if applicable, required certificates and declarations as directed in the document titled “Notification of Acceptance of Tender” within seven (7) Business Days of the date the documents are received.

13.4 Following receipt of all properly executed forms and documentation, the Preferred Bidder will receive written authority to proceed with the work.

14.0 FAILURE TO PROVIDE DOCUMENTS OR ENTER INTO CONTRACT

14.1 If the Preferred Bidder is a Rated Contractor and fails to return the applicable documents as directed in the notification of acceptance of Tender, within seven (7) Business Days of receipt of such notification, the Ministry may reject the Bid on written notice to the Preferred Bidder and refer the matter to the Ministry’s Qualification Committee without prejudice to any right or remedy the Ministry may have in law.

14.2 If the Preferred Bidder is a Rated Contractor and fails for any reason to enter into the Contract within the specified time, then it shall not be allowed to work on the Contract as a subcontractor or be allowed to supply any material, equipment or labour to the contract and the matter shall be referred to the Ministry’s Qualification Committee without prejudice to any right or remedy the Ministry may have in law.

14.3 If the Preferred Bidder is a Non-Rated Contractor and fails to return the applicable documents as directed in the notification of acceptance of Tender, within seven (7) Business Days of receipt, the Ministry may reject the Bid, on written notice to the Preferred Bidder without prejudice to any right or remedy the Ministry may have in law, and the Ministry may revoke the Preferred Bidder’s bidding privileges with the Ministry on future Ministry Contracts for a period of up to two (2) years.

14.4 If the Preferred Bidder is a Non-Rated Contractor and fails for any reason to enter into the contract within the specified time, then it shall not be allowed to work on the Contract as a subcontractor or be allowed to supply any material, equipment or labour to the Contract and the Ministry may revoke the Preferred Bidder’s bidding privileges on future Ministry Contracts for a period of up to two (2) years without prejudice to any right or remedy the Ministry may have in law.

15.0 NON-RESIDENT CONTRACTORS REQUIREMENTS

15.1 If the Preferred Bidder is a Non-Resident, it must provide a copy of their approved Workplace Safety and Insurance Board registration form titled "Registration of Constructors and Employers Engaged in Construction" with their executed documents.

DECLARATION OF CONFLICT OF INTEREST

Contract Number: 2023-4010

With the submission of this form we are declaring an actual or potential Conflict of Interest relating to the preparation of the Bid, and/or we foresee an actual or potential Conflict of Interest in performing the contractual obligations contemplated in the procurement for the above-noted Contract.

Details of the actual or potential Conflict of Interest (include attachments, if required):

This form and supporting documents shall be received by the Ministry as required and shall be included as attachment(s) to the on-line Summary Bid Submission Form.

I certify that the information provided is true and correct by my signature below:

Name (Print) | Position

Company Name

Signature | Date

PERSONS WHO PARTICIPATED IN THE PREPARATION OF THE TENDER

Contract Number: 2023-4010

This form is required to be submitted per Section 9.10 of the Instructions to Bidders.

Name	E-mail	Phone Number	Contribution (%)

Company Name

Name

Date

SCHEDULE OF PROVISIONS, CONTRACT PLANS, STANDARD DRAWINGS, SPECIFICATIONS AND GENERAL CONDITIONS

The work specified in the Contract shall be performed in strict accordance with the following Provisions, Contract Plans, Specifications and Conditions for **CONTRACT NO. 2023-4010**

A. SPECIAL PROVISIONS

Section A - Special Provisions for Contract No. 2023-4010	ATTACHED
Section B - Fair Wage Program - Labour Conditions	ATTACHED
Section C - Liquidated Damages for Contract No. 2023-4010	ATTACHED

B. PLANS

Contract Drawing Book(s).

C. STANDARD DRAWINGS

OPSD

Dwg No.	Issue Date	Dwg No.	Issue Date	Dwg No.	Issue Date	Dwg No.	Issue Date
0100.0100	Nov 2010	0100.0110	Nov 2006	0100.0120	Nov 2009	0100.0130	Nov 2009
0100.0140	Nov 2002	0100.0500	Nov 2006	0100.0600	Nov 2006	0101.0100	Nov 2006
0101.0110	Nov 2006	0101.0120	Nov 2006	0101.0130	Nov 2006	0101.0140	Nov 2006
0101.0150	Nov 2006	0101.0160	Nov 2006	0101.0170	Nov 2007	0102.0100	Nov 2006
0103.0100	Nov 2006	0103.0110	Nov 2006	0104.0100	Nov 2007	0200.0100	Nov 2009
0205.0100	Nov 2016	0206.0100	Nov 2018	0206.0500	Nov 2018	0210.0100	Nov 2018
0210.0700	Nov 2016	0219.1910	Nov 2015	0301.0200	Nov 2010	0310.0100	Nov 2019
0310.0390	Nov 2019	0401.0100	Nov 2018	0403.0100	Nov 2017	0405.0100	Nov 2018
0405.0200	Nov 2018	0701.0100	Nov 2014	0705.0400	Nov 2019	0708.0200	Nov 2016
0802.0100	Nov 2014	0804.0300	Nov 2017	0804.0500	Nov 2021	0810.0100	Nov 2018
0810.0200	Nov 2018	0971.1010	Nov 2016	0971.1030	Nov 2016	0972.1020	Nov 2012
0985.1100	Apr 2019	0985.2100	Apr 2019	0989.1100	Apr 2019	0989.2100	Apr 2019
0990.1100	Nov 2014	0992.2100	Nov 2018	2000.0010	Nov 2018	2011.1010	Nov 2018
2011.2010	Nov 2018	2011.4010	Nov 2018	2011.5010	Nov 2018	2012.1010	Nov 2018
2014.1010	Nov 2018	2014.1020	Nov 2018	2100.0500	Nov 2013	2100.0600	Nov 2015
2101.0100	Nov 2013	2102.0200	Nov 2015	2103.0100	Nov 2015	2103.0200	Nov 2015
2103.0500	Nov 2015	2111.0200	Nov 2015	2111.0400	Nov 2015	2111.0500	Nov 2015
2112.0400	Nov 2004	2116.0100	Nov 2013	2116.0200	Nov 2013	2117.0100	Nov 2013
2117.0200	Nov 2013	2118.0200	Nov 2009	2123.0100	Nov 2013	2123.0200	Nov 2013
2123.0300	Nov 2013	2200.0100	Nov 2012	2200.0110	Nov 2010	2200.0410	Nov 2014
2210.0100	Nov 2013	2215.0200	Nov 2015	2215.0300	Nov 2014	2220.0100	Nov 2010
2228.0100	Nov 2016	2250.0100	Nov 2016	2255.0300	Nov 2013	2415.0110	Nov 2010
2420.0100	Apr 2007	2421.0100	Nov 2016	2432.0100	Nov 2010		

MTOD

Dwg No.	Issue Date	Dwg No.	Issue Date	Dwg No.	Issue Date	Dwg No.	Issue Date
0101.0700	Apr 1994	0219.1100	Jan 2021	0219.1200	Jan 2021	0219.1310	Jan 2021
0219.2110	Jan 2021	0960.1020	May 2013	0960.1030	May 2013	0960.1060	May 2013

0960.1080	May 2013	0972.1300	May 2023	0972.1320	May 2023	0986.1010	Jan 2014
0986.1050	Jan 2014	0986.2010	Jan 2014	0986.3010	Jan 2014	0993.1010	Aug 2021
0993.2100	Aug 2021	2270.0000	Sep 2010				

SSD

N / A

The following notes refer to the Standard Drawing numbers in Section C above.

1. OPSDs and MTODs are available for viewing and download from the MTO Technical Publications website at Ontario.ca/MTOTechPubs. If the Issue Date coincides with the most recent version that has been published, the document will be located under the “Current Documents” tab, and if not, it will be located under the “Archived Documents” tab.

2. Applicable Structural Standard Drawings (SSDs) are contained within the Contract Documents.

D. GENERAL SPECIAL PROVISIONS

Special No.	Issue Date	Special No.	Issue Date	Special No.	Issue Date
100F28	May 2023	100F68	May 2023	100F71	May 2023
100S72	Feb 2024	101S18	Apr 1994	101F21	Nov 2014
102S05	May 2017	103F03	Oct 2021	103S05	Aug 2019
105S22M	Aug 2021	109S61	Feb 2024	110S05	Feb 2019
110S06	Jun 2020	110F10	Sep 2001	110S16	May 2023
110S17	Jan 2023	110S18	Jan 2020	111F06	Oct 2021
113S03	Dec 2004	113S09	Feb 2013	114S07	Jan 2023
199F01	Aug 2019	199F03	May 2016	199S05	Sep 2023
199F14	Oct 2020	199S18	Jun 1992	199F31	Apr 2016
199F33	Jan 2020	199S37	Aug 2018	199S38	Mar 2017
199F45	Aug 2019	199S54	Feb 2018	199S55	May 2004
199S56	Sep 2005	199F57	May 2023	199S60	Oct 2009
199S64	May 2023	199S65	Dec 2016	199S66	Aug 2019

E. ITEM SPECIFIC SPECIAL PROVISIONS

Special No.	Date	Item No.
353S02	Jul 2007	14
517F01	Feb 2024	72
599S05	Oct 2020	79, 80
617F03	Jan 2020	71
709S01	Oct 2021	36
710S12	Feb 2024	37, 38, 39
799S05	Sep 2023	36
799S08	Mar 2012	44
799S12	May 2013	45, 46
804F02	Oct 2021	49, 50
805F01	Jan 2021	51, 52, 53

The following notes refer to the Special Provisions listed in Sections D and E above.

1. SPs with an “S” identifier signifies that the standard published version of the SSP is applicable. SSPs

are available for viewing and download from the Technical Publications website at Ontario.ca/MTOTechPubs. If the Issue Date coincides with the most recent version that has been published, the document will be located under the "Current Documents" tab, and if not, it will be located under the "Archived Documents" tab.

2. SPs with an "F" identifier signifies that additional fill-in information has been added to the standard published version of the SSP. The entire text of fill-in SPs shall be obtained directly from Section "A" of the Contract Documents.

3. SPs with an "M" identifier signifies that the standard published version of the SSP has been modified. The entire text of modified SPs shall be obtained directly from Section "A" of the Contract Documents.

F. STANDARD SPECIFICATIONS

OPSS

No.	Date	No.	Date	No.	Date	No.	Date
0102	Oct 1992	0353	Sep 1996	0802	Nov 2010		

OPSS - Provincial

No.	Date	No.	Date	No.	Date	No.	Date
0100	Apr 2023	0106	Nov 2019	0127	Apr 2024	0180	Nov 2016
0182	Apr 2021	0201	Apr 2019	0206	Nov 2014	0305	Nov 2022
0308	Jul 2023	0313	Apr 2021	0314	Nov 2015	0351	Apr 2023
0355	Nov 2020	0405	Nov 2017	0407	Nov 2022	0410	Jul 2023
0421	Jul 2023	0441	Apr 2017	0501	Nov 2014	0510	Nov 2014
0511	Nov 2018	0517	Nov 2023	0602	Nov 2017	0603	Nov 2017
0604	Nov 2017	0609	Nov 2019	0615	Apr 2017	0616	Apr 2018
0617	Nov 2019	0703	Nov 2019	0704	Apr 2021	0706	Nov 2016
0709	Nov 2018	0710	Nov 2023	0771	Nov 2017	0772	Apr 2023
0803	Apr 2023	0804	Apr 2021	0805	Nov 2020	0902	Nov 2019
0904	Nov 2019	0905	Apr 2020				

G. REFERENCED STANDARD SPECIFICATIONS

The standard OPS specifications in the following list are applicable to the Contract when referenced by the Contract Documents.

No.	Type	Date	No.	Type	Date	No.	Type	Date
0100	Prov	Apr 2023	0102	Comm	Oct 1992	0106	Prov	Nov 2019
0120	Prov	Nov 2014	0127	Prov	Apr 2024	0180	Prov	Nov 2016
0182	Prov	Apr 2021	0201	Prov	Apr 2019	0202	Prov	Nov 2013
0203	Prov	Apr 2023	0206	Prov	Nov 2014	0209	Prov	Nov 2014
0212	Prov	Nov 2013	0220	Prov	Nov 2014	0301	Prov	Nov 2018
0304	Prov	Nov 2022	0305	Prov	Nov 2022	0307	Prov	Nov 2022
0308	Prov	Jul 2023	0311	Prov	Apr 2023	0312	Prov	Apr 2018
0313	Prov	Apr 2021	0314	Prov	Nov 2015	0316	Prov	Nov 2018
0317	Prov	Apr 2021	0320	Prov	Nov 2020	0330	Prov	Nov 2014
0331	Prov	Nov 2015	0332	Prov	Apr 2021	0333	Prov	Nov 2015
0335	Prov	Nov 2015	0336	Prov	Nov 2018	0337	Prov	Nov 2017
0341	Prov	Apr 2018	0342	Prov	Nov 2015	0350	Prov	Jul 2023

0351	Prov	Apr 2023	0353	Comm	Sep 1996	0355	Prov	Nov 2020
0363	Prov	Nov 2014	0365	Prov	Nov 2014	0366	Prov	Apr 2023
0369	Prov	Apr 2023	0401	Prov	Nov 2015	0402	Prov	Apr 2017
0403	Prov	Apr 2017	0404	Prov	Nov 2017	0405	Prov	Nov 2017
0407	Prov	Nov 2022	0408	Prov	Nov 2022	0409	Prov	Nov 2017
0410	Prov	Jul 2023	0411	Prov	Nov 2022	0415	Comm	Feb 1990
0416	Comm	Feb 1990	0421	Prov	Jul 2023	0422	Prov	Nov 2022
0441	Prov	Apr 2017	0490	Prov	Nov 2018	0491	Prov	Nov 2017
0492	Prov	Nov 2018	0493	Prov	Apr 2022	0501	Prov	Nov 2014
0510	Prov	Nov 2014	0511	Prov	Nov 2018	0512	Prov	Nov 2014
0517	Prov	Nov 2023	0539	Prov	Nov 2014	0578	Prov	Apr 2017
0602	Prov	Nov 2017	0603	Prov	Nov 2017	0604	Prov	Nov 2017
0609	Prov	Nov 2019	0610	Prov	Nov 2016	0611	Prov	Nov 2019
0614	Prov	Nov 2019	0615	Prov	Apr 2017	0616	Prov	Apr 2018
0617	Prov	Nov 2019	0620	Prov	Apr 2017	0621	Prov	Nov 2018
0622	Prov	Apr 2017	0623	Prov	Nov 2018	0630	Prov	Nov 2016
0631	Prov	Nov 2019	0703	Prov	Nov 2019	0704	Prov	Apr 2021
0705	Prov	Apr 2021	0706	Prov	Nov 2016	0707	Prov	Apr 2022
0708	Prov	Nov 2016	0709	Prov	Nov 2018	0710	Prov	Nov 2023
0721	Prov	Jul 2023	0723	Prov	Nov 2015	0732	Prov	Apr 2016
0733	Prov	Nov 2017	0740	Prov	Apr 2022	0741	Prov	Nov 2023
0760	Comm	Nov 2014	0771	Prov	Nov 2017	0772	Prov	Apr 2023
0791	Prov	Apr 2023	0801	Prov	Apr 2018	0802	Comm	Nov 2010
0803	Prov	Apr 2023	0804	Prov	Apr 2021	0805	Prov	Nov 2020
0810	Prov	Apr 2021	0811	Prov	Apr 2021	0812	Prov	Apr 2020
0820	Prov	Apr 2020	0821	Prov	Apr 2020	0822	Prov	Apr 2020
0823	Prov	Apr 2020	0824	Prov	Apr 2020	0825	Prov	Nov 2019
0832	Prov	Apr 2021	0902	Prov	Nov 2019	0903	Prov	Apr 2016
0904	Prov	Nov 2019	0905	Prov	Apr 2020	0906	Prov	Nov 2020
0907	Prov	Nov 2023	0908	Prov	Nov 2021	0909	Prov	Nov 2016
0910	Prov	Apr 2023	0911	Prov	Nov 2022	0912	Prov	Nov 2020
0913	Prov	Nov 2017	0914	Prov	Jul 2023	0915	Prov	Nov 2022
0918	Prov	Apr 2017	0919	Prov	Nov 2023	0920	Prov	Nov 2020
0921	Prov	Nov 2020	0922	Prov	Nov 2020	0928	Prov	Apr 2012
0929	Prov	Nov 2017	0930	Prov	Nov 2014	0931	Prov	Apr 2020
0932	Prov	Nov 2020	0935	Prov	Nov 2014	0942	Prov	Apr 2020
0950	Prov	Nov 2023	1001	Prov	Nov 2018	1002	Prov	Apr 2018
1003	Prov	Nov 2017	1004	Prov	Nov 2012	1005	Prov	Nov 2022
1006	Prov	Apr 2017	1010	Prov	Apr 2013	1101	Prov	Nov 2020
1103	Prov	Nov 2022	1151	Prov	Apr 2021	1153	Prov	Nov 2022
1202	Prov	Nov 2020	1203	Prov	Nov 2020	1204	Comm	Nov 2003
1205	Prov	Apr 2015	1210	Prov	Nov 2020	1212	Prov	Nov 2023
1213	Prov	Jul 2023	1215	Prov	Jul 2023	1216	Prov	Jul 2023
1217	Prov	Jul 2023	1301	Comm	Sep 1996	1302	Prov	Nov 2023
1303	Prov	Nov 2014	1305	Prov	Apr 2019	1306	Prov	Apr 2019
1308	Comm	Nov 2003	1315	Comm	Sep 1996	1350	Prov	Nov 2019
1351	Comm	Nov 2004	1352	Comm	Nov 1989	1430	Prov	Nov 2017
1440	Prov	Apr 2020	1441	Prov	Nov 2017	1442	Comm	May 1994
1443	Comm	May 1994	1503	Prov	Apr 2022	1504	Prov	Apr 2021
1505	Prov	Apr 2017	1540	Prov	Nov 2017	1541	Prov	Apr 2023

1601	Prov	Nov 2023	1605	Prov	Nov 2018	1640	Prov	Nov 2023
1704	Prov	Nov 2014	1712	Prov	Jul 2023	1713	Prov	Jul 2023
1714	Prov	Jul 2023	1715	Prov	Jul 2023	1716	Prov	Jul 2023
1750	Prov	Jul 2023	1801	Prov	Apr 2018	1802	Prov	Apr 2018
1820	Prov	Nov 2014	1821	Prov	Nov 2022	1840	Prov	Nov 2018
1841	Prov	Nov 2018	1842	Prov	Nov 2018	1843	Prov	Apr 2018
1850	Prov	Apr 2018	1853	Prov	Nov 2022	1854	Prov	Apr 2018
1860	Prov	Nov 2019	2001	Prov	Apr 2021	2301	Prov	Nov 2014
2401	Prov	Nov 2018	2409	Prov	Nov 2018	2410	Prov	Nov 2017
2414	Prov	Nov 2019	2420	Prov	Nov 2018	2421	Prov	Nov 2017
2422	Prov	Nov 2016	2423	Prov	Apr 2017	2426	Prov	Nov 2017
2428	Prov	Nov 2017	2432	Prov	Nov 2017	2434	Prov	Nov 2016
2452	Prov	Nov 2018	2453	Prov	Nov 2019	2460	Prov	Nov 2018
2461	Prov	Apr 2021	2471	Prov	Jul 2023	2474	Prov	Nov 2016
2475	Prov	Apr 2017	2476	Prov	Apr 2019	2479	Prov	Nov 2017
2485	Prov	Nov 2017	2501	Prov	Jul 2023	2502	Prov	Nov 2021
2510	Prov	Nov 2017						

The following notes refer to the Ontario Provincial Standard Specifications (OPSS) listed in Sections F and G above.

1. OPSSs are available for viewing and download from the MTO Technical Publications website at Ontario.ca/MTOTechPubs. If the Issue Date coincides with the most recent version that has been published, the document will be located under the “Current Documents” tab, and if not, it will be located under the “Archived Documents” tab.

H. GENERAL CONDITIONS

1. OPSS.PROV 100, MTO General Conditions of Contract, April 2023 is available for viewing and download from the MTO Technical Publications website at Ontario.ca/MTOTechPubs.

SECTION A - SPECIAL PROVISIONS FOR

CONTRACT NO. 2023-4010

NOTICE TO CONTRACTOR – Conflicts between Ontario Provincial Standard Specifications and National Master Specifications (NMS)

Special Provision

The MTO General Conditions of Contract shall apply in its entirety to all aspects of this Contract. The Contract uses a combination of Ontario Provincial Standards (OPS) and NMS as detailed elsewhere in the Contract.

The National Master Specifications (NMS) are Standard Specifications in accordance with General Condition 2.02. Where a conflict occurs between Standard Specifications the more stringent specification shall govern.

NOTICE TO CONTRACTOR – Emergency Contractor Contact Person

Special Provision

The Contractor shall provide at least one emergency contact person (ECP) who shall be available for the duration of the Contract, to communicate with the Contract Administrator (CA) during any emergency situations that may occur within the limits of the Contract.

The ECP shall be the Contractor's main point of contact for the CA to report emergency situations.

The ECP provided by the Contractor shall have the following minimum qualifications:

a) Be accessible 24/7 for the duration of the Contract to receive and record emergency calls.
b) Return all calls within 60 minutes.
c) Have the required level of authority within the Contractor's organization to immediately respond to the emergency response direction received from the CA and MTO. This includes having the authority to immediately organize and approve all required resources to carry out the specified emergency response direction.
d) Be knowledgeable of the contract scope of work, timing and traffic control.

Immediately after receiving emergency response direction from the CA, the ECP shall implement the necessary actions to resolve the emergency situation.

The ECP shall record details of all emergency calls received in a hard-bound journal addressing the time of the call, name, address and phone number of the caller, description of the emergency, direction received from the CA and the action taken by the Contractor to resolve the emergency situation.

The Contractor shall provide a copy of this information to the CA within 24 hours from the time that each emergency call is received.

NOTICE TO CONTRACTOR – Obstructions

Special Provision

The Contractor shall be alerted to the presence of obstructions (i.e., cobbles and/or boulders) across the Fenelon Falls Maintenance Patrol Yard. Considerations of the presence of these obstructions must be made in the selection of appropriate equipment and procedures for excavations for the foundations, and trenches.

NOTICE TO CONTRACTOR – Registration of Water Taking

Special Provision

The estimated dewatering rate is in not anticipated to exceed of 50,000 L/day.

The Contractor shall be responsible for independently assessing the water taking amounts based on their dewatering design, providing appropriate documentation and obtaining registration as detailed elsewhere in the Contract Documents. It shall be the responsibility of the Contractor to obtain an Environmental Activity and Sector Registry (EASR) if their construction operations result in a daily water taking volume in excess of 50,000 L/day and a Permit to Take Water if their construction operations result in a daily water taking volume in excess of 400,000 L/day. The required permit shall be obtained at no cost to the Ministry and any delays resulting from this application shall be the responsibility of the Contractor. The Contractor is fully responsible to apply for a receive any water taking permits required prior to undertaking dewatering activities.

NOTICE TO CONTRACTOR – Notification of Affected Agencies

Special Provision

The Contractor shall notify the affected agencies listed below at least two (2) weeks in advance of the start of construction activities regarding the construction schedule and if any changes to traffic flow are anticipated.

Notifications shall be in writing and submitted to the Contract Administrator for approval before distribution and shall include the contact information of the Contractor and the Contract Administrator.

Contact information is provided below:

City of Kawartha Lakes 26 Francis Street Lindsay, ON, K9V 5R8 Phone: (705) 324-9411	**Ontario Provincial Police – Kawartha Lakes Detachment** 3028 Highway 35 Lindsay, ON, K9V 4R1 Phone: (705) 324-6741
Kawartha Lakes Police Service 6 Victoria Avenue North Lindsay, ON, K9V 4E5 Phone: (613) 913-2747	**Kawartha Lakes Fire Services** 9 Cambridge Street North Lindsay, ON, K9V 4C4 Phone: (613) 580-4771
Kawartha Lakes Paramedic Services 4 Victoria Avenue North Lindsay, ON, K9V 0K6 Phone: (613) 623-4231	**WG Jackett & Sons Construction Ltd.** 5065 Highway 35 Fenelon Falls, ON, K0M 1N0 Phone: (705) 887-6737

NOTICE TO CONTRACTOR – Construction Operations during Winter Season

Special Provision

The Contractor may continue with construction activities, such as building and facility construction operations, at the Fenelon Falls Maintenance Patrol Yard (MPY) during the winter season. The Contractor shall be responsible for all snow removal and winter maintenance requirements within in the Fenelon Falls MPY. Contractor work operations during the winter or shoulder seasons shall not result in additional costs to the owner for work in such conditions.

NOTICE TO CONTRACTOR - Fairness in Procurement

Special Provision No. CMOB0007

Contractors shall adhere to the Fairness in Procurement Act, 2018 and Suppliers from New York Regulation which set out specific mandatory requirements related to the Fairness in Procurement regulation.

Any structural iron used or supplied in the performance of this Contract and permanently incorporated in the surface road or bridge shall be fabricated in a jurisdiction other than New York.

Structural Iron means a product that is made of either wrought iron or cast iron or both and that is designed to carry a load, but does not include a product that contains any form of steel.

NOTICE TO CONTRACTOR – Waste Material Area

Special Provision

The Contractor shall reuse all material excavated in the construction of the MPY site unless otherwise directed by a qualified geotechnical engineer. Should material excavated be deemed unacceptable for reuse in the construction of the MPY site, the material shall be placed in the waste material area shown in contract drawings.

The Contractor shall construct the waste pile no higher than 2.0m, with side slopes of 4:1 or flatter. All exposed material shall be covered with 50 mm of topsoil and early succession wet meadow mix seed.

Payment shall be as a change in the work.

NOTICE TO CONTRACTOR – Site Granular Placement

Special Provision

The Contractor’s placement of the site fill, subbase, and base granular material shall be completed tot the top of Granular ‘A’ a minimum of 14 calendar days prior to the start of the pavement placement.

NOTICE TO CONTRACTOR – Footings and Foundation Construction

Special Provision

The Contractor's placement of the engineered fill pad shall be completed a minimum of 14 calendar days prior to starting the construction of the footings and/or foundation walls for the Vehicle Maintenance Garage, Material Storage Building and Auxiliary Storage Building.

NOTICE TO CONTRACTOR – Right of Way Permit

Special Provision

The Contractor is required to obtain a work in right-of-way permit from the City of Kawartha Lakes prior to starting the rehabilitation of Glenarm Road.

This permit can be obtained through the City of Kawartha Lakes website as follows:

https://www.kawarthalakes.ca/en/index.aspx

For inquiries, the Contractor is directed to call Roads Operations at 705-324-9411 extension 1171.

The contractor shall apply for this permit from the City, taking into consideration the timing of the required work on Glenarm Road as outlined elsewhere in this contract package.

The contractor is responsible for the fees and any costs associated with obtaining this permit.

OPERATIONAL CONSTRAINT – Protection of Subgrade

Special Provision

Following completion of subgrade construction (including quality control checks), the Contractor shall protect the subgrade to minimize deformation of the subgrade prior to or during granular placement operations. Under no circumstances will loaded trucks be permitted to travel on the subgrade or on a granular lift which does not provide adequate protection of the subgrade.

The Contractor shall modify the lift thickness, placement procedures, or equipment as required to protect the subgrade.

OPERATIONAL CONSTRAINT – Bell Canada Telephone Service Supply

Special Provision

Bell Canada

The Contractor shall install new telephone wiring (supplied and delivered by Bell Canada) within the 100mm duct between the demarcation pedestal and the communication room inside the new Garage/Administration building. The Contractor shall provide a minimum of 10 Days notice to Bell prior to installation of the telephone wiring.

It is the Contractor's responsibility as "constructor" under the provisions of the Occupational Health and Safety Act to co-ordinate the activities of all employers and works operating within the contract limits to ensure that the requirements of the Occupational Health and Safety Act are satisfied. The Contractor shall ensure that the utility company operating within the contract limits is included in this process.

OPERATIONAL CONSTRAINT (ELECTRICAL) – Hydro One Power Supply Service

Special Provision

The Contractor shall arrange for the Hydro One permanent power supply services to support the operation of the electrical systems at the Fenelon Falls Maintenance Patrol Yard (MPY). The Contractor shall obtain all approvals required by ESA and Hydro One prior to needing permanent service

The Contractor shall contact the following for preparing "Service Layout" by Hydro One:

POWER SUPPLY	TYPE OF WORK	ESTIMATED DURATION OF WORK
Permanent Supply Fenelon Falls MPY*	Hydro One – Peterborough Field Business Centre: 1-888-871-3514	1 Days

* Includes 3-Phase connection at Glenarm Road

Prior to the utility company arriving on site, the Contractor shall complete all preparatory work that will enable the utility company to perform the work.

It will be the Contractor's responsibility to ensure that the utility works are coordinated with the construction operations, so as to comply with the requirements of the Occupational Health and Safety Act.

The Contractor shall also notify the Contract Administrator in writing, and coordinate with the MTO Electrical Coordinator at the same time notification is given to the utility company. The locations of work to be performed by the utility company are shown on the Contract Drawings.

The Contractor shall pay for all costs for Hydro One to complete their work as required and all paid invoices shall be submitted to the Contract Administrator for reimbursement. Payment for all other associated work shall be included in the appropriate tender items for permanent and temporary electrical work.

OPERATIONAL CONSTRAINT (ENVIRONMENTAL) - Erosion and Sedimentation Control

Special Provision

Unless otherwise specified in Table M, the time interval between commencement and completion of any work that disturbs earth surfaces shall be a maximum of 45 Days. Commencement of such work shall be considered to have occurred when the original stabilizing ground cover has been removed, including grubbing, or has been covered with fill material. Completion of such work shall be considered to have occurred when the specified cover material (seed and mulch, seed and erosion control blanket, sod, riprap, etc.) has been applied.

Unless otherwise specified in Table M, the period in which the time interval is permitted shall be determined by the Contractor. In addition, this period shall be in compliance with any timing constraints specified elsewhere in the Contract for the application of the specified cover.

Table M

AREA #	AREA BOUNDED BY			TIMING CONSTRAINTS	
	STATION	OFFSET LEFT	OFFSET RIGHT	TIME INTERVAL IN CALENDAR DAYS FROM COMMENCEMENT TO COMPLETION	PERMITTED PERIOD FOR TIME INTERVAL BETWEEN COMMENCEMENT & COMPLETION
No Exceptions For This Contract					

These timing constraints apply regardless of timing of Contract award.

Where interceptor ditches or subsurface drains are specified in the Contract, they shall be constructed before commencement of any related cut or fill.

Run-off from construction materials and any stockpiles shall be contained and discharged so as to prevent entry of sediment to watercourses.

Where dewatering is required, and where culverts are cleaned by hydraulic means, effluent shall be discharged so as to prevent entry of sediment to watercourses.

Erosion and sedimentation control measures shall not be placed in watercourses unless otherwise specified in the Contract, or directed by the Contract Administrator.

A 200 m stand-by supply of prefabricated silt fence barrier, in addition to silt fence barrier which may be specified elsewhere in the Contract, shall be maintained at the Contract site prior to commencement of grading operations and throughout the duration of the Contract.

Silt fence geotextile shall be a woven, Class I geotextile, having a width of 1 m minimum. It shall have a filtration opening size (FOS) of 840 micrometres maximum, meeting CAN/CGSB 148.1, Method 10.2

OPERATIONAL CONSTRAINT (ENVIRONMENTAL) - General Environmental Protection Requirements

Special Provision

The Contractor is responsible for protection of people, property and the natural environment from environmental impacts and damage that may result from this contract.

Environmental protection during construction shall:

a) comply with commitments and conditions of environmental approvals, permits, exemptions, agreements, reports, and clearances provided by the owner;
b) comply with any other formal environmental approvals, permits, exemptions, agreements, reports and clearances that must be procured by the contractor in order to perform the work; and,
c) be integrated with environmental and other requirements specified in the contract.

Environmental protection shall include, but not be restricted to the control of materials, equipment and construction operations in order to avoid and minimize:

a) direct physical damage;
b) sediment, noise, vibration, dust, chemical, and other emissions; and,
c) interference with local use, access and passage.

Such control shall include but not be restricted to selection and management of:

a) materials, including the management of excess and contaminated materials;
b) equipment, including maintenance of refuelling;
c) method of construction;
d) construction site disturbance limits; construction site access, detours and haul roads earth aggregate and rock borrow areas; material storage and disposal areas; equipment storage areas; construction yards; and,
e) timing, duration and staging of work

All materials used in the construction of temporary physical environmental protection measures shall remain the property of the Contractor.

OPERATIONAL CONSTRAINT (ENVIRONMENTAL) – Equipment Refueling, Maintenance and Washing

Special Provision

All activities, including equipment maintenance, refueling and concrete truck washing shall be controlled to prevent entry of petroleum products (e.g. gasoline, oils, lubricants), primers, grout, bonding adhesives or other hazardous or deleterious substances including any debris, waste, rubble or concrete materials in all water courses and water bodies within the project limits unless otherwise specified in the contract. Substances are to be stored and mixed on protected surfaces away from the water courses and water bodies within the project limits in order to prevent contamination of soils and waters. Any such material which advertently enters the water courses or water bodies within the project limits shall be removed by the Contractor, at his own expense, in a manner satisfactory to the Contract Administrator.

For mobile equipment and vehicles, maintenance, refueling and truck washing shall be conducted no closer than 30 metres from the water courses and water bodies within the project limits in order to prevent water contamination due to accidental spills.

All large equipment working in or near the water courses and water bodies within the project limits shall be well maintained to avoid contaminant leakage, shall be free of excess surface oil or grease and shall be equipped with spill kits deemed acceptable by the Contract Administrator.

OPERATIONAL CONSTRAINT (ENVIRONMENTAL) - Prevention of Wildlife Harassment

Special Provision

The Contractor shall not harass or kill any wildlife encountered during construction.

No Additional compensation shall be made for work delays as a result of encounters with wildlife.

OPERATIONAL CONSTRAINT (ENVIRONMENTAL) - Migratory Bird Protection - General

Special Provision

The Contractor shall not destroy active nests of protected migratory birds. When these nests are encountered the ministry's Contract Administrator must be contacted.

Tree removal operations shall be prohibited between April 1 and August 31 in any calendar year.

In the event that tree removal must occur within the above window, the Contractor must retain a Qualified Avian Biologist to conduct a nesting survey prior to clearing. If active migratory bird nests are encountered, work shall not continue in the location of the nest until after August 31, or as soon as it has been determined by a qualified biologist that the young have left the nest.

OPERATIONAL CONSTRAINT (ENVIRONMENTAL) - Spill Prevention and Response Contingency Plan

Special Provision

General

The Contractor shall have a Spill Prevention and Response Contingency Plan.

Submission

This plan will address procedures for preventing and responding to spills, and equipment and resources that will be available to prevent and/or respond to all potential discharges resulting from the Contractor's operations in this contract.

Emergency spill kit requirements shall be detailed as part of this plan.

The plan shall be submitted to the Contract Administrator no less than seven (7) days in advance of start of construction activities.

NMS DIVISION 1 SPECIFICATIONS

Special Provision

The following Division 1 National Master Specifications are included in this Contract.

NMS 011400 – REGULATORY REQUIREMENTS

Special Provision

Part 1 General

1.1 SUMMARY

.1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of

Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

1.2 RELATED REQUIREMENTS

– Not Applicable.

1.3 REFERENCES TO REGULATORY REQUIREMENTS

.1 Perform Work in accordance with the Ontario Building Code, 2012 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
- .1 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes and referenced documents.

1.4 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Contract Administrator.

.2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Contract Administrator.

.3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Contract Administrator.

1.5 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions and municipal by-laws.

1.2 QUALITY ASSURANCE

.1 Regulatory Requirements: Except as otherwise specified, Constructor shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
- .1 Regulatory requirements and fees in force on date of Bid submission, and
- .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

Part 2 Products

2.1 NOT USED

– Not Applicable.

2.2 EASEMENTS AND NOTICES

.1 Owner will obtain permanent easements and rights of servitude that may be required for

performance of Work.

.2 Constructor shall give notices required by regulatory requirements.

2.3 PERMITS

.1 Development Permit: Owner has applied for, obtained, and paid for development permit (if required).

.2 Building Permit:
  .1 The MTO is a Provincial Authority and is not subject to the Municipal level building permit requirements. A building permit will not be obtained for this project.

.3 Occupancy Permits:
  .1 An occupancy permit is not required for this project.

.4 Demolition Permits:
  .1 Constructor shall apply for, obtain and pay for demolition permit on behalf of Owner, and other permits required for Work and its various parts.
  .2 Constructor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.
  .3 Constructor shall display demolition permit and other permits in a conspicuous location at Place of Work.

.5 Health unit approvals or Township/Municipality Approvals
  .1 Constructor shall apply for, obtain and pay for septic system permits (construction and use) on behalf of Owner, and other permits required for Work and its various parts.
  .2 Constructor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.
  .3 Constructor shall display permit and other permits in a conspicuous location at Place of Work

Part 3 Execution

3.1 NOT USED

– Not Applicable.

NMS 011935 – LEAKAGE TESTING FOR TANKS

Special Provision

Part 1 General

1.1 APPROVALS

.1 Obtain approval from the Contract Administrator for the test procedures and the water to be used for leakage tests. Clean, potable water shall be used for leakage testing.

Part 2 Products

– Not Applicable

Part 3 Execution

3.1 GENERAL

.1 Tanks shall include all water or liquid retaining or conveying structures of FRP, cast-in-place or precast concrete construction.

.2 Perform leakage tests on all liquid retaining structures and tanks.

.3 If the tank being tested has more than one cell, or if it has a common wall with another tank, test each cell or tank separately so that individual cells are leakage tested.

.4 Carry out leakage tests before backfill is placed so that visible leakage, if any, will be apparent.

.5 Carry out leakage testing before installing concrete coating system on the interior of the tank.

.6 Do not commence testing until all structural concrete work and related structural steelwork has been completed and all concrete is at least 28 days old.

.7 The Contract Administrator may permit multi-stage tests if required to allow backfill operations to proceed.

.8 Do not perform leakage tests in any way which is likely to endanger the structural integrity of any tank.

.9 All electrical conduits and fittings shall be sealed to prevent wetting during leakage testing.

3.2 TESTING

.1 Carry out leakage tests by filling the tanks with water to top water or overflow level and measuring drop in water level over at least a 5-day period.

.2 Perform all leakage testing under the supervision of the Contract Administrator and subject to their prior approval.

.3 Furnish all labour, water and equipment, including temporary pumps, measuring instruments, etc. necessary for testing.

.4 For concrete tanks the tanks shall be filled with water up to 7 days before the start of the 5-day test period. Water level shall be maintained at constant level by adding water as required during this 7-day period. At the end of this period, the absorptive capacity of the concrete will be deemed to be satisfied and the 5-day test for leakage shall start. This absorption period is not required for FRP tanks.

.5 If any tank does not meet the acceptance criteria and the daily drop in water level at the end of the 5-day period is decreasing, the Contract Administrator may direct the test to continue a further 5 days. If the specified criteria are satisfactorily met during the second 5-day period, the tank may be considered acceptable.

.6 If the tank shows visible leakage or leakage in excess of the permissible rate:
- .1 Empty the tanks and remedy defects as directed by the Contract Administrator.
- .2 Re-test the tanks after the remedial work has been completed.
- .3 Repeat this procedure until leakage testing meets acceptance criteria.

.7 If leakage occurs during the 12-month maintenance period following substantial completion of construction, remedy such faults as directed by the Contract Administrator at no additional cost to the Owner.

3.3 CRITERIA FOR ACCEPTANCE

.1 Criteria for acceptance of concrete tanks containing potable water shall be:

.1 No visible leakage of water at external walls or floors of tanks.

.2 Average leakage rate over a 5-day period not to exceed "Q" as calculated by the equation:

$Q = 0.9A\sqrt{H}$

Where: Q = maximum permissible rate of leakage over a 5-day period in litres per day
A = wetted surface area of tank in square metres
H = vertical depth of water in tank in metres

.3 In calculating the wetted surface area of tank:
- .1 Do not include internal partition or baffle walls normally wetted on both faces unless specifically directed by the Consultant in writing.
- .2 Measure bottom areas for tanks having sloped bottoms in horizontal plane.
- .3 Similarly, refer vertical water depths to mid-depth of sloping bottoms.
- .4 Make no allowance for local drainage sumps or pockets.

.1 Criteria for acceptance of the sewage holding tanks and FRP tanks shall be:
- .1 No visible leakage of water at external walls or floors of tanks.
- .2 No measured leakage throughout the 5 day test period.

3.4 BASIS OF PAYMENT

.1 Payment for leakage testing to be included in the lump sum item in the form of tender for the Vehicle Maintenance Garage.

.2 Cost of repairs to rectify noncompliant leakage and re-testing to be at Contractor's expense.

NMS 013300 – SUBMITTAL PROCESS

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

– Not Applicable

1.2 REFERENCE STANDARDS

– Not Applicable

1.3 ADMINISTRATIVE

.1 Submit to Contract Administrator submittals listed for review. Submit promptly and in orderly

sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Contractor (including general contractor and applicable sub contractors) shall review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are co-ordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's, Owner or Contract Administrator review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant, Owner or Contract Administrator review.

.10 Keep one reviewed copy of each submission on site.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada. Shop drawings that require a professional engineers seal are identified in their given specification section.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 14 days for Contract Administrator review of each submission.

.5 Adjustments made on shop drawings by Contract Administrator or Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.

.6 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, in duplicate, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.9 After Contract Administrator review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Contract Administrator may reasonably request.

.11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Contract Administrator where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Contract Administrator.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Contract Administrator.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
- .2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic copies of manufacturer’s instructions for requirements requested in

specification Sections and as requested by Contract Administrator.

.1 Pre-printed material describing installation of product, system or material, including special notices and Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Contract Administrator.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Contract Administrator.

.18 Delete information not applicable to project.

.19 Supplement standard information to provide details applicable to project.

.20 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.5 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Contract Administrator site office or Consultant site office. Contract Administrator will provide direction on where to ship each sample.

.3 Notify Contract Administrator in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.

.6 Make changes in samples which Contract Administrator may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg format, fine resolution monthly with progress statement.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints:

.1 Viewpoints and their location as determined by Contract Administrator.

.4 Frequency of photographic documentation: daily and prior to closing in or covering up any work or as directed by Contract Administrator.

.1 Upon completion of: excavation, foundation, framing and services before concealment, as directed by Contract Administrator.

1.7 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

Part 2 Products

2.1 NOT USED

– Not Applicable.

Part 3 Execution

3.1 NOT USED

– Not Applicable.

NMS 017400 – CLEANING

Special Provision

Part 1 General

1.1 DESCRIPTION

.1 This section specifies the requirement for cleaning during and after the works has been completed.

1.2 GENERAL

.1 Conduct cleaning and disposal operations to comply with local ordinances and antipollution laws, including requirements of WHMIS.

.2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.3 Prevent accumulation of waste which creates hazardous conditions.

.4 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

1.3 MATERIALS

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

1.4 CLEANING DURING CONSTRUCTION

.1 Maintain the work, including roof and building systems, at least on a daily basis free from accumulations of waste material and debris.

.2 Provide on-site containers for collection of waste materials and debris.
.3 Remove waste materials and debris from site.

.4 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

.5 Vacuum clean all building interiors prior to paint application. Continue to vacuum clean finished areas until final completion.

1.5 FINAL CLEANING

.1 In preparation for acceptance of the project on an Interim or Final Certificate of Completion, perform final cleaning.

.2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from interior and exterior finished surfaces including glass and other polished surfaces.
.3 Clean lighting reflectors, lenses, and other lighting surfaces.

.4 Broom clean paved surfaces; rake clean other surfaces of grounds.

.5 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.6 Remove snow and ice from access to buildings.

1.6 MEASUREMENT AND PAYMENT PROCEDURE

.1 No measurement will be made under this section. Include costs in items of work for which cleaning is required at the Lump Sum Price bid in Form of Tender.
.2 The Lump Sum Price shall cover supply of all labor, materials, tools and equipment, as specified, and/or required.

Part 2 Products

– Not Applicable.

Part 3 Execution

– Not Applicable.

NMS 017800 – CLOSEOUT SUBMITTALS

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00 – Concrete Forming and Accessories

.2 Section 03 20 00 – Concrete Reinforcing

.3 Section 03 30 00 – Cast-in-place Concrete

.4 Section 04 20 00 – Masonry

.5 Section 05 12 23 – Structural Steel for Buildings

.6 Section 05 21 00 – Steel Joist Framing

.7 Section 05 31 00 – Steel Decking

.8 Section 05 50 00 – Metal Fabrications

.9 Section 31 23 02 – Backfill and Compaction for Structures.

1.2 REFERENCE STANDARDS

.1 Canadian Environmental Protection Act (CEPA)
- .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:
- .1 Convene meeting one week prior to contract completion with Contract Administrator, to:
  - .1 Verify Project requirements.
  - .2 Review warranty requirements and manufacturer's installation instructions.

.2 Contract Administrator to establish communication procedures for:
- .1 Notifying construction warranty defects.
- .2 Determine priorities for type of defects.
- .3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Two weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, a digital copy of operating and maintenance manuals in English. Final hard copies to be submitted to the Contract Administrator after review and approval of the digital copy is received.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.5 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 mm x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.
.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.
.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dwg and dxf format on CD or solid state memory device.

1.6 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;
.1 Date of submission; names.
.2 Addresses, and telephone numbers of Consultant, Contract Administrator and Contractor with name of responsible parties.
.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:
.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data.
.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

.6 Training: refer to Section 01 79 00 – Demonstration and Training.

1.7 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, in addition to requirements in General Conditions, at site for Contract Administrator one record copy of:
.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples.
.6 Field test records.
.7 Inspection certificates.
.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction.
.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.
.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Contract Administrator.

.6 The Contractor is fully responsible for keeping a daily red-line as built markup of all contract documents (drawings, specifications, shop drawings, addenda, field test records etc.). Contractor shall clearly mark all as-built conditions in red-line marking on al contract documents daily. After substantial completion the Contractor shall transfer all red-line as-built markups to a digital format and submit as-built documents to the Contract Administrator for review and approval.

1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of blue line opaque drawings, and in copy of Project Manual, provided by Contract Administrator.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.
.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
.1 Measured depths of elements of foundation in relation to finish first floor datum.
.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
.4 Field changes of dimension and detail.
.5 Changes made by change orders.
.6 Details not on original Contract Drawings.
.7 Referenced Standards to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:
.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain field test records, manufacturer's certifications, inspection certifications, required by individual specifications sections.

.7 Provide digital photos, if requested, for site records.

1.9 FINAL SURVEY

.1 Submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents. Provide survey in AutoCAD format in accordance with owner requirements.

1.10 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.
- .1 Give function, normal operation characteristics and limiting conditions.
- .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
- .1 Include regulation, control, stopping, shut-down, and emergency instructions.
- .2 Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 91 13 – General Commissioning Requirements.

.15 Underground and aboveground storage tank inspection documentation, registration, forms, decommissioning and removal in accordance with CEPA SOR/2008-197.

.16 Additional requirements: as specified in individual specification sections.

1.11 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
  .1 Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: as specified in individual specifications sections.

1.12 MAINTENANCE MATERIALS

.1 Spare Parts:
  .1 Provide spare parts, in quantities specified in individual specification sections.
  .2 Provide items of same manufacture and quality as items in Work.
  .3 Deliver to site; place and store.
  .4 Receive and catalogue items.
    .1 Submit inventory listing to Contract Administrator.
    .2 Include approved listings in Maintenance Manual.
  .5 Obtain receipt for delivered products and submit prior to final payment.

.2 Extra Stock Materials:
  .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  .2 Provide items of same manufacture and quality as items in Work.
  .3 Deliver to site; place and store.
  .4 Receive and catalogue items.
    .1 Submit inventory listing to Contract Administrator.
    .2 Include approved listings in Maintenance Manual.
  .5 Obtain receipt for delivered products and submit prior to final payment.

.3 Special Tools:
  .1 Provide special tools, in quantities specified in individual specification section.
  .2 Provide items with tags identifying their associated function and equipment.
  .3 Deliver to site; place and store.
  .4 Receive and catalogue items.
    .1 Submit inventory listing to Contract Administrator.
    .2 Include approved listings in Maintenance Manual.

1.13 DELIVERY, STORAGE AND HANDLING

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and for review by Contract Administrator.

1.14 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Contract Administrator approval.

.3 Warranty management plan to include required actions and documents to assure that Contract Administrator receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Contract Administrator for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Conduct joint four month and nine month warranty inspection, measured from time of acceptance, by Contract Administrator.

.9 Include information contained in warranty management plan as follows:
- .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
- .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include HVAC balancing, ground source heat pumps, motors, roofs, pumps, transformers, snow melting system, lightning protection systems, fire protection, sprinkler systems, alarm systems, access control, door hardware, cctv and any commissioned systems.
- .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
  - .1 Name of item.
  - .2 Model and serial numbers.
  - .3 Location where installed.
  - .4 Name and phone numbers of manufacturers or suppliers.
  - .5 Names, addresses and telephone numbers of sources of spare parts.
  - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.
.8 Starting point and duration of warranty period.
.9 Summary of maintenance procedures required to continue warranty in force.
.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
.11 Organization, names and phone numbers of persons to call for warranty service.
.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at four and nine month post-construction warranty inspections.
.5 Procedure and status of tagging of equipment covered by extended warranties.
.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification to follow oral instructions.
.1 Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.

1.15 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Contract Administrator.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:
.1 Type of product/material.
.2 Model number.
.3 Serial number.
.4 Contract number.
.5 Warranty period.
.6 Inspector's signature.
.7 Construction Contractor.

Part 2 Products

– Not Applicable.

Part 3 Execution

– Not Applicable.

NMS 017900 – DEMONSTRATION AND TRAINING

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Not Applicable.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.

.2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.

.3 Preparation:
- .1 Verify conditions for demonstration and instructions comply with requirements.
- .2 Verify designated personnel are present.
- .3 Ensure equipment has been inspected and put into operation.
- .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 – General Commissioning Requirements and equipment and systems are fully operational.

.4 Demonstration and Instructions:
- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the designated location.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

.5 Time Allocated for Instructions: ensure an adequate amount of time for instruction of each item of equipment is provided.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Contract Administrator approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

.5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.4 QUALITY ASSURANCE

.1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
- .1 Instruct Owner's personnel.
- .2 Provide written report that demonstration and instructions have been completed.

Part 2 Products

– Not Applicable.

Part 3 Execution

– Not Applicable.

NMS 019113 – GENERAL COMMISSIONING REQUIREMENTS

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.

.2 Related Requirements
– Not Applicable.

.3 Acronyms:
- .1 AFD – Alternate Forms of Delivery, service provider.
- .2 BMM – Building Management Manual.
- .3 Cx – Commissioning.
- .4 EMCS – Energy Monitoring and Control Systems.
- .5 O&M – Operation and Maintenance.
- .6 PI – Product Information.
- .7 PV – Performance Verification.
- .8 TAB – Testing, Adjusting and Balancing.

1.2 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
- .1 Verify installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.
- .2 Ensure appropriate documentation is compiled into the BMM.
- .3 Effectively train O&M staff.

.2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
- .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
- .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

.1 Cx to be included in the contractor lump sum bid.

.2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.3 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.

.4 Contract Administrator will issue Interim Acceptance Certificate when:
- .1 Completed Cx documentation has been received, reviewed for suitability and approved by Contract Administrator.
- .2 Equipment, components and systems have been commissioned.
- .3 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Contract Administrator, to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.5 PRE-CX REVIEW

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

.2 During Construction:
- .1 Co-ordinate provision, location and installation of provisions for Cx.

.3 Before start of Cx:
- .1 Have completed Cx Plan up-to-date.
- .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
- .3 Fully understand Cx requirements and procedures.
- .4 Have Cx documentation shelf-ready.
- .5 Understand completely design criteria and intent and special features.
- .6 Submit complete start-up documentation to Contract Administrator.
- .7 Have Cx schedules up-to-date.
- .8 Ensure systems have been cleaned thoroughly.
- .9 Complete TAB procedures on systems, submit TAB reports to Contract Administrator

for review and approval.

.10 Ensure "As-Built" system schematics are available.

.4 Inform Contract Administrator in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Contract Administrator before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.1 Submit no later than four weeks after award of Contract:

.1 Name of Contractor's Cx agent.

.2 Draft Cx documentation.

.3 Preliminary Cx schedule.

.2 Request in writing to Contract Administrator for changes to submittals and obtain written approval at least eight weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Contract Administrator where not specified and obtain written approval at least eight weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Contract Administrator.

1.8 COMMISSIONING DOCUMENTATION

.1 Contract Administrator to review and approve Cx documentation.

.2 Provide completed and approved Cx documentation to Contract Administrator.

1.9 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule in accordance with the General Conditions.

.2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:

.1 Approval of Cx reports.

.2 Verification of reported results.

.3 Repairs, retesting, re-commissioning, re-verification.

.4 Training.

1.10 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings: as specified herein.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60 % construction completion stage Contract Administrator to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for

Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Contract Administrator, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60 % and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

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

1.12 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days notice prior to commencement.

.2 Contract Administrator to witness of start-up and testing.

.3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by Contract Administrator.

.3 Arrange for Contract Administrator to witness tests.

.4 Obtain written approval of test results and documentation from Contract Administrator before delivery to site.

.2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Contract Administrator:

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and testing in following distinct phases:
- .1 Included in delivery and installation:
  - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
  - .2 Visual inspection of quality of installation.
- .2 Start-up: follow accepted start-up procedures.
- .3 Operational testing: document equipment performance.
- .4 System PV: include repetition of tests after correcting deficiencies.
- .5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Contract Administrator after distinct phases have been completed and before commencing next phase.

.4 Document require tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Contract Administrator. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
- .1 Minor equipment/systems: implement corrective measures approved by Contract Administrator.
- .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Contract Administrator.
- .3 If evaluation report concludes that major damage has occurred, Contract Administrator shall reject equipment.
  - .1 Rejected equipment to be remove from site and replace with new.
  - .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Contract Administrator for approval before commencement of commissioning.

.2 Start-up documentation to include:
- .1 Factory and on-site test certificates for specified equipment.
- .2 Pre-start-up inspection reports.
- .3 Signed installation/start-up check lists.
- .4 Start-up reports,
- .5 Step-by-step description of complete start-up procedures, to permit Contract Administrator to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

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

.2 With assistance of manufacturer develop written maintenance program and submit Contract Administrator for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

.1 Notify Contract Administrator at least 21 days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS/EQUIPMENT

.1 Submit to Contract Administrator for review and approval:
- .1 Complete list of instruments proposed to be used.
- .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:
- .1 2-way radios.
- .2 Ladders.
- .3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:
- .1 Under actual operating conditions, over entire operating range, in all modes.
- .2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

.1 Contract Administrator to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to Contract Administrator within five days of test and with Cx report.

1.23 COMMISSIONING CONSTRAINTS

.1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

1.24 EXTRAPOLATION OF RESULTS

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

1.25 EXTENT OF VERIFICATION

.1 Laboratory areas:
  .1 Provide manpower and instrumentation to verify up to 100 % of reported results.

.2 Elsewhere:
  .1 Provide manpower and instrumentation to verify up to 30 % of reported results, unless specified otherwise in other sections.

.3 Number and location to be at discretion of Contract Administrator.

.4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.

.5 Review and repeat commissioning of systems if inconsistencies found in more than 20 % of reported results.

.6 Perform additional commissioning until results are acceptable to Contract Administrator.

1.26 REPEAT VERIFICATIONS

.1 Assume costs incurred by Contract Administrator for third and subsequent verifications where:
  .1 Verification of reported results fail to receive Contract Administrator approval.
  .2 Repetition of second verification again fails to receive approval.
  .3 Contract Administrator deems Contractor's request for second verification was premature.

1.27 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

1.28 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Contract Administrator.

.2 Report problems, faults or defects affecting Cx to Contract Administrator in writing. Stop Cx until problems are rectified. Proceed with written approval from Contract Administrator.

1.29 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Contract Administrator.

1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING

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

1.31 TRAINING

.1 Contractor shall include time to train Owner and Owners occupants on the correct operation of all building systems.

1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.33 OCCUPANCY

.1 Cooperate fully with Contract Administrator during stages of acceptance and occupancy of facility.

1.34 INSTALLED INSTRUMENTATION

.1 Use instruments installed under Contract for TAB and PV if:
- .1 Accuracy complies with these specifications.
- .2 Calibration certificates have been deposited with Contract Administrator.

.2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.35 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:
- .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10 % of specified values.

.2 Instrument accuracy tolerances:
- .1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement tolerances during verification:
- .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

1.36 OWNER'S PERFORMANCE TESTING

.1 Performance testing of equipment or system by Contract Administrator will not relieve

Contractor from compliance with specified start-up and testing procedures.

1.37 COMMISSIONING OF THE FIRE WATER STORAGE SYSTEM

.1 The Contractor is fully responsible for commissioning the fire water storage system
.2 Commissioning activities include but are not limited to: verification and testing of the tank level monitoring system, leakage testing the storage tanks in accordance with the Div. 1 leakage testing specification, verification operation and testing of valves and tank isolation, hiring the City of Ottawa Fire Department to visit the site with their pumper truck and fully test connection and draw down of the fire water storage system.
.3 The Contractor is fully responsible to pay for all costs related to the commissioning activities including any fees the City of Ottawa Fire Department may have to undertake the test connection and pumping.

Part 2 Products

– Not Applicable

Part 3 Execution

– Not Applicable

NMS 019200 – FACILITY OPERATION

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
  .1 This section is limited to portions of the Building Management Manual (BMM) provided to Contract Administrator by Contractor.

.2 Related Requirements
– Not Applicable

.3 Acronyms:
  .1 BMM – Building Management Manual.
  .2 Cx – Commissioning.
  .3 HVAC – Heating, Ventilation and Air Conditioning.
  .4 PI – Product Information.
  .5 PV – Performance Verification.
  .6 TAB – Testing, Adjusting and Balancing.
  .7 WHMIS – Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

.1 Standard letter size paper 216 mm x 279 mm.

.2 Methodology used to facilitate updating.

.3 Drawings, diagrams and schematics to be professionally developed.

.4 Electronic copy of data to be in a format accepted and approved by Contract Administrator.

1.3 APPROVALS

.1 Prior to commencement, co-ordinate requirements for preparation, submission and approval with Contract Administrator.

1.4 GENERAL INFORMATION

.1 Provide Contract Administrator the following for insertion into appropriate Part and Section of BMM:
- .1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project – as indicated in Section 1.2 of BMM.
- .2 Summary of architectural, structural, fire protection, mechanical and electrical systems installed and commissioned – as indicated in Section 1.4 of BMM.
  - .1 Including sequence of operation as finalized after commissioning is complete as indicated in Section 2.0 of BMM.
- .3 Description of building operation under conditions of heightened security and emergencies as indicated in Section 2.0 of BMM.
- .4 System, equipment and components Maintenance Management System (MMS) identification – Section 2.1 of BMM.
- .5 Information on operation and maintenance of architectural systems and equipment installed and commissioned – Section 2.0 of BMM.
- .6 Information on operation and maintenance of fire protection and life safety systems and equipment installed and commissioned – Section 2.0 of BMM.
- .7 Information on operation and maintenance of mechanical systems and equipment installed and commissioned – Section 2.0 of BMM.
- .8 Operating and maintenance manual – Section 3.2 of BMM.
- .9 Final commissioning plan as actually implemented.
- .10 Completed commissioning checklists.
- .11 Commissioning test procedures employed.
- .12 Completed Product Information (PI) and Performance Verification (PV) report forms, approved and accepted by Contract Administrator.
- .13 Commissioning reports.

1.5 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

.1 For detailed requirements refer to Section 01 78 00 – Closeout Submittals.

.2 Contract Administrator to review and approve format and organization within 12 weeks of award of contract.

.3 Include original manufactures brochures and written information on products and equipment installed on this project.

.4 Record and organize for easy access and retrieval of information contained in BMM.

.5 Include completed PI report forms, data and information from other sources as required.

.6 Inventory directory relating to information on installed systems, equipment and components.

.7 Approved project shop-drawings, product and maintenance data.

.8 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O&M, shutdown and training materials.

.9 Inventory and location of spare parts, special tools and maintenance materials.
.10 Warranty information.

.11 Inspection certificates with expiration dates, which require on-going re-certification inspections.

.12 Maintenance program supporting information including:
- .1 Recommended maintenance procedures and schedule.
- .2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.6 LIFE SAFETY COMPLIANCE (LSC) MANUAL

.1 Content of Manual:
- .1 All possible Emergency situations modes including: presence of fire and smoke, power failure, lose of water or pressure, chemical spills and refrigerant release.
- .2 Failure of elevators and escalators.
- .3 HVAC emergencies and fuel supply failures.
- .4 Intrusion and security breach.
- .5 Emergency provisions for natural disasters, bomb threats and other disruptive situations.
- .6 Dedicated emergency generators for high security projects, medical facilities and computer systems.
- .7 Emergency control procedures for fire, power and major equipment failure.
- .8 Emergency contacts and numbers.
- .9 Manual to be readily available and comprehensible to non- technical readers.

1.7 SUPPORTING DOCUMENTATION FOR INSERTION INTO SUPPORTING APPENDICES

.1 Provide Contract Administrator supporting documentation relating to installed equipment and system, including:
- .1 General:
  - .1 Finalized commissioning plan.
  - .2 WHMIS information manual.
  - .3 Approved "as-built" drawings and specifications.
  - .4 Procedures used during commissioning.
  - .5 Cross-Reference to specification sections.
- .2 Architectural and structural:
  - .1 Inspection certificates, construction permits.
  - .2 Roof anchor log books.
  - .3 PV reports.
- .3 Fire prevention, suppression and protection:
  - .1 Test reports.
  - .2 Smoke test reports.
  - .3 PV reports.
- .4 Mechanical:
  - .1 Installation permits, inspection certificates.
  - .2 Piping pressure test certificates.
  - .3 Ducting leakage test reports.
  - .4 TAB and PV reports.
  - .5 Charts of valves and steam traps.
  - .6 Copies of posted instructions.
- .5 Electrical:
  - .1 Installation permits, inspection certificates.
  - .2 TAB and PV reports.

.3 Electrical work log book.
.4 Charts and schedules.
.5 Locations of cables and components.
.6 Copies of posted instructions.

.2 Assist Contract Administrator with preparation of BMM.

1.8 LANGUAGE

.1 English and French Language to be in separate binders.

1.9 USE OF CURRENT TECHNOLOGY

.1 Use current technology for production of documentation. Emphasis on ease of accessibility at all times, maintain in up-to-date state, compatibility with user's requirements.

.2 Obtain Contract Administrator approval before starting Work.

Part 2 Products

– Not Applicable

Part 3 Execution

– Not Applicable

NMS DIVISION 3 SPECIFICATIONS

Special Provision

The following Division 3 National Master Specifications are included in this Contract.

NMS 031000 – CONCRETE FORMING AND ACCESSORIES

Special Provision

All formwork for concrete shall be in accordance with OPSS.PROV 919 and OPSS.PROV 904 except as amended and added to below.

Form ties:
.1 For concrete not designated 'Architectural': removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes minimum 25 mm diameter in concrete surface.
.2 For Architectural concrete; snap ties complete with plastic cones and light grey concrete plugs.
.3 For water retaining walls, use ties of a watertight design, approved by the Contract Administrator.
.4 Construct ties so that when end of fasteners of ties are removed, no metal shall be within 50 mm of formed faces of concrete.
.5 All form tie holes in concrete not designated 'Architectural' to be patched solid with non-metallic, non shrink grout matching the surrounding concrete colour and texture.

NMS 031500 – JOINTS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 – Cast-in-Place Concrete.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 No measurement or payment will be made under this section. Include costs in items of work for which joints in concrete structures are required.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM D1751-18, Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .2 ASTM D1752-18, Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.2 Canadian Standards Association (CSA)
- .1 CSA A23.1-14, Concrete Materials and Methods of Concrete Construction.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction/Demolition Waste Management and Disposal Plan.

Part 2 Products

2.1 MATERIALS

.1 Preformed joint filler (non-staining) to ASTM D1751, except for sidewalks, use 20 mm thick, 100 mm deep non-extruding asphalt impregnated fibre conforming to OPSS 1308.

.2 Isolation Joint Sealants: Duoflex SL by Sika Canada Inc. or Contract Administrator approved equal, multi-component polysulphide sealant. Use primer and all support products as recommended by sealant manufacturer.

.3 Interior and Exterior Control Joint Filler: Sikaflex 2c SL by Sika Canada Inc. or Contract Administrator approved equal. Install in strict accordance with manufacturers recommendations. Use primer and all support products as recommended by sealant manufacturer.

.4 Control joint in concrete push walls: Duoflex NS by Sika Canada Inc. or Contract Administrator approved equal, multi-component polysulphide sealant. Use primer and all support products as recommended by sealant manufacturer.

.5 Joint Back-Up Rope (closed cell foam):
- .1 “Sealtight Sealant Backer Rod” by W.R. Meadows of Canada, or Contract Administrator approved equal. Back-up rope to be 25% larger than joint.

Part 3 Execution

3.1 INSTALLATION

.1 General:
- .1 Construct joints as detailed on the drawings and as specified herein.
- .2 Apply joint sealant in accordance with manufacturer's instructions.
- .3 Clean joints of all dirt, foreign matter and water before filling with sealant.

.2 Control Joints:
- .1 Where control joints are shown between areas of floor slabs, they shall be formed by saw cutting to a depth and width shown on the drawings.
- .2 Carry out saw cutting as soon as the surface can support the saw cutting equipment without damage to the surfaces to be cut.
- .3 Complete saw cutting within 24 hours of placing concrete.
- .4 Fill joints with sealant.

.3 Isolation Joints:
- .1 Form isolation joints between two slab areas and floor slabs butting against foundation walls, equipment bases or columns with pre-moulded joint filler and fill top of joint with sealant.
- .2 Width of joint and depth of sealant shall be 12 mm, unless otherwise detailed on the Drawings.

.4 Construction Joints: all reinforcing steel shall be 100% continuous through construction joints and construction joints shall be capable of supporting the full moment and shear capacity of the monoloithically placed concrete sections adjacent to the construction joint. All construction joint locations and details shall be approved by the Contract Administrator prior to construction.

NMS 032000 – CONCRETE REINFORCEMENT

Special Provision

All reinforcement for concrete shall be in accordance with OPSS.PROV 905 and OPSS.PROV 904 except as amended and added to below.

Subsection 905.05.05 of OPSS.PROV 905 is amended by the addition of the following clause to the subsection:

All bar chairs and spacers shall be non-metallic. When placing bar chairs over vapour barriers the appropriate bearing plates (i.e., sand plates) shall be used to protect the vapour barrier during concrete placement activities. Concrete blocks or bricks shall not be substituted for non-metallic bar chairs.

Subsection 905.07.02.02 of OPSS.PROV 905 is amended by the addition of the following clause to the subsection:

The contractor shall place a sufficient number of bar chairs to securely support reinforcing steel and welded wire mesh during concrete placement activities including the weight of the plastic concrete and workers walking on reinforcing steel grids during concrete placement. Bar chairs shall be spaced so that any sagging between supports will not reduce or increase the concrete cover beyond the reinforcing steel tolerances in OPSS.PROV 905. If excessive sagging or displacement of bars is identified by the Contract Administrator, the Contractor shall add additional bar chairs and bar ties to limit the sagging/displacement of bars from plastic concrete or workers to acceptable levels as determined by the Contract Administrator at no additional cost to the Contract.

Subsection 905.09 of OPSS.PROV 905 is amended by removal of the section and replacement with the following:

905.09 MEASUREMENT FOR PAYMENT

.1 No measurement shall be made under this Section.

Subsection 905.10 of OPSS.PROV 905 is amended by removal of the section and replacement with the following:

905.10 BASIS OF PAYMENT

.1 No payment shall be made for this item. Include reinforcement costs in items of concrete work in the form of tender that require reinforcing steel.

NMS 033000 – CAST-IN-PLACE CONCRETE

Special Provision

All cast-in-place concrete shall be in accordance with OPSS.PROV 904 and OPSS.PROV 1350 except as amended and added to below.

904.07.07 CONCRETE FINISHING

Subsection 904.07.07 of OPSS.PROV 904 is amended by the addition of the following clauses:

All concrete finishing shall be in accordance with CSA A23.1-19.

All exterior slabs on grade and the slab of the auxiliary storage building shall receive a final non-slip broom finish.

The slab on grade for the vehicle maintenance garage shall receive a dense and even steel trowel finish.

904.07.12.03 SURFACE TOLERANCE

Subsection 904.07.12.03 of OPSS.PROV 904 is amended by the addition of the following clauses:

Surface tolerances for all concrete flatwork shall be in accordance with CSA A23.1-19. All slabs on grade shall be considered Class A in accordance with Table 21 in CSA A23.1.

904.09 MEASUREMENT FOR PAYMENT

Subsection 904.09 of OPSS.PROV 904 is amended by removal of the section and replacement with the following:

.1 No measurement shall be made under this Section.

Subsection 904.10 of OPSS.PROV 904 is amended by removal of the section and replacement with the following:

904.10 BASIS OF PAYMENT

.1 No payment shall be made for this item. Include all costs in items that require concrete work in the form of tender. This cost shall be inclusive of all hot weather and cold weather concrete requirements outlined in OPSS.PROV 904.

1350.05.05.02 PLASTIC CONCRETE REQUIREMENTS

Subsection 1350.05.05.02 of OPSS.PROV 1350 is amended by the addition of the following clause to subsection (b):

All concrete shall have a target air content of 6% except for the slab on grade of the vehicle maintenance garage. The slab on grade for the vehicle maintenance garage shall not be air entrained since this slab will receive a steel trowel finish.

1350.05.05.03 HARDENED CONCRETE REQUIREMENTS

Subsection 1350.05.05.03 of OPSS.PROV 1350 is amended by the addition of the following clause to subsection (c):

c) Air void system parameters identified in OPSS.PROV 1350 are only required for the mix designs where air content is specified.

1350.07.05.09.02 ACCEPTANCE METHOD A

Subsection 1350.07.05.09.02 of OPSS.PROV 1350 can be deleted in entirety. Acceptance Method B will be utilized.

1350.07.05.09.03 ACCEPTANCE METHOD B

Subsection 1350.07.05.09.03 of OPSS.PROV 1350 can be deleted in entirety and replaced with the following:

One set of acceptance and referee cylinders, each shall be cast for every 50m3 of concrete placed or one set per day, whichever is more frequent.

Table 3 of OPSS.PROV 1350 is amended by the addition of the following rows:

Table 3: Cores for Air Void System (AVS) and Rapid Chloride Permeability (RCP) Determination

Category	**Lot Size**	**Core Size**	**Number of Cores per Lot for AVS**	**Number of Cores per Lot for RCP**
Interior slab on grade of Vehicle Maintenance Garage	2 lots for the entire slab	100mm in dia. and 200mm long	Not required	2
Exterior apron slabs for the Vehicle Maintenance Garage	1 lot for all slabs		1	2

Category	Lot Size	Core Size	Number of Cores per Lot for AVS	Number of Cores per Lot for RCP
Foundation walls of the Vehicle Maintenance Garage	1 lot for all foundation walls		1	2
Slab on grade of the Auxiliary Storage Building	1 lot for the entire slab		1	2
Concrete push walls in the Material Storage Building	2 lots for the entire push wall		1	2

Areas of concrete not listed in Table 3 do not require cores for AVS or RCP testing.

NMS 033050 – CONCRETE CURING

Special Provision

All concrete curing shall be in accordance with OPSS.PROV 904 except as amended and added to below.

904.07.08.01 GENERAL

Subsection 904.07.08.01 of OPSS.PROV 904 shall be amended by including the following:

Curing compounds shall not be used.

All concrete, unless noted otherwise in the contract documents, shall be wet cured with burlap, water and moisture vapour barrier as per OPSS.PROV 904 for a minimum of 4 days. Concrete slabs on grade and push walls shall be wet cured for a minimum of 7 days with burlap, water and moisture vapour barrier as per OPSS.PROV 904. Cold weather or hot weather curing may require longer curing periods as outlined in OPSS.PROV 904.

All curing shall be with burlap and water as per 904.07.08.03 or water flooding of slabs where the surface of the slab is kept fully submerged in a layer of water for the full 7 day curing period.

904.07.08.06 CURING FORMED SURFACES

Subsection 904.07.08.06 of OPSS.PROV 904 shall be amended by including the following:

For curing of concrete push walls, the Contractor shall crack the wall forms 24hrs after placement and maintain moisture between the cracked forms and the wall surface by soaker hoses along the top of the walls or other approved means. The tops of the walls shall be covered with wet burlap and a moisture vapour barrier. Push walls shall be wet cured for the full 7 day curing period. Wall forms can be removed after the concrete push walls have reached 70% of the specified compressive strength. Curing shall remain in place for the full 7 day cure period. When wall forms are removed curing shall be accomplished according to the Curing with Burlap and Water clause for the remainder of the curing period.

NMS 033506 – CONCRETE SEALER

Special Provision

Part 1 General

1.1 SCOPE

.1 This Section specifies requirements for the supply and application of concrete surface sealer to concrete floors receiving a non-metallic floor hardener, concrete push walls in the material storage building, and other concrete surfaces where "Concrete Sealer" is scheduled on the Drawings.

1.2 REFERENCE STANDARDS

.1 Health Canada – workplace Hazardous Materials Information Systems (WHIMS)
.1 Material Safety Data Sheets (MSDS).

.2 Canadian Standards Association (CSA)
.1 CAN/CSA-A23.1.-14, Concrete Materials and Methods of Construction.

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Include application instructions for concrete sealer.

.3 Submit WHMIS MSDS Material Safety Data Sheets in accordance with Section 02 61 33 Hazardous Materials.
.1 WHMIS MSDS acceptable to Human Resources Development Canada Labour and Health Canada for concrete floor hardeners.
.2 Indicate VOC content.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with the General Conditions.

1.5 ENVIRONMENTAL CONDITIONS

.1 A minimum room temperature of 15°C shall be maintained during the installation. If this involves the use of space heaters, they must be effectively vented to avoid floor surface damage caused by carbonization.

.2 Concrete temperature shall not be less than 5°C.

.3 Provide water tight protection against rain and detrimental weather conditions.

.4 Ensure concrete substrate is within moisture limits prescribed by sealer manufacturer.

.5 Safety:
.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.6 Ventilation:
.1 Ventilate area of work by use of approved portable supply and exhaust fans.

.2 Provide continuous ventilation during and after coating application

Part 2 Products

2.1 CONCRETE SEALER

.1 INTRAGUARD Water based concrete sealer as manufactured by W. R. Meadows of Canada Ltd., or Contract Administrator approved equal, for walls and slabs on grade not receiving an epoxy finish.
.2 Sika FerroGard 903 or Contract Administrator approved equal for push walls.

2.2 CURING COMPOUND

.1 Not permitted.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that all surfaces are ready to receive work.

3.2 APPLICATION INSTRUCTIONS

.1 Apply in accordance with manufacturers' printed instructions.

.2 Prepare concrete for clean, smooth, and uniform finish. Concrete must be clean and completely dry prior to sealer application. Remove stains and discolourations.

.3 New concrete shall be properly cured for a minimum of seven days prior to sealer application.

.4 Apply by spray, brush or Lambswool applicator in a uniform film.

3.3 PRECAUTIONS

.1 The sealer is flammable – keep away from heat and open flame.

.2 Avoid prolonged contact with skin. Use with adequate ventilation and avoid prolonged breathing of vapour.

.3 The sealer could be harmful or fatal if swallowed.

3.4 PROTECTION

.1 Protect finished installation until floor treatment has completely cured.

NMS 034500 – PRECAST ARCHITECTURAL CONCRETE

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 22 23 – Architectural Concrete Unit Masonry.

1.2 REFERENCE STANDARDS

.1 CSA A23.4-00/A251-00 Precast Concrete-Materials and Construction/Qualification Code for Manufacturers of Architectural and Structural Precast Concrete Products.

.2 CAN/CSA-G30.18-M92 (R1998) Billet-Steel Bars for Concrete Reinforcement.

.3 CSA A23.1/23.2-00, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.4 CSA A23.3-94(R2000) Design of Concrete Structures.

.5 CSA A231.1-95(R2000) Precast Concrete Pavers.

.6 CSA A231.2-99 Precast Concrete Paving Slabs.

.7 CSA G30.15-M1983 (R1991) (R1998) Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

.8 CSA W48.1-M1991 (R1998) Carbon Steel Covered Electrodes for Shielded Metal Arc Welding.

.9 CSA W186-M1990 (R1998) Welding of reinforcing Bars in Precast Concrete Construction.

1.3 WORK INCLUDED

.1 Work under this Section shall include the complete supply and installation of plant precast architectural concrete items Listed in Part 2 of this Section.

.2 Supply only precast patio stones to the roofer for installation by that trade. See Section 07 55 00 – Modified Bituminous Membrane Roofing.

.3 Examine Drawings for other items of Precast Architectural Concrete indicated.

1.4 SOURCE QUALITY CONTROL

.1 If requested by the Contract Administrator, provide certified copies of quality control tests related to this project as specified in CSA A23.4/A251.

1.5 SHOP DRAWINGS

.1 Submit shop drawings indicating all precast elements of this section including supports, fittings, accessories, reinforcement and installation details.

.2 Shop Drawings of precast concrete stair sections to bear seal of a Professional Engineer registered in the Province of Ontario.

1.6 WARRANTY

.1 The Contractor hereby warrants that the precast architectural elements will not spall or show visible evidence of cracking in accordance with GC 12.3 - WARRANTY, but for five years.

Part 2 Products

2.1 MATERIALS

.1 Cement, aggregates water, admixtures: to CSA A23.4/A251.

.2 Use same brands and source of cement and aggregate for entire project to ensure uniformity of colouration and other mix characteristics.

.3 Reinforcing steel: to CSA G30.15.

.4 Welding materials: to CSA W48.1.

.5 Air entrainment admixtures: to CSA A23.1/A23.2.

2.2 CONCRETE MIXES

.1 To manufacturers standard to achieve specified durability under warranty.

2.3 FABRICATION

.1 Fabricate in the factory to exact profile and dimensions indicated. No on-site fabrication is permitted.

2.4 MANUFACTURERS

.1 Manufacture all precast units in accordance with CSA A23.4/A251.

.2 Design and attach anchors and inserts to precast concrete elements to carry design loads. All units in exterior masonry veneer to have custom anchors fabricated and cast into the units suitable to tying back to back up concrete block.

2.5 LIST OF PRECAST ARCHITECTURAL CONCRETE ITEMS

.1 Roof Service Walkways.

.1 Precast concrete paving slabs, conforming to CSA A231.2, 600 x 600mm (24" x 24"), 50mm (2") thick, plain face with a pressed-in patterned surface, standard gray colour. Provide to the Roofer for installation by that trade. Acceptable Products:

.1 “Vibropress” Paving Slabs by D. Barnett & Co. Ltd.

.2 Contract Administrator approved equivalent.

.2 Accessories: 1” Polyisocyanurate Rigid Insulation Board to be laid underneath pavers, see Section 07 55 00 – Modified Bituminous Membrane Insulation.

Part 3 Execution

3.1 INSTALLATION

.1 Set precast concrete units straight, level and square.

3.2 CLEANING

.1 Obtain approval of cleaning methods from the Contract Administrator before cleaning soiled precast concrete surfaces.

NMS DIVISION 4 SPECIFICATIONS

Special Provision

The following Division 4 National Master Specifications are included in this Contract.

NMS 042000 – MASONRY

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 – Cast-in-Place Concrete.

.2 Section 04 22 23 – Architectural Concrete Unit Masonry.

.3 Section 05 50 00 – Metal Fabrications.

.4 Section 07 21 13 – Board Insulation.

.5 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.2 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.3 CSA-A165 Series-04, CSA Standards on Concrete Masonry Units. covers: A165.1, A165.2, A165.3.

.4 CSA-A179-04 Mortar and Grout for Unit Masonry.

.5 CSA-A370-14, Connectors for Masonry.

.6 CSA-A371-04, Masonry Construction for Buildings.

.7 CSA-G30.14-M1983 (R1998), Deformed Steel Wire for Concrete Reinforcement.

.8 CAN/CSA G30.18-M92, Billet Steel Bars for Concrete Reinforcement.

.9 CSA-S304.1-04, Design of Masonry Structures.

.10 CSA-W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 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 two copies of WHMIS MSDS – Material Safety Data Sheets in accordance with Section 01 33 00 – Submittal Procedures.

.2 Samples.
- .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit samples:
  - .1 Two of each type of masonry unit specified.
  - .2 Two of each type of masonry accessory specified.
  - .3 One of each type of masonry reinforcement, tie and connector proposed for use.
- .3 Submit two size samples of coloured mortar.

.3 Shop Drawings.
- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop drawings consist of bar bending details, lists and placing drawings.
- .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

.4 Manufacturer's Instructions.
- .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.2 Mock-ups.
- .1 Construct mock-ups for Contract Administrator approval for each masonry wall type.
- .2 Construct mock-up panel of interior masonry wall construction and the exterior masonry veneer construction, 1,200 x 1,800 mm showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar and workmanship.
- .3 Mock-up will be used:
  - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
- .4 Construct mock-up where directed by Contract Administrator.
- .5 Allow 7 days hours for inspection of mock-up by Contract Administrator before proceeding with work.
- .6 When accepted by Contract Administrator, mock-up will demonstrate minimum standard for judging materials, quality and workmanship incorporated into the masonry work.
- .7 Sample panels to remain on site until removal is directed by the Contract Administrator.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, handle and protect materials in accordance with the General Conditions.

.2 Deliver materials to job site in dry condition.

.3 Cement and other packaged materials shall be delivered in original undamaged packages.

.4 Storage and Protection.
- .1 Keep materials dry until use except where wetting of bricks is specified.
- .2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with contract requirements.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material and pallets in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Unused metal materials are to be diverted from landfill to a metal recycling facility as approved by Contract Administrator.

.5 Unused or damaged masonry materials must be diverted from landfill to a local quarry facility as approved by Contract Administrator.

1.7 SITE CONDITIONS

.1 Site Environmental Requirements.
- .1 Cold weather requirements.
  - .1 No masonry shall be laid when the temperature is below 5°C, unless means approved by the Contract Administrator are provided to heat and maintain the temperature of masonry materials and protect the completed work from freezing.
  - .2 Protection shall consist of heating and maintaining the temperature of the masonry materials to at least 5°C, but not more than 71°C and maintaining an air temperature above 5°C on both sides of the masonry for a period of at least 48 hours if Type "M" or "S" mortar is used, and 72 hours if Type "N" is used. These periods may be reduced to 24 and 48 hours, respectively, if high-early-strength cement is used.
  - .3 The Contractor shall take such further measures as the Contract Administrator may deem advisable, but the responsibility for the adequacy of the finished work shall remain with the Masons.
  - .4 Supplement Clause 6.7.2 of CSA-A371 with following requirements.
    - .1 Maintain temperature of mortar between 5° C and 50° C until batch is used or becomes stable.
    - .2 Maintain ambient temperature between 5° C and 50° C and protect site from wind-chill.
- .2 Hot weather requirements.
  - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
  - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

Part 2 Products

2.1 MASONRY UNITS

.1 Standard concrete block units: to CSA-A165 Series (CSA-A165.1).
- .1 Classification:
  - .1 Hollow units: H/15/A/M
  - .2 Solid units: S/15/A/M.
- .2 Size: metric modular, sizes as indicated on the Drawings, and complete with return corners and required shapes.
- .3 Dry density shall not be less than 2,000 kg/m³ concrete.
- .4 All units shall have a uniform texture and shall be free of smears, slick spots and other surface imperfections.
- .5 Special shapes: provide bull-nosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.
- .6 Manufacturers of Standard concrete block units having Products considered acceptable for use:
  - .1 Shaw Brick
  - .2 Permacon
  - .3 Boehmers Block
  - .4 Contract Administrator approved equal.
  - .5 Colour: Standard grey.

2.2 FACE BLOCK

.1 Solid units with architectural face in two face dimensions and textures to achieve pattern shown on drawings.

.2 Products:

1. FB-1 Low Bay:
   a. Profile Series Concrete Block with water repellant additive by Brampton Brick – colour: Select from manufacturer's complete colour range (separate colour from FB-2). Size: D 90mm x H 190mm x W 390mm.
   b. Contract administrator approved equivalent.

2. FB-2 High Bay:
   a. Profile Series Concrete Block with water repellant additive by Brampton Brick – colour: Select from manufacturer's complete colour range (separate colour from FB-1). Size: D 90mm x H 190mm x W 390mm.
   b. Contract administrator approved equivalent.

.3 Equivalent products by Permacon, Richvale York Block Inc., Alba Stone Products, or Contract Administrator approved equivalent.

2.2 MORTAR AND GROUT

.1 Use same brands of materials and source of aggregate for entire project.

.2 Mortar and grout: CSA A179.

.3 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.

.4 Colour: ground, coloured natural aggregates or metallic oxide pigments as approved by the Contract Administrator for use where coloured face block is indicated.

.5 The proportions of Portland cement, masonry cement and sand aggregate shall be as shown in table below:

Mortar Type	Portland Cement	Masonry Cement	Sand	28-Day Compressive Strength (Laboratory Strength)
M	1	1 (Type H)	6	17.5 MPa
S	½	1 (Type H)	4½	12.5 MPa
N	0	1 (Type H)	3	5.0 MPa

.6 Mortar for exterior masonry above grade:
- .1 Loadbearing: type S as per table above.
- .2 Non-Loadbearing: type S as per table above.
- .3 Parapet walls, chimneys, unprotected walls: type S as per table above.

.7 Mortar for foundation walls, manholes, sewers, pavements, walks, patios, and other exterior masonry at or below grade: type M as per table above.

.8 Mortar for interior masonry.
- .1 Loadbearing: type S based on Proportion specifications.as per table above.
- .2 Non-Loadbearing: type S based on Proportion specifications.

.9 Structural mortar:
- .1 Mortar for bedding steel bearing plates and steel lintels shall be Type "M" as per table above.

.10 Following applies regardless of mortar types and uses specified above:
- .1 Mortar for grouted reinforced masonry: type M as per table above.

.11 Pointing Mortar:
- .1 Pointing mortar shall be Type S to which add ammonia stearate or calcium stearate not more than 2% of the cement volume.
- .2 Pre-hydrate mortar for pointing by mixing the dry ingredients with sufficient water to produce a damp mass of such consistency that it will retain its form when pressed into a ball with hands, but will not flow under the trowel. Allow mortar to stand for a period of not less than one hour nor more than two hours, after which remix with addition of sufficient water to produce satisfactory workability.

.12 Coloured mortar: use colouring admixture not exceeding 10% of cement content by mass, or integrally coloured masonry cement, to produce coloured mortar to match approved sample.
- .1 Use coloured mortar for all exterior brickwork and block work, unless otherwise noted. Colour to suit colour of units.

.13 Non-Staining mortar: use non-staining masonry cement for cementitious portion of specified mortar type.

.14 Grout Mortar: to CSA-A179, Table 3.
- .1 Grouting mortar shall consist of Type M mortar to which add a sufficient quantity of water to produce a pouring consistency without segregating the ingredients, while still retaining cohesiveness. After water has been added, stir at frequent intervals until used.

2.3 MASONRY ANCHORAGE AND REINFORCING

.1 Bar reinforcement: to CSA-A371 and CAN/CSA G30.18, Grade 400 (refer to architectural and structural drawings for extent).

.2 Wire reinforcement: to CSA-A371 and CSA G30.14, galvanized to CSA-S304 and CSA-A370 where fully imbedded.

.3 Connectors and Ties: to CSA-A370 and CSA-S304, stainless steel.

.4 All masonry walls shall be reinforced by means of the following unless otherwise specified:
- .1 Horizontal Joint Reinforcement: BL-10 HD ladder type masonry wall reinforcing fabricated of 4.8 mm parallel side rods welded to cross rods of 3 mm cold drawn steel wire, hot-dipped galvanized after fabrication. Overall width of reinforcing shall be approximately 50 mm less than the nominal wall thickness. At minimum provide ladder reinforcement in every other horizontal joint.
- .2 For single wythe walls: use Blok-Lok Type BL-10 HD.
- .3 Corner-Lok: of same gauge and finish material as specified for ladder reinforcement.
- .4 Adjustable veneer anchors: Blok-Lok BL-607 (steel stud bayonette style) with BLT-9 Seismic Flex-o-lok ties, stainless steel.
- .5 Manufacturers of Masonry Reinforcement and Anchors having Products considered acceptable for use:
  - .1 Blok-Lok
  - .2 Duro-O-Wal Limited
  - .3 Acrow-Richmond
  - .4 Fero
  - .5 Contract Administrator approved equal.

2.4 ACCESSORIES

.1 Control joint: Dur-O-Wall Wide Flange, DA 2003, Rubber or Contract Administrator approved equal.

.2 Control joint filler: joint backing material for caulking of joints shall be white, non-absorbent, closed cell foam polyethylene of size and shape indicated.

.3 Lap adhesive: recommended by masonry flashing manufacturer.

.4 Cavity Wall Air Space Filler (Mortar Boards): Fibrous Material, nominal 10" high, thickness to suit cavity space width. Acceptable products:
- .1 Mortar Net by J.V. Building Supply Ltd., Woodbridge, Ontario.
- .2 Contract Administrator approved equivalent.

.5 Weep hole vents: Dur-O-Wall Type DA1006, Cell Vent Weep Hole Ventilators or Contract Administrator approved equivalent. Finish colour to match mortar colour.

.6 Mechanical fasteners: stainless steel.

.7 Damp-proof Course and Base Flashings:
- .1 Blueskin TWF, thru wall flashing sheet, as manufactured by Bakor.
- .2 Flex-Guard 40 mil P.V.C. Masonry Flashing, as manufactured by W.R. Meadows of Canada.
- .3 Contract Administrator approved equal.

2.5 FABRICATION OF MASONRY REINFORCING

.1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.

.2 Fabricate connectors in accordance with CSA-A370.

.3 Obtain Contract Administrator's approval for locations of reinforcement splices other than shown on placing drawings.

.4 Upon approval of Contract Administrator, weld reinforcement in accordance with CSA W186.

.5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

2.6 SOURCE QUALITY CONTROL

.1 Upon request, provide Contract Administrator with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.

.2 Upon request inform Contract Administrator of proposed source of material to be supplied.

Part 3 Execution

3.1 GENERAL

.1 The Contractor shall co-ordinate all aspects of masonry work to ensure an efficient, satisfactory installation free from unnecessary delays.

.2 All defects of work previously prepared shall be reported to the Contract Administrator and corrected before laying of concrete block or any other masonry work starts.

.3 Provide scaffolding for all masonry work as required to properly carry out the work. Scaffolding shall be properly supported, strongly built and firmly braced, and shall not be secured or braced against any part of the building. Scaffolding shall comply with all Federal and Provincial Safety Regulations and the General Requirements forming part of this Contract.

.4 Remove excess mortar and projections. Take care to prevent breaking corners and to make the tooled joints uniform.

.5 In laying masonry, avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after they are set in position. When an adjustment must be made after the mortar has started to harden, the mortar shall be removed and replaced with fresh mortar.

.6 Where flashing turns out and terminates in horizontal mortar joints, at lintels, shelf angles, spandrels, bases, and bottom of cavities in cavity walls, provide weepholes in the mortar joints of outer wythes at 600 mm horizontally. Make hole 10 mm diameter formed with breather and turn breather 100 mm up wythe. Heat seal inner end and leave outer end cut to fray.

.7 All masonry walls and partitions, unless specifically noted on the Drawings, shall extend from bearing surface to the underside of the structure above, where they shall be wedged tightly with pieces of masonry, neatly cut to required shape and set in a full bed of mortar. Support tops of masonry walls with angles and anchors where shown on the drawings.

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 PREPARATION

.1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

.2 Submit shop drawings for temporary bracing in accordance with Section 01 33 00 – Submittal Procedures. The temporary bracing shall be designed by a professional engineer licensed in the province of Ontario and shall bear the seal of the design engineer.

.3 The designer of the temporary bracing (or their designate) shall visit the site to ensure the temporary bracing is installed in conformance with the design drawings and specifications. Submit a letter to the Contract Administrator detailing the results of the field review.

3.4 INSTALLATION

.1 Do masonry, mortar and grout work in accordance with CSA-A371 except where specified otherwise.

.2 Concrete block units.
- .1 Bond: running.
- .2 Coursing height: 200 mm for one block and one joint.
- .3 Jointing: concave where exposed.
- .4 Lay concrete blocks in full bed of mortar, plumb, level, true to line and properly jointed with other connecting work. Blocks with open cells exposed in wall will not be permitted.
- .5 Intersecting block bearing walls shall not be tied together in a masonry bond, except at corners.
- .6 All external corners to be bullnosed where concrete unit masonry will remain exposed in building.

.3 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.4 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

.5 Install continuous control joint fillers in control joints at locations indicated on drawings.

.6 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.

3.5 MIXING OF MORTARS

.1 Mix mortar ingredients thoroughly and only in such quantities as are needed for immediate use. Except for small jobs or batches, mixing shall be done by machine.

.2 When the mixing is done in a mechanical mixer, the mortar shall be mixed for not less than 3 minutes after all the materials are in the drum. Hand mixing shall be continued until the mortar is completely and uniformly mixed.

.3 Cement mortar shall be used and placed in final position within 2 hours after mixing, when the air temperature is above 25°C and within 3 hours after mixing when the air temperature is less than 25°C. Mortars that have stiffened within these time limits due to evaporation of moisture may be retempered to restore workability by adding water.

.4 Mortar materials shall be measured by volume, and the methods of measurements shall be such that the proportions can be controlled with an error of not over 2%.

.5 Colour and admixtures: mix grout to semi-fluid consistency.

.6 Coloured mortars: incorporate colour and admixtures into mixes in accordance with manufacturer's instructions.
- .1 Use clean mixer for coloured mortar.

.7 Pointing mortar: prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour nor more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.

3.6 CONSTRUCTION

.1 Exposed masonry.
- .1 Remove chipped, cracked, and otherwise damaged units, in accordance with CSA-A165, Clause 82.1, in exposed masonry and replace with undamaged units.

.2 Jointing
- .1 Mortar joints shall be straight, clean and uniform in thickness.
- .2 Strike flush joints concealed from view in walls or ceilings and joints in walls to receive rubber wall base, plaster, tile, insulation, or other applied material except paint or similar thin finish coating.

.3 Cutting.
- .1 Minimize cutting of masonry. Where cutting of exposed masonry is required, cut with power drive abrasive cutting disc.
- .2 Cut out for flush-mounted electrical switches, outlet boxes, grilles, pipes, conduit and other recessed or built-in objects, leaving 3 mm maximum clearance.
- .3 Masonry shall be cut accurately to fit snugly around pipes, conduits and ducts, and all spaces around such work shall be filled solidly and neatly finished to reduce sound transmission throughout the building.
- .4 Masonry shall be built around pipes and ducts only after they have been tested, covered where applicable and approved by the Contract Administrator.
- .5 Make cuts straight, clean, and free from uneven edges.
- .6 Approval of the Contract Administrator shall be obtained before cutting into any parts which will impair the appearance or strength of the work.

.4 Building-In.
- .1 Build in materials supplied under this and other Sections such as door; louvre frames, loose steel lintels, sleeves, anchors, bolts, ties, and all other inserts which have to be built into masonry.
- .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
- .3 All frames set in masonry shall be well braced and lugs or anchors attached or provided shall be properly placed. Spaces at the back of and over metal frames shall be filled with the type of mortar used in surrounding work.
- .4 Chases and openings in masonry work shall be built as the work progresses, and shall be accurately sized and located where shown, directed or required.

.5 Loose steel lintels.
.6 Build in loose steel lintels for all openings where indicated in masonry walls. Minimum 200 mm bearing at each end.
.7 Centre over opening width.

.5 Support of loads.
.1 Fill concrete blocks bearing lintels and other structural members, solid with 25 MPa course masonry cavity grout unless otherwise noted.
.2 Use 30 MPa F1 concrete to Section 03 30 00 – Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
.3 Use grout to CSA-A179 where grout is used in lieu of solid units.
.4 Install building paper and wire mesh reinforcing below voids to be filled with concrete; keep paper 25 mm back from faces of units.

.6 Provision for movement.
.1 Leave 3 mm space below shelf angles.
.2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
.3 Built masonry to tie in with stabilizers, with provision for vertical movement.

.7 Control joints.
.1 Provide control joints in masonry walls as shown on Architectural Drawings and as follows:
.1 In continuous walls spaced not to exceed 6 m.
.2 Where there is a variation in the wall thickness.
.3 Where the wall changes in height.
.4 At door openings in accordance with accepted masonry practice.
.2 Shrinkage control joints shall consist of a straight vertical joint extending from structural foundation to top of wall.
.3 Vertical joint filler to extend to within 20 mm of masonry face, ready for caulking under Section 07 92 00.

.8 Flashings.
.1 Build in all flashings, show or required, in masonry in accordance with CSA-A371.
.2 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.
.3 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 200 mm, and as follows:
.1 For masonry backing embed flashing 25 mm in joint.
.2 For concrete backing, insert flashing into reglets.
.3 For wood frame backing, staple flashing to walls behind sheathing paper.
.4 For gypsum board backing, bond to wall using manufacturer's recommended adhesive.
.4 Lap joints in the running length and at angles 150 mm and seal with adhesive in accordance with the material manufacturer's instructions.

.9 Interface with other work.
.1 Openings in walls: approved by Contract Administrator.
.2 Make good existing work. Use materials to match existing.

3.7 MASONRY ANCHORAGE AND REINFORCING 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 Prior to placing concrete, mortar or grout, obtain Contract Administrator’s approval of placement of reinforcement and connectors.

.3 All masonry walls shall be reinforced continuously with horizontal masonry reinforcement. Place reinforcement at spacing indicated on drawings and lap splices in accordance with manufacturer's instructions. At minimum place horizontal joint reinforcement at 400mm o/c (maximum) and lap splices in accordance with manufacturer’s instructions.

.4 Above and below all openings, reinforcing shall be placed in both first and second joint and the additional reinforcing shall extend 600 mm beyond each side of the opening.

.5 Install prefabricated corner sections in reinforced joints at corners and prefabricated tee sections at reinforced joints where partitions intersect other partitions or walls, unless lateral support is being provided, or walls or partitions are erected on separate foundations.

.6 Where intersecting walls are erected on different foundations and lateral support is not required, provide straight joint full height of wall with crimped masonry ties at every second joint. Overall thickness of reinforcement shall be 50 mm less than the nominal thickness of the wall.

.7 Supply and install additional reinforcement to masonry as indicated.

3.8 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 Tie masonry veneer to backing in accordance with NBC, OBC, CSA-S304.1, CSA-A371 and as indicated.

.3 Spacing of veneer anchors not to exceed 600 mm vertically and 600 mm horizontally per tie.

.4 Provide additional ties at the top of walls and perimeter of openings within 300 mm of openings and top of parapets.

3.9 REINFORCED LINTELS AND BOND BEAMS

.1 Provide and install concrete block bond beam units where indicated and required for bearing of structural members.

.2 Bond beams shall be made of special channel blocks with reinforcing bars placed in the bottom, and shall be filled with 30 MPa F1 concrete.

.3 Reinforce masonry bond beams as indicated on the Drawings.

.4 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.

3.10 GROUTING

.1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.

3.11 ANCHORS

.1 Supply and install metal anchors as indicated.

3.12 LATERAL SUPPORT AND ANCHORAGE

.1 Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.

3.13 MOVEMENT JOINTS

.1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.14 FIELD BENDING

.1 Do not field bend reinforcement and connectors except where indicated or authorized by Contract Administrator.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars and connectors which develop cracks or splits.

3.15 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

3.16 SITE TOLERANCES

.1 Tolerances in notes to Clause 6.2 of CSA-A371 apply.

3.17 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

.3 Standard and Decorative block.

- .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block and finally by brushing.
- .2 To remove excess mortar, smears and stains, use a non-acid cleaning solution, recommended by the manufacturer, of type which will not harm completed masonry.
- .3 Use non-metallic tools in cleaning operations, and sufficient amounts of clean water.
- .4 Protect adjacent materials and work from damage while cleaning.
    - .1 Repeat cleaning process as often as necessary to remove mortar and other stains.
    - .2 Use acid solution treatment for difficult to clean masonry as described in Technical Note No.20 by the Brick Industry Association.

3.18 PROTECTION

.1 Masonry shall be protected during the execution of the work in an approved manner, and generally as follows:
- .1 Tops of walls under construction shall be covered with tarpaulins at nights, during inclement weather, and during delays in the work.
- .2 Projecting ledges, exposed facework and angles, shall be protected by means of boards to prevent damage or disfigurement, and such covering shall be secured in place so that finished work will not be affected.
- .3 Work which has been damaged due to a lack of or inadequate protection being provided shall be replaced to the satisfaction of the Contract Administrator at no expense to the Owner.
- .4 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

3.19 COMPLETION

.1 All surfaces shall be examined carefully upon completion and any holes or cracks in joints shall be tuck-pointed full with mortar, matching colour and finish of adjacent joints.

NMS DIVISION 5 SPECIFICATIONS

Special Provision

The following Division 5 National Master Specifications are included in this Contract.

NMS 051223 – STRUCTURAL STEEL FOR BUILDINGS

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 21 00 – Steel Joist Framing.

.2 Section 05 31 00 – Steel Decking.

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)
- .1 ASTM A36/A36M-19, Carbon Structural Steel.
- .2 ASTM A123/A123M-13, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A193/A193M-19, Alloy-Steel and Stainless Steel Bolting for High-Temperature or High-Pressure Service and Other Special Purpose Applications.
- .4 ASTM A307-14e1, Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
- .5 ASTM A325-14, Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

.6 ASTM A325M-14, Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).
.7 ASTM A490M-14a, High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
.8 ASTM A563-15, Carbon and Alloy Steel Nuts.
.9 ASTM F436/F436M-19, Hardened Steel Washers Inch and Metric Dimensions.
.10 ASTM F1554-18, Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
.11 ASTM F3125/F3125M-19, High Strength Structural Bolts and Assemblies, Steel and Allow Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPA Minimum Tensile Strength.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-85.10-99, Protective Coatings for Metals.

.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
.1 Handbook of the Canadian Institute of Steel Construction.
.2 CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.

.4 CSA Group (CSA)
.1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CSA S16-14, Design of Steel Structures.
.4 CSA S136-16, North American Specifications for the Design of Cold-Formed Steel Structural Members.
.5 CSA W47.1-09 (R2019), Certification of Companies for Fusion Welding of Steel.
.6 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
.7 CSA W55.3-08 (R2018), Certification of Companies for Resistance Welding of Steel and Aluminium.
.8 CSA W59-18, Welded Steel Construction (Metal Arc Welding).

.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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada.

.3 Erection drawings:
.1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
.1 Description of methods.
.2 Sequence of erection.
.3 Type of equipment used in erection.
.4 Temporary bracings.

.4 Fabrication drawings:
.1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada.

.5 Source Quality Control Submittals:
.1 Submit 2 copies of mill test reports 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 the Province of Ontario, Canada.

.6 Fabricator 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.

1.4 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement and Payment:
.1 No measurement will be made under this section. Include costs in items of work for which structural steel is required at the Lump Sum Price bid in Form of Tender.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.
.1 Packaging Waste Management: remove for reuse by manufacturer and return of crates, pallets, packaging materials, and padding in accordance with Construction/Demolition Waste Management and Disposal Plan.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Design details and connections in accordance with requirements of CSA S16 and CSA S136 to resist forces, moments, shears and allow for movements indicated.

.2 Unless shown otherwise, the fabricator’s engineer shall design and be solely responsible for all connections between all steel members including but not limited to columns, beams, girders, trusses, braces, etc. and their supporting member, whether steel or concrete. The fabricator’s engineer shall also be responsible for the design of stiffeners, doubler plates and the like, required to maintain the local strength and stability of a member.

.3 Design connections to safely withstand the combined effects of axial forces, shear, moment and torque and any secondary effects due to welding.

.4 Make shop connections with high-tensile bolts or welding. Field connections between steel members shall be made with high-tensile bolts and shall be friction-type connections. Field connections to plates cast into concrete walls shall be welded connections. No ordinary bolts shall be used except where shown on the Drawings or approved by the Contract Administrator. Welding and bolting shall not be combined in a connection to share in the resistance of forces.

.5 Shear 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 connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
.3 Single angle connections are not permitted. Double angle connections shall be used.

.6 For composite construction select or design minimum end connection to resist reaction resulting from factored movement 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.

.7 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in the Province of Ontario, Canada for non-standard connections.

2.2 MATERIALS

.1 Structural wide flange and welded wide flange shapes (W, WWF): to CSA G40.20/G40.21, Grade 350W.

.2 Hollow structural sections (HSS): to CSA G40.20/G40.21, Grade 350W, Class C.

.3 Angles, channels and plates (L, C): to CSA G40.20/G40.21, Grade 300W.

.4 Anchor rods: to ASTM F1554, Grade 36 (Fy = 248 MPa) unless alternate grade is noted on the contract drawings.

.5 Bolts, nuts and washers: to ASTM F3125M grade A325M. All bolts nuts and washers to be hot dip galvanized.

.6 Welding materials: to CSA W48 Series, compatible with steel grades to be welded and certified by Canadian Welding Bureau. Use basic, low hydrogen type welding electrodes.

.7 Shop paint primer: to CISC/CPMA 2-75 solvent reducible alkyd, grey.

.8 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 750 g/m2. All structural steel to be hot dip galvanized.

.9 Shear studs: to CSA W59, Appendix H.

.10 Stainless steel plates: ASTM 240/240M-20a Type 316L

.11 Zinc rich primer: Carbozinc 859 epoxy zinc rich primer (min 5 mils DFT). Any areas with zinc rich primer shall receive an epoxy top coat. Ensure surface preparation is in accordance with manufacturer recommendations.

.12 Epoxy top coat: Carbomastic 15 aluminum flake filled epoxy mastic top coat (min 5 mils DFT). Ensure surface preparation is in accordance with manufacturer recommendations.

.13 Epoxy Mastic: Macropoxy 646 by Sherwin Williams or Contract Administrator approved equal.

.14 Touch up coating system for damage to any galvanized coating or for field welds (where permitted by the Contract Administrator): Where field welding or damage of hot dip galvanized steel occurs, sandblast the weld surface or damaged area and provide 5 mils dry

film thickness (DFT) of Carbozinc 859 epoxy zinc rich primer with constant agitation, then provide 5 mils DFT of Carbomastic 15 aluminum flake filled epoxy mastic top coat in accordance with manufacturer's specifications.

2.3 FABRICATION

.1 Fabricate structural steel in accordance with CSA S16 and in accordance with approved and reviewed shop drawings. All fabrication, drilling, shop welding, bending etc shall take place prior to hot dip galvanizing.

.2 Install shear studs in accordance with CSA W59.

.3 Unless shown otherwise on the drawings, provide 10 mm thick cap plate for all hollow sections. Continuously seal weld cap plate to the member.

.4 Provide holes in flanges for attachment of wood nailers where required. All holes to be shop fabricated prior to hot dip galvanizing.

.5 Provide beams and columns with anchors to masonry at 400 mm on centre when columns are located within or adjacent to masonry wall.

.6 Cutting of holes in structural members will not be permitted unless detailed on the Drawings or approved in writing by the Contract Administrator. All holes permitted to be cut shall be done prior to hot dip galvanizing.

.7 Splices, other than those shown on the Drawings, shall not be permitted without the Contract Administrator approval. If approved by the Contract Administrator, welded splices shall be non-destructively tested at no additional cost to the Owner.

2.4 SHOP PAINTING

.1 Clean, prepare surfaces and shop prime structural steel in accordance with CSA S16, except where members to be encased in concrete.

.2 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.

.3 Apply one coat of primer in shop to steel surfaces to achieve minimum dry film thickness of 4 to 6 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.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.

.5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

.6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

.7 All surfaces and connections of steel members that are exposed to atmosphere and become inaccessible at completion of the project after erection of steel shall receive two coats of primer. Primer to be same as material for shop coat.

2.5 FIELD PAINTING

.1 Field paint structural steel where indicated on the contract drawings.

.2 Clean members, remove loose mill scale, shop primer, rust, oil, dirt and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.

.3 Apply one coat of inorganic zinc rich primer, dft = 2.0-4.0.

.4 Apply one coat of mastic epoxy dft = 5.0-10.0 mils.

.5 See architectural drawings for colour schedules.

.6 Strictly follow the manufacturer’s application recommendations.

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 CSA S136 and 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.

3.3 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Contract Administrator for direction before commencing fabrication.

3.4 MARKING

.1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.5 ERECTION

.1 Erect structural steel, as indicated and in accordance with CSA S16 and CSA S136 and in accordance with reviewed erection drawings.

.2 Field cutting or altering structural members: to approval of Contract Administrator.

.3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.4 Continuously seal members by continuous welds where indicated. Grind smooth.

.5 Provide additional bracing and anchor bolts, supplementary to that in the finished structure, to resist forces present during construction. Ensure that all connections are adequate to sustain construction forces through all stages of construction.

.6 Where horizontally adjustable connections are used, provide field welded connections after final erection and adjustment of steel members.

3.6 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be carried out by testing laboratory approved by the Contractor Administrator.

.2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Contractor Administrator.

.3 Submit test reports to Contractor Administrator within 2 weeks of completion of inspection.

.4 Test shear studs in accordance with CSA W59.

.5 The contractor shall arrange for inspection and testing of the structural steel connections by an independent inspection and testing company specializing in structural steel connection inspections.

.6 All welded connections shall be visually inspected in accordance with CSA W178.2. If defects or areas of concern are noted from the visual inspection, further non-destructive testing such as MPI or UT testing shall be utilized to further determine the condition of these identified areas. Areas identified as not meeting standard shall be repaired as directed by the Contract Administrator.

.7 All snug tight bolted connections shall be inspected as per CSA S16 and all pretensioned bolted connections shall be witnessed by the inspector using the turn-of-nut method identified in CSA S16.

.8 Contractor to submit the connection testing results to the Contract Administrator for review and approval prior to closing in structural steel.

.9 Contractor shall facilitate the Contract Administrators inspection of the structural steel by providing an elevated work platform and operator for the Contract Administrators inspection. Allow as much time with the elevated work platform and operator as required for the inspection.

3.7 FIELD PAINTING

.1 Paint in accordance with Section 09 91 00 – Painting and Section 2.5 above.

.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.

3.8 CLEANING

.1 Progress Cleaning:

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

.2 Final Cleaning: upon completion remove surplus material, rubbish, tools and equipment in accordance with General Conditions.

NMS 052100 – STEEL JOIST FRAMING

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 12 23 – Structural Steel for Buildings

.2 Section 05 31 00 – Steel Deck

.3 Section 09 91 00 – Painting

1.2 REFERENCE STANDARDS

.1 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
- .1 CISC/CPMA 2-75-1975, Quick-Drying, Primer for Use on Structural Steel.
- .2 CISC/CPMA 1-73a-1975, Quick-Drying, One-Coat Paint for Use on Structural Steel.

.2 CSA Group (CSA)
- .1 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA S16-14, Design of Steel Structures.
- .3 CSA S136-16, North American Specification for the Design of Cold-Formed Steel Structural Members.
- .4 CSA W47.1-09 (R2019), Certification of Companies for Fusion Welding of Steel.
- .5 CSA W55.3-08 (R2018), Certification of Companies for Resistance Welding of Steel and Aluminum.
- .6 CSA W59-18, Welded Steel Construction.

.3 The Master Painters Institute (MPI)
- .1 Architectural Painting Specification Manual – current edition.

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement and Payment:
- .1 No measurement will be made under this section. Include costs in items of work for which open web steel joists are required at the Lump Sum Price bid in Form of Tender.

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 steel joist framing 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 the Province of Ontario, Canada.
- .2 Indicate on erection drawings, relevant details such as joist mark, depth, spacing,

bridging lines, bracing lines, bearing, anchorage and details.

.3 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 Delegated Design Submittals:

.1 Submit 4 copies of calculations and joist design drawings for typical joists to Contract Administrator for review a minimum of 4 weeks prior to fabrication and delivery.

1.5 QUALITY ASSURANCE

.1 Submit 2 copies of mill test reports minimum 4 weeks prior to fabrication of steel joists and accessories. Reports to show:

.1 Chemical and physical properties.

.2 Other details of steel 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 materials and products used in fabrication conform to this specification.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse by manufacturer and return of padding, crates, packaging materials and pallets in accordance with Construction/Demolition Waste Management and Disposal Plan.

1.7 SITE CONDITIONS

.1 Verify dimensions and condition of existing work; report discrepancies and potential problem areas to Contract Administrator for direction before commencing fabrication.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Design steel joists and bridging and bracing to carry loads indicated in joist schedule shown on drawings to CSA S16. In addition to loads shown on the drawings, joists to support and concentrated load of 2.0 kN at any panel point.

.2 Design joists and anchorages for uplift forces as indicated.

.3 Manufacture joists to consider load effects due to fabrication, erection and handling.

.4 Limit roof joist deflection due to specified live load to L/300 of maximum span and deflection due to specified total load to L/240 of maximum span.

.5 Open web steel joists will be subject to a corrosive environment. In accordance with clause 6.6.7 of CSA S16 the steel thickness of any component shall be 4.5mm or greater.

2.2 MATERIALS

.1 Open web steel joists: to CSA S16.

.2 Structural steel: to CSA G40.20/G40.21.

.3 Welding materials: to CSA W59.

.4 Shop paint primer: to CISC/CPMA 2.

.5 Shear studs: to CSA W59, Appendix H.

2.3 FABRICATION

.1 Fabricate steel joists and accessories as indicated in accordance with CSA S16 and in accordance with reviewed shop drawings.

.2 Weld in accordance with CSA W59.

.3 Provide bottom and top chord extensions where indicated.

.4 Provide diagonal and horizontal bridging and anchorages as indicated and where required by the joist designer for stability during and after construction.

2.4 SHOP PAINTING

.1 Clean, prepare and shop prime surfaces of steel joists to CSA S16.

.2 Clean members of loose mill scale, rust, oil, dirt and other foreign matter. Prepare surfaces to SSPC SP1 brush blast.

.3 Apply one coat of CISC/CPMA 2 primer to steel surfaces (dip immersion method) to achieve dry film thickness of .065 mm to .080 mm maximum except:

- .1 Surfaces encased in concrete.
- .2 Surfaces to receive field installed stud shear connectors and steel decks.
- .3 Surfaces and edges field welded.
- .4 Faying surfaces of friction-type connections.
- .5 Below grade surfaces in contact with soil.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures minimum 5 degrees C.

.5 Maintain dry condition and 5 degrees C minimum temperature until paint thoroughly dry.

.6 Strip paint bolts, nuts, sharp edges and corners before prime coat is dry.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for steel joist framing installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Contract Administrator.
- .2 Inform Contract Administrator 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 Contract Administrator.

3.2 ERECTION

.1 Do structural steel work: to CSA S16.

.2 Do welding: in accordance with CSA W59.

.3 Ensure installers certified to CSA W47.1 for fusion welding and CSA W55.3 for resistance welding.

.4 Submit certification welded joints qualified by Canadian Welding Bureau.

.5 Erect steel joists and bridging as indicated to approved CSA S16 erection drawings.

.6 Complete installation of bridging and anchorages before placing construction loads on joists.

.7 Field cutting or altering joists or bridging not shown on shop drawings: to approval of Contract Administrator.

.8 Clean and touch up shop primer to bolts, welds, burned or scratched surfaces at completion of erection.

3.3 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and work carried out by testing laboratory approved by Contract Administrator and paid for by the Contractor.

.2 Testing laboratory to inspect representative joists for integrity, accuracy of fabrication and soundness of welds. Testing laboratory to also monitor test loading of joists used by manufacturer to verify design and check representative field connections Contract Administrator will determine extent of and identify inspections.

.3 Submit test report to Contract Administrator within 14 days after completion of inspection.

.4 Test shear studs to CSA W59.

.5 Contractor shall facilitate the Contract Administrators inspection of the joists by providing an elevated work platform and operator for the Contract Administrators inspection. Allow as much time with the elevated work platform and operator as required for the inspection.

3.4 FIELD PAINTING

.1 Paint: in accordance with Section 09 91 00 – Painting.

.2 Touch up damaged surfaces and surfaces without shop coat with CISC/CPMA-2 in accordance with manufacturers' recommendations.

3.5 CLEANING

.1 Progress 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 General Conditions.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by steel joist framing installation.

NMS 053100 - STEEL DECKING

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 12 23 – Structural Steel for Buildings

.2 Section 05 21 00 – Steel Joist Framing

.3 Section 09 91 00 – Painting

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)
- .1 ASTM A653/A653M-08, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM A780-01 Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.
- .3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.2 Canadian Sheet Steel Building Institute (CSSBI)
- .1 CSSBI 10M-06, Standard for Steel Roof Deck.
- .2 CSSBI 12M-06, Standard for Composite Steel Deck.

.3 CSA Group (CSA)
- .1 CSA C22.2 No.79-2016, Cellular Metal and Cellular Concrete Floor Raceways and Fittings.
- .2 CSA S16-09, Design of Steel Structures.
- .3 CSA S136-07, North American Specification for the Design of Cold Formed Steel

Structural Members including Update No. 1 (2014), Update No. 2. (2014), Update No. 3 (2015).

.4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.

.5 CSA W55.3-09, Certification of Companies for Resistance Welding of Steel and Aluminum.

.6 CSA W59-13, Welded Steel Construction, (Metal Arc Welding) including Update No. 1 (2014), Update No. 3 (2015), Update No. 4 (2015).

1.3 DESIGN REQUIREMENTS

.1 Design steel deck to CSA S136 and CSSBI 10M.

.2 Design roof and floor composite steel deck to CSA S16, CSA S136, and CSSBI 12M.

.3 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, composite deck action, and uplift as indicated.

.4 Deflection under specified live load maximum L/240 of span, except when gypsum board or plaster ceilings hung directly from deck, live load deflection maximum L/360 of span.

.5 Where vibration effects controlled as indicated, dynamic characteristics of decking system designed in accordance with CSA S16.

.6 Design deck anchorage to the supporting framework or walls to safely resist net uplift forces of as shown on the drawings or a minimum of 1.0 kPa.

.7 Steel deck units shall span continuously over a minimum of four supports (three-span condition). End laps shall be not less than 50 mm and shall be formed over supports. At end spans or where deck cannot span over four supports design deck for single span condition.

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 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 the Province of Ontario, Canada.

.2 Submit design calculations if requested by Contract Administrator.

.3 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

.4 Indicate details of temporary shoring of steel deck, such as location, time and duration of placement and removal of shoring for concrete fill decks.

.5 When shop drawings are revised and resubmitted, all revisions to the shop drawings shall be clearly identified by means of bubbles, clouds or other obvious means.

1.5 QUALITY ASSURANCE

.1 Retain professional engineer registered or licensed in the Province of Ontario, Canada, with experience in steel deck Work of comparable complexity and scope, to perform following services as part of Work of this Section:
- .1 Structural design of steel deck.
- .2 Review, stamp, and sign Shop, shoring and erection Drawings, design calculations, and revisions required.
- .3 Conduct on-site inspections and prepare and submit inspection reports verifying this part of Work in accordance with Contract Documents and reviewed Shop Drawings. Perform inspections minimum of once per month.
- .4 Monitor supplier's and fabricator's quality control tests and reports.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground in dry location 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.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of crates, packaging materials, pallets and padding, as specified in Construction Waste Management Plan.

Part 2 Products

2.1 MATERIALS

.1 See drawings for metal deck.

.2 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 finish.

.3 Decks to be painted: zinc-iron alloy coated decks suitable for finish painting.

.4 Closures: as indicated in accordance with manufacturer's recommendations.

.5 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.76 mm minimum. Metallic coating same as deck material.

.6 All angles, channels and beams used for reinforcing and trimming around openings in deck, unless specifically as part of structural steel, steel conforming to CSA detailed on the Drawings shall be from structural G40.21, Grade 300W.

.7 Primer: to Section 09 91 00 – Painting.

.8 Caulking: to Section 07 92 00 – Joint Sealing.

.9 Shear studs: to CSA W59.

2.2 TYPES OF DECKING

.1 Steel roof deck. See drawings for steel thickness and corrugation depth, non-cellular, interlocking side laps.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for steel decking installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Contract Administrator.
- .2 Inform Contract Administrator of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation after unacceptable conditions remedied and after receipt of written approval to proceed from Contract Administrator.

3.2 PREPARATION

.1 Locate bundles of deck materials to prevent overloading of supporting members.

.2 Install temporary shoring before placing deck panels, if required to meet deflection limitations.

3.3 ERECTION

.1 Structural steel work: in accordance with CSSBI 10M, CSA S136 and CSSBI 12M.

.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 or CSA W55.3 for resistance welding.

.4 Erect steel deck as indicated and in accordance with CSSBI 12M, CSSBI 10M and CSA S136 and in accordance with reviewed erection drawings.

.5 Butt ends: to 1.5 to 3 mm gap. Install steel cover plates over gaps wider than 3 mm.

.6 Lap ends: to 50 mm minimum.

.7 Weld and test stud shear connectors through steel deck to steel joists/beams below in accordance with CSA W59.

.8 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.

.9 Prior to concrete placement, steel deck free of soil, debris, standing water, loose mil scale and other foreign matter.

.10 Temporary shoring, if required, designed to support construction loads, wet concrete and other construction equipment. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.

.11 Place and support reinforcing steel as indicated.

.12 Closures: Install closures in accordance with approved details.

.13 Openings and Areas of Concentrated Loads
- .1 No reinforcement required for openings cut in deck maximum 150 mm square.
- .2 Frame deck openings with dimension between 150 to 300 mm as recommended by manufacturer and as shown on the drawings, except as otherwise indicated.
- .3 For deck openings with dimension minimum 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

.14 Connections: Install connections in accordance with CSSBI recommendations as indicated.

3.4 FIELD TOUCH-UP PAINTING

.1 Upon erection completion, mechanically brush clean bolts, rivets, welds, and burned or scratched surfaces.

.2 For galvanized steel surface with damage and without shop coat, repair with field touch up primer.

3.5 CLEANING

.1 Progress 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 General Conditions.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by steel decking installation.

3.7 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and work carried out by testing laboratory approved by Contract Administrator and paid for by the Contractor.

.2 Testing laboratory to inspect steel deck for integrity, accuracy of fabrication and soundness of welds.

.3 Submit test report to Contract Administrator within 14 days after completion of inspection.

.4 Contractor shall facilitate the Contract Administrators inspection of the steel deck by providing an elevated work platform and operator for the Contract Administrators inspection. Allow as much time with the elevated work platform and operator as required for the inspection.

NMS 054100 – STRUCTURAL METAL STUD FRAMING

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 09 21 16 – Gypsum Board Assemblies.

.2 This section includes the requirements for wind load bearing exterior wall stud framing.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM C754 00, Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.

.2 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-1.181 Ready-Mixed Organic Zinc-Rich Coating.

.3 Environmental Choice Program (ECP).
- .1 CCD-047a -98, Paints - Surface Coatings.
- .2 CCD-048-98, Surface Coatings - Recycled Water-borne.

1.3 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.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Contract Administrator.

.4 Divert unused gypsum materials from landfill to recycling facility approved by Contract Administrator.

Part 2 Products

2.1 MATERIALS

.1 Exterior wind bearing studs: Stud size and required spacing to be determined by metal stud designer. Stud depth shall be 152mm and 203mm and the minimum stud gauge shall be 16 gauge (54 mils). Maximum stud spacing shall be 400 on centre complete with floor and double head track.

.2 Metal channel stiffener:67 x 22 mm minimum size, minimum 25ga thick cold rolled steel, galvanized steel.

.3 Insulating strip: rubberized, moisture resistant 3 mm thick foam strip, 12 wide, with self-sticking adhesive on one face, lengths as required.

2.2 DESIGN REQUIREMENTS

.1 For design and details of wind bearing exterior wall metal stud framing systems, submit Shop Drawings stamped and signed by a qualified Professional Engineer, licensed in the Province of Ontario, and experienced in structural design.

.2 Design wind load shall be determined in accordance with Section 4 of the latest adopted version of the Ontario Building Code. Normal Importance.

Part 3 Execution

3.1 ERECTION

.1 Align partition tracks at floor and ceiling and secure as indicated on drawings.

.2 Place studs vertically at the required spacing and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.3 Erect metal studding to tolerance of 1:1000.

.4 Attach studs to bottom and ceiling track using screws.

.5 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.6 Co-ordinate erection of studs with installation of door frames and special supports or anchorage for work specified in other Sections.

.7 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.8 Install heavy gauge single jamb studs at openings.

.9 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.10 Frame openings and around built in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.11 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.12 Extend partitions to underside of slab except where noted otherwise on drawings.

.13 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50 leg ceiling tracks.

.14 Install continuous insulating strips to isolate studs from un-insulated surfaces.

.15 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

.16 Provide double head track under structural components to accommodate anticipated vertical deflection.

3.2 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

NMS 055000 – METAL FABRICATIONS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 20 00 – Masonry.

.2 Section 09 91 00 – Painting.

1.2 REFERENCES

.1 ASTM
- .1 ASTM A36/A36M-00a Standard Specification for Carbon Structural Steel.
- .2 ASTM A53/A53M-99b Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .3 ASTM A269-00 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .4 ASTM A307-00 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- .5 ASTM A653/653M -00 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
- .6 ASTM A666-00 Standard Specification for Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.
- .7 ASTM A1008/A1008M-00 Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .8 ASTM A1011/A1011M-00 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy And High-Strength Low-Alloy with Improved Formability.

.2 CSA
- .1 CSA G40.20/G40.21-98 General Requirements for Rolled or Welded Structural Quality Steels/ Structural Quality Steels.
- .2 CAN/CSA-G164-M92 Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CAN/CSA-S16.1-M89 Limit States Design of Steel Structures.
- .4 CSA S136-94 Cold Formed Steel Structural Members.
- .5 CSA W59-1989 Welded Steel Construction (Metal Arc Welding).

.6 CSA W47.1-92(R1998) Certification of Companies for Fusion Welding of Steel Structures.
.7 CSA W48.1-M1991 Carbon Steel Covered Electrodes for shielded Metal Arc Welding.
.8 CSA W55.3-1965 Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.3 CGSB
.1 CAN/CGSB-1.40-97 Anti Corrosive, Structural Steel, Alkyd Primer.
.2 CAN/CGSB-1.108-M89 Bitumastic Solvent type paint.
.3 CAN/CGSB-1.181-M92 Ready-Mixed Organic Zinc-Rich Coating.
.4 CGSB 1-GP-171M, Coating Inorganic Zinc.

1.3 WORK INCLUDED

.1 The work specified under this Section includes all labour, equipment and materials necessary for the complete supply and installation of metal fabrications listed in the Schedule of Fabrications in Part 3 of this section, unless specifically designated to be supplied only.

.2 Work includes, but is not limited to, fabrications listed in the Schedule in Part 3. Provide other fabrications not listed but indicated on the Drawings. Examine the Drawings thoroughly to determine complete scope of work.

.3 Include shop painting where required.

.4 Provide complete with all hardware necessary for secure installation.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.3 Provide shop drawings bearing the stamp of a Professional Engineer licensed in Ontario for all metal fabrications.

Part 2 Products

2.1 MATERIALS

.1 Structural steel sections and plates: to CSA G40.20/G40.21, Grade 300W. Conform to ASTM A36/A36M for steel sections not manufactured in Canada.

.2 Steel pipe: to ASTM A53/A53M extra strong, hot dipped galvanized finish.

.3 Hollow Structural Sections: to CSA G40.20/G40.21, Grade 350W.

.4 Sheet Steel: to ASTM A1011/A1011Mand ASTM A1008/1008M.

.5 Galvanized Sheet Steel: Hot dipped galvanizing as specified in ASTM A653/653M, structural quality sheets. Must be specially treated by a phosphate conversion process if steel is to be exposed and finish painted.

.6 Welding materials: to CSA W59 and W48.1 for steel and CSA W59.2 for aluminum. Weld stainless steel to mild steel using stainless steel electrodes. Weld aluminum that is to be

anodized later with aluminum alloy 5356 welding rod.

.7 Bolts and anchor bolts: to ASTM A307 (standard connections A325), minimum 12.5mm (½") diameter, c/w washers and nuts; lengths as indicated.

.8 Sleeve Anchors: 12.5mm (½") diameter, carbon steel anchors, ultimate tensile load capacity of 13 kn, ultimate shear load capacity of 17 kn when used in 14 MPa (2000psi) concrete, 65mm (2 ½") embedment. Acceptable products:
- .1 Rawl Lok/Bolt.
- .2 Hilti SVA.
- .3 Ramset Dynabolt.
- .4 Contract Administrator approved equivalent.

.9 Galvanizing: hot dipped galvanizing with zinc coating 600 g/sq.m. (2oz. per sq. ft.) to CAN/CSA-G164. All steel required to be hot-dipped galvanized and later painted shall have an unpassivated surface treatment or wipe coat treatment depending on use and location of the steel. Steel required to be hot-dipped galvanized but not painted later may be supplied with the standard passivated treatment.

.10 Shop coat primer: anti-corrosive type to CAN/CGSB-1.40. Use products manufactured by the same company that supplies finish painting under Section 09 91 00 - Painting.

.11 Zinc primer: zinc rich, ready mix to flowable, 24h, MPa 15 pull-out strength 7.9 Mpa.

.12 Aluminum for structural applications: Aluminum Association alloy 6351-T6, mill finish unless otherwise specified.

.13 Aluminum for general purpose architectural work (doors, windows, handrails, storefronts, light fixtures, signs): AA6063-T5.

.14 Stainless steel: for all metal fabrications unless otherwise noted to be type 316L with an AISI Satin Lustre finish.

.15 Bitumastic Coating: Acceptable products:
- .1 Koppers Bitumastic 50.
- .2 Contract Administrator approved equivalent.

.16 Metal Filler: polyester based. Acceptable products:
- .1 Combo or First Choice by Dura Chemicals Ltd., Hamilton, Ontario.
- .2 White Lightning by Marsden Ltd.
- .3 Contract Administrator approved equivalent.

.17 Non-Shrink Grout: Non-shrink, non-metallic, flowable, 24h, MPa 15, pull-out strength 7.9 MPa. Acceptable products:
- .1 Axpandcrete Set Grout by Anti-Hydro Canada Ltd.
- .2 Tartan No-Iron Grout by Webster & Sons Ltd.
- .3 M-Bed by Sternson Ltd.
- .4 Sealtight V-3 Non-Metallic Grout by W. R. Meadows of Canada Ltd.
- .5 InPakt by C. C. Chemicals Ltd.
- .6 Contract Administrator approved equivalent.

2.2 FABRICATION

.1 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Fabricate items from steel unless otherwise noted.

.3 Use self-tapping shake-proof fully countersunk flat headed screws on items requiring assembly by screws.

.4 Where possible, fit and shop assemble work, ready for erection.

.5 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.6 Provide all bolts, fastenings, grouts, anchors and accessories necessary for complete installation of each item.

.7 Supply and install all fabrications listed in the Schedule of Fixtures listed in Part 3 following unless specifically designated to be supplied only. Provide all other items not listed here but indicated on the Drawings.

2.3 PRODUCTS

.1 See Schedule of Fabrications in Part 3 of this Section. Examine Drawings for other fabrications indicated.

Part 3 Execution

3.1 EXAMINATION

.1 Examine and obtain all necessary measurements of previously executed work which may affect the work of this section.

.2 Report any discovered discrepancies to the Contract Administrator so that instructions can be given for any remedial action.

3.2 ERECTION – GENERAL

.1 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.2 Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields and toggles to provide secure installation.

.3 Make field connections with bolts to CAN/CSA-S16.1 or weld.

.4 Provide items for casting into concrete or building into masonry to appropriate trades, together with setting templates.

.5 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.6 Touch-up galvanized surfaces with zinc primer where burned by field welding.

.7 Isolate dissimilar metals from contact with each other with Bitumastic coating, neoprene, or other approved material.

3.3 SURFACE PREPARATION AND SHOP PAINTING

.1 Clean, prepare and shop prime all ferrous metal fabrications in accordance with CAN/CSA-S16.1 and CSA S136 except where members are encased in concrete or where a specific preparation is specified.

.2 Apply one shop coat of primer to metal items, with exception of stainless steel, aluminum, galvanized or concrete encased items.

.3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg.C. Prime all metals that do not receive galvanized coating.

.4 Clean surfaces to be field welded; do not paint.

.5 Shop prime within 4 hours of white blast and near white blast where steel blasting is specified.

3.4 SCHEDULE OF FABRICATIONS

.1 ANCHOR BOLTS:
- .1 Low Carbon steel conforming to ASTM A307 cadmium plated American standard threads, bending and configuration as indicated or as specifically recommended by the fabrication manufacturer.

.2 CONCRETE ANCHORS:
- .1 For securing metal fabrications to concrete and masonry surfaces: stainless steel anchors of a size and spacing suitable to maintain the specified strength requirements for the item.
- .2 Recommended Concrete Anchor manufacturers:
  - .1 Hilti Canada Ltd.
  - .2 Star Expansion.
  - .3 ITW Canada Limited.
  - .4 Ramset Limited.
  - .5 Rawl.
  - .6 Contract administrator approved equivalent.

.3 ANGLE LINTELS:
- .1 Steel angles: hot dipped galvanized for exterior applications, prime painted elsewhere, sizes indicated for openings. Provide 200 mm (8") minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.

.4 GUARDRAIL TYPE 1: (balustrade type)
- .1 Fabricate top and bottom rails and vertical posts from standard weight 1 ½" IPS schedule 40 round steel pipe, 48 mm (1.9") nominal outside diameter, formed to shapes and sizes indicated, with mitred and welded joints ground and buffed to provide a smooth surface.
- .2 Provide 12.5mm (½") dia balusters @ 200mm (8") c/c and weld to rails.
- .3 Provide posts where indicated, but not less than 1800 mm (6 ft) apart.
- .4 Secure to concrete with purpose made brackets and expansion bolts.
- .5 Hot dip galvanize external pipe railings after fabrication. Prime paint interior guardrails.
- .6 Railing Design: Notwithstanding above noted post and rail sizes, railing design shall be such that it is capable of withstanding loads as specified in section 3 and 4 of the Ontario Building Code.

.5 RAILINGS AT STAIRS:
- .1 Match Guardrail Type 1 design, specified above. See Drawings for types.

.6 WALL RAILINGS AT CONCRETE STAIRS AND RAMPS:
- .1 At interior and exterior steps and ramps with straight runs.
- .2 Wall supported round rail Type 1 ½" IPS, schedule 40 steel pipe.
- .3 Return railing ends back to within 12mm (½") of supporting wall, as detailed.
- .4 Galvanize exterior railings after fabrication; prime paint elsewhere.

.7 ACCESS LADDERS:
- .1 Siderails: 75x50x6mm (3"x2"x1/4") hollow steel section (self supporting). Where indicated or required, extend side rails to 1070 mm above landing or roof top level. Flare extended portion of ladders to 600 mm wide and brace for rigid assembly.
- .2 Rungs: 20 mm (¾" diameter steel punched and welded to stringers at 300 mm (12") o.c.
- .3 Brackets: bent steel plate, 10 x 64mm (3/8" x 2 ½") material, 7.5 mm (3") leg against wall, weld to inside face of stringers at 1500mm (5 feet) c.c., complete with fixing anchors.
- .4 Centre rungs min 150 mm (6") from face of wall.
- .5 Provide 600mm (24") dia round safety hoops at all ladders where height between levels served exceeds 5000 mm (16"-5").
- .6 Provide lockable aluminum cage gate and ladder security panel for all caged ladders.
- .7 Finish to all components: prime paint interior applications; hot dip galvanize exterior applications.

.8 VEHICLE BUMPER POSTS (BOLLARDS):
- .1 Provide 300 mm (12") dia; schedule 80 (double extra strong) steel pipe.
- .2 Provide 900 mm (3 ft) dia. concrete foundations with 300 mm (12") cover at bottom.
- .3 Fill posts solid with concrete; round off at top.
- .4 Install bollards such that 1220 mm (4 ft) is above grade.
- .5 Yellow HDPE or PVC sleeve cover over bollards with two red reflective bands at top.

.9 STAIR LANDINGS:
- .1 All welded steel construction, channel shaped perimeter frame forming minimum 50mm high floor base.
- .2 Frame against walls to be minimum C8x11.5; outside perimeter frame and stair stringers supporting guardrail posts to be C10x15.3.
- .3 Provide steel substructure fabricated from angles, channels or HSS to support grating and steps. Weld to perimeter framing. Design to support loading and meet deflection requirements indicated.
- .4 Weld piperails to top of channel frames and channel stringers.
- .5 Finish to all components: prime paint interior applications; hot dip galvanize for all applications.

.10 GRATING AND STEPS TO LANDINGS:
- .1 All welded, 32 x 3.2mm (approx 1.25" x .125") bearing bars @25 mm (1") c/c, cross bars at 100 mm (4") c/c, all edges banded. Supply in sections as indicated and weld or bolt to perimeter channel framing. Acceptable products:
  - .1 Flowforge Type 30 Grating.
  - .2 Contract Administrator approved equivalent.
- .2 Steps to be prefabricated open grating type with cast abrasive nosing, approx. 308mm (12.125") wide x length to suit stringers, all welded construction, widths indicated. Secure through end plates to stringers with bolts.
- .3 Finish to all components: hot dipped galvanize for all applications.

3.5 CLEAN-UP

.1 At the completion of the work of this Section, remove any excess materials, debris and equipment from the site.

NMS DIVISION 6 SPECIFICATIONS

Special Provision

The following Division 6 National Master Specifications are included in this Contract.

NMS 060573 – WOOD TREATMENT

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

1.2 REFERENCES

.1 AWPA.M4-80 Care of Preservative-Treated Wood Products.

.2 AWPA.M2-81 Inspection of Treated Timber Products.

.3 CAN/CSA-O80.201-M89 Standard for Hydrocarbon Solvents for Preservatives.

.4 CSA O80 Series -97 Wood Preservation.

1.3 SOURCE QUALITY CONTROL

.1 Plant inspection of products treated with preservative by pressure impregnation will be carried out by designated testing laboratory to AWPA.M2.

1.4 CERTIFICATES

.1 For products treated with preservative fire-retardant by pressure impregnation submit following information certified by authorized signing officer of treatment plant:
- .1 Information listed in AWPA.M2 applicable to specified treatment.
- .2 Moisture content after drying following treatment with water-borne preservative.
- .3 Acceptable types of paint, stain, and clear finishes that may be used over treated materials to be finished after treatment.

Part 2 Products

2.1 GENERAL

.1 See the Drawings and/or Section 06 10 11 – Rough Carpentry, and Section 06 20 00 - Finish Carpentry, for list of all materials required to be pressure fire retardant treated.

2.2 PRESSURE TREATMENT PRESERVATIVE

.1 Treat lumber material to CSA O80.4M and panel material to CSA O80.1M and O80.9M.

.2 Use chromated arsenate type preservative applied by a licensee treatment plant of Timber Specialties Ltd., Mississauga, Ont., in a closed cylinder by vacuum- pressure process in strict accordance with recommendations of CSA O80.

.3 Minimum retention of dry salts shall be according to oxide formulations which are 4.0 kg per cu m (0.25 lbs per cu ft) of wood.

.4 Use preservative manufacturer's recommended solvent to CSA O80.201.

.5 Following water-borne preservative treatment, dry material to maximum moisture content of 12%.

.6 All material required to receive preservative or fire retardant treatment shall receive such treatment prior to any fabrication or installation.

.7 Acceptable products:
- .1 C-50 CCA by Timber Specialties Ltd.
- .2 Contract Administrator approved equivalent.

2.3 SURFACE APPLIED PRESERVATIVE

.1 5% pentachlorophenol solution, water repellant preservative. Use clear material for surfaces to be painted or left exposed; coloured material for concealed areas. Acceptable products:

- .1 Clear:
  - .1 Pentox Clear by Osmose Pentox Inc.
  - .2 10-10 Paintable Penta by Solignum Inc.
  - .3 Contract Administrator approved equivalent.
- .2 Coloured:
  - .1 Pentox Green by Osmose Pentox Inc.
  - .2 Woodlife by Lepages.
  - .3 Preserv-Green 1-42 by Solignum Inc.
  - .4 Contract Administrator approved equivalent.

Part 3 Execution

3.1 PRESSURE TREATED WOOD PRESERVATIVE

.1 Pressure treat exposed exterior lumber including the following:
- .1 Any wood in direct contact with the ground.

.2 Install as per manufacturers' directions.

3.2 SURFACE-APPLIED WOOD PRESERVATIVE

.1 Surface apply material to those areas indicated on the Drawings including the following:
- .1 Wood cants, fascia backing, curbs, nailers, sleepers, or other supports related to

roofing work.

.2 Wood furring where used on outside surface of exterior masonry and concrete walls.

.3 Wood sleepers or framework supporting wood subflooring over concrete slabs in contact with ground or fill.

.4 Shims for pressure treated lumber.

.5 All wood members in contact with concrete or masonry surfaces. Such material shall also be separated from concrete or masonry by a layer of building paper.

.2 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.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

3.3 FIELD TREATMENT OF PRESERVATIVE TREATED PRODUCTS

.1 Comply with AWPA.M4.

.2 Remove with fine sandpaper, chemical deposits on treated wood to receive applied finish.

3.8 CLEAN-UP

.1 At the completion of the work of this Section, remove any excess materials, debris and equipment from the site.

NMS 060899 – ROUGH CARPENTRY FOR MINOR WORKS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 05 73 – Wood Treatment.

.2 Section 07 27 00 – Air Barrier.

.3 Section 07 55 00 – Modified Bituminous Roofing Membrane.

.4 Section 09 91 00 – Painting.

1.2 REFERENCES

.1 ASTM C1177/C1177M-96, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

.2 ASTM C1280-99, Standard Specification for Application of Gypsum Sheathing.

.3 CAN3-O188.1-M78, Interior Mat Formed Wood Particleboard.

.4 CAN O437 Series-93, Standards on OSB and Waferboard.

.5 CAN/CGSB-11.3-M87, Hardboard.

.6 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

.7 CAN/CSA-O141-91, Softwood Lumber.

.8 CSA A123.3-M1979 (R1992) Asphalt or Tar Saturated Roofing Felt.

.9 CSA B111-1974 - Wire Nails, Spikes and Staples.

.10 CSA O80 Series-97 Wood Preservation.

.11 CSA O121-M1978, Douglas Fir Plywood.

.12 CSA O151- M1978, Canadian Softwood Plywood.

.13 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber, 1987.

.14 Ontario Building Code (OBC), Ontario Regulation 403/97.

.15 Underwriters Laboratories of Canada (ULC), latest edition.

1.3 SHOP DRAWINGS

.1 Submit Shop Drawings of Prefabricated Structural Wood Members, if any are indicated, in accordance with Division 1. Include joists and laminated beams and posts. Indicate all connections and hangers between components.

1.4 SOURCE QUALITY CONTROL

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

Part 2 Products

2.1 LUMBER MATERIAL

.1 General: Lumber for each structural or architectural component shall be of the same species and grade. Unless specified otherwise, all lumber for rough carpentry to be softwood, SPF Species, S4S (surfaced four sides), moisture content 19% or less conforming to CAN/CSA-O141and NLGA.

.2 Framing Members: SPF No. 2 or better grade.

.3 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:

- .1 SPF Standard or better grade.
- .2 S2S (surfaced two sides) is acceptable for nailing strips, grounds and sleepers; otherwise use S4S.
- .3 Board sizes: "Standard" or better grade.
- .4 Dimension sizes: "Standard" light framing or better grade.
- .5 Post and timbers sizes: "Standard" or better grade.

.4 Lumber material designated as "pressure treated" to be White Jack Pine, No. 1 grade.

.5 Glued end-jointed (finger jointed) lumber is not acceptable.

2.2 PANEL MATERIALS

.1 Panels to be of thicknesses indicated and comply to the following standards. Grades for panel work shall be as indicated under "Panel Materials - End Uses" clause of this section.

.2 Douglas fir plywood (DFP): to CSA O121.

.3 Marine Ply: DFP treated for water resistance.

.4 Canadian softwood plywood (CSP): to CSA O151.

.5 Interior mat-formed wood particleboard: to CAN3 O188.1.

.6 Waferboard: to CSA O437 Series.

.7 Hardboard: to CAN/CGSB-11.3.

.8 Glass Mat Sheathing Panels for exterior wall sheathing:
- .1 Glass mat-embedded, water resistant gypsum core panel with bond enhancing surface coating manufactured in accordance with ASTM C1177/1177M. Provide 12.7 mm (½") thick in largest panels available to minimize joints.
- .2 Provide the following accessories:
  - .1 Joint Tape: 51 mm (2") 10 x 10 fibreglass mesh tape.
  - .2 Joint Compound: Georgia-Pacific Canada Inc GyProc 90 setting-type compound.
  - .3 Fasteners: Provide size and type in accordance with manufacturer's recommendations.
  - .4 Sealant: Dow Corning 795 or equivalent.
- .3 Acceptable products:
  - .1 Dens-Glas Gold by Georgia-Pacific Canada Inc., Mississauga.
  - .2 Contract Administrator approved equivalent.

2.3 FASTENERS AND ACCESSORIES

.1 Nails, spikes and staples: to CSA B111.

.2 Bolts: 12.5 mm (½") diameter unless indicated otherwise, complete with nuts and washers.

.3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, to be as recommended for purpose by manufacturer.

.4 Sill Gaskets: continuous closed cell polyethylene strip, minimum 12 mm (½") thick, width to suit plate width. Acceptable products:
- .1 Ethafoam 2211 by Dow Chemical.
- .2 2220X Perma-Stik by Jacobs & Thompson Inc.
- .3 Contract Administrator approved equivalent.

.5 Galvanizing: to CAN/CSA-G164; use galvanized fasteners for exterior work, interior highly humid areas, and for any preservative or fire-retardant treated lumber.

.6 Building Paper Type: No. 15 asphalt saturated felt to CSA A123.3.

2.4 WALL AIR BARRIER

.1 See Section 07 27 00 – Air Barriers, for materials.

2.5 WOOD TREATMENT

.1 See Section 06 05 73 – Wood Treatment, for materials.

2.6 PANEL MATERIALS – END USES

.1 Roof sheathing: DFP, unsanded exterior sheathing grade, square edges, 12.7mm (½") thick.

.2 Wall Sheathing: glass matt sheathing panel for areas to receive masonry veneer or siding.

.3 All other locations: CSP, G1S, thickness as indicated.

Part 3 Execution

3.1 FURRING AND BLOCKING

.1 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.

.2 Align and plumb faces of furring and blocking to tolerance of 1:600.

3.2 NAILING STRIPS, GROUNDS AND ROUGH BUCKS

.1 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

3.3 CANTS, CURBS, BACKING, SUPPORTS

.1 Install wood cants, fascia backing, curbs, nailers, and other wood supports as required and secure using galvanized steel fasteners.

.2 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation if detailed for roof hoppers.

3.4 ERECTION OF FRAMING MEMBERS

.1 Install members true to line, levels and elevations.

.2 Construct continuous members from pieces of longest practical length.

.3 Install continuous sill gaskets under sill plates on concrete or masonry walls.

.4 Comply with local and provincial authorities regarding provisions for hold-down clips and anchors at roof/wall connections.

3.5 AIR BARRIER INSTALLATION

.1 See Section 07 27 00 – Air Barriers, for installation.

3.6 GLASS MAT SHEATHING

.1 Provide glass matt sheathing to exterior walls to receive masonry veneer and siding.

.2 Install in accordance with manufacturer's instructions and applicable instructions in ASTM C1280.

.3 Examine sub-framing; verify that surface of framing and furring members to receive sheathing does not vary more than 6.4 mm (1/4") from the plane of faces of adjacent members.

.4 Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.

.5 Locate fasteners minimum 9.5 mm (3/8") from edges and ends of sheathing panels.

3.7 SURFACE-APPLIED WOOD PRESERVATIVE

.1 See Section 06 05 73 – Wood Treatment.

3.8 PRESSURE TREATED WOOD PRESERVATIVE

.1 See Section 06 05 73 – Wood Treatment.

3.9 FASTENERS

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

3.10 CLEAN-UP

.1 At the completion of the work of this Section, remove any excess materials, debris and equipment from the site.

NMS 061011 – ROUGH CARPENTRY

Special Provision

Part 1 General

1.1 SOURCE QUALITY CONTROL

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

1.2 PRODUCT HANDLING

.1 Store all lumber and other materials in a dry place and protect them completely from dampness and damage.

Part 2 Products

2.1 LUMBER MATERIAL

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:

.1 CAN/CSA-O141-91(R1999).
.2 NLGA Standard Grading Rules for Canadian Lumber, latest edition.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Furring, blocking, nailing strips, rough bucks, soffit framing and wall plates.
.1 Board sizes: "Standard" or better grade.
.2 Dimension sizes: "Standard" light framing or better grade.

2.2 FASTENINGS AND HARDWARE

.1 Nails, spikes and staples: to CSA B111-1974(R1998).

.2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.3 Galvanizing: to CSA G164-M92 (R1998), use galvanized fasteners in attic area, exterior work, interior highly humid areas, and for preservative treated lumber.

.4 Use surface fastenings of following types, except where specific type is indicated:
.1 To hollow masonry, drywall and panel surfaces use toggle bolt.
.2 To solid masonry and concrete, use expansion shield with lag screw or bolt.
.3 To structural steel, use bolts through drilled hole, or welded stud-bolts or power driven self-drilling screws.

.5 Supply fastenings which are to be built into work of other trades to the applicable trade with written instructions and/or necessary templates.

2.3 WOOD PRESERVATIVE

.1 Pressure-treated wood, CCA or CA: to CSA O80 Series for elements concealed within walls or roofing.

Part 3 Execution

3.1 CONSTRUCTION

.1 Comply with requirements of the Ontario Building Code, Part 9, supplemented by the following paragraphs.

3.2 FURRING AND BLOCKING

.1 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascias, soffits, siding, and other work as required.

.2 Align and plumb faces of furring and blocking to tolerance of 1:600.

3.3 LUMBER

.1 Install soffit framing, wall plates, rough bucks, nailers, and framing for rough openings as required to provide backing and support and other work.

3.4 FASTENERS

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

3.5 SURFACE-APPLIED WOOD PRESERVATIVE

.1 Treat surfaces of material with wood preservative, before installation.

.2 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.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.4 Treat following material:
- .1 Wood cants, fascia and trim backing, curbs, nailers, plywood sheathing to walls and parapets.
- .2 Wood blocking in cavity walls on perimeter of window openings and louvres, etc.

.5 Pressure-treated lumber and plywood in lieu of surface- applied wood preservative is acceptable.

3.6 ELECTRICAL EQUIPMENT BACKBOARD

.1 Provide backboards for mounting electrical equipment as indicated. Use 19 mm thick Douglas fir plywood (GIS) on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing.

.2 Secure furring to masonry or concrete surfaces using anchors as specified, or indicated.

NMS 061053 – MISCELLANEOUS ROUGH CARPENTRY

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 11 – Rough Carpentry.

.2 Section 06 17 53 – Shop Fabricated Wood Trusses.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/National Particleboard Association (ANSI/NPA)
- .1 ANSI/NPA A208.1-2009 Particleboard.

.2 ASTM International (ASTM)
- .1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A153/A153M-09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .3 ASTM A307-14 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
- .4 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5 ASTM D 5055-13e1, Standard Specification for Establishing and Monitoring

Structural Capacities of Prefabricated Wood I-Joists.
.6 ASTM D 5456-14b, Standard Specification for Evaluation of Structural Composite Lumber Products.
.7 ASTM F1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-11.3-M87, Hardboard.
.2 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.4 Canadian Wood Council
.1 Wood Design Manual 2010 (R2014) Edition.
.2 Engineering Guide for Wood Frame Construction 2014.

.5 CSA Group (CSA)
.1 CAN/CSA-A123.2-14, Asphalt Coated Roofing Sheets.
.2 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
.3 CSA O86-14 Engineered Design in Wood.
.4 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
.5 CSA O121-08 (R2013), Douglas Fir Plywood.
.6 CSA O141-05 (R2014), Softwood Lumber.
.7 CSA O151-09 (R2014), Canadian Softwood Plywood.
.8 CSA O153-13, Poplar Plywood.
.9 CSA O325-07 (R2012), Construction Sheathing.
.10 CAN/CSA-S406-92 (R2008), Construction of Preserved Wood Foundations.
.11 CAN/CSA-Z809-08, Sustainable Forest Management.

.6 Forest Stewardship Council (FSC)
.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.7 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2010.

.8 National Research Council Canada (NRC)
.1 National Building Code of Canada 2015 (NBC).

.9 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
.1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.10 Sustainable Forestry Initiative (SFI)
.1 SFI-2015-2019 Standard.

.11 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S706-09, Standard for Wood Fibre Insulating Boards for Buildings.

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 wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Include manufacturer's pre-engineered floor, ceiling and roof joist span charts, and

manufacturer's pre-engineered installation details.

.3 Submit certified test reports for prefabricated structural members from approved independent laboratory indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Submit CCMC Product Evaluation Report for engineered wood products.

.5 Submit manufacturer's installation instructions.

.3 Shop Drawings:

.1 For structural applications or conditions beyond the scope of the manufacturer's pre-engineered design information, submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.2 Include on drawings:

.1 Design data in accordance with CAN/CSA-O86 and CWC Engineering Guide for Wood Frame Construction.

.2 Indicate configuration and spacing of joists, hanger and connector types, fasteners, locations and design values; bearing details.

.3 Submit stress diagrams or print out of computer design indicating design loads for members. Indicate allowable load and stress increase.

.4 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with the General Conditions 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 materials off ground with moisture barrier at both ground level and as a cover forming a well-ventilated enclosure, with drainage to prevent standing water.

.3 Store wood I-beams and I-joists on edge.

.4 Stack, lift, brace, cut and notch engineered lumber products in strict accordance with manufacturer's instructions and recommendations.

.5 Store and protect architecturally exposed lumber from nicks, scratches, and blemishes.

.6 Replace defective or damaged materials with new.

.7 Store separated reusable wood waste convenient to cutting station and work areas.

Part 2 Products

2.1 STRUCTURAL FRAMING

.1 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:

.1 CSA O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Glued end-jointed (finger-jointed) lumber SPS, are not acceptable for use.

.3 Plant fabricated structural wood:

.1 Proprietary prefabricated I-joists of solid, laminated veneer lumber glue laminated lumber flanges or oriented strandboard panel web, with factory pre-punched knock-

out holes for electrical services and ventilation holes for roof joists.

.2 Proprietary prefabricated open web parallel chord joists of solid, laminated veneer lumber glue laminated lumber flanges or oriented strandboard panel web, with factory pre-punched knock-out holes for electrical services and ventilation holes for roof joists.

.3 Adhesive: Exterior rated phenol-formaldehyde or phenol-resorcinol: to CSA O112.9.

.4 Plant fabrication with quality control in accordance with ASTM D 5055.

.4 Structural Composite Lumber (SCL) in accordance with ASTM D 5456, for following uses:

.1 Laminated veneer lumber (LVL): beams, hip and valley rafters, headers as indicated.

.2 Parallel strand lumber (PSL): headers and beams as indicated.

.3 Laminated strand lumber (LSL): studs as indicated.

.4 Oriented strand lumber (OSL): studs as indicated.

.5 Framing and board lumber: in accordance with NBC.

2.2 FURRING AND BLOCKING

.1 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:

.1 S2S is not acceptable.

.2 Board sizes: "Standard" or better grade.

.3 Dimension sizes: "Standard" light framing or better grade.

.4 Post and timbers sizes: "Standard" or better grade.

.2 Where indicated, provide pressure treated materials for furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers.

2.3 PANEL MATERIALS AND APPLICATION

.1 Roof sheathing:

.1 Plywood, DFP sheathing grade, square edge.

.2 Exterior/Interior wall sheathing:

.1 Plywood, DFP sheathing grade, square edge.

.2 Use one side good plywood when paint finish is specified.

.3 Subflooring:

.1 N/A.

.4 Underlay:

.1 N/A.

.5 Electrical equipment mounting boards and all wall mounting boards:

.1 Plywood, DFP grade, square edge, minimum 16mm thick.

.2 Fire retardant treated.

.6 Where indicated, provide pressure treated panel materials in accordance with CSA 080.

2.4 MATERIALS AND PRODUCTS FOR TREATED WOOD FOUNDATIONS

.1 Lumber and panel materials: to CAN/CSA-S406.

.1 Preservative treatment in accordance with CSA O80.

.2 Fasteners and connectors, moisture barrier, sealant and field applied preservative: to CAN/CSA-S406.

2.5 ACCESSORIES

.1 Subflooring adhesive: to CAN/CGSB-71.26, cartridge loaded.

.2 General purpose adhesive: to CSA O112.9.

.3 Nails, spikes and staples: to ASTM F1667.

.4 Bolts: 12.5 mm diameter unless indicated otherwise, hot dip galvanized, complete with nuts and washers.

.5 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.

.6 Joist hangers, connectors and fasteners: in accordance with accepted shop drawings, minimum 1 mm thick sheet steel, galvanized to minimum ZF001 coating designation.

.7 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, formed to prevent dishing. Bell or cup shapes not acceptable.

.8 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Contract Administrator.

.9 Fastener Finishes:
- .1 Galvanizing: to ASTM A123/A123M, use galvanized fasteners for all areas
- .2 Proprietary corrosion resistant fasteners for pressure- preservative, fire-retardant, treated lumber: as recommended by manufacturer for material and service conditions.

.10 Wood Preservative: to CSA O80.

.11 Sill Plate Gasket: Closed cell polyethylene foam gasket in width to match sill plate width, 6 mm thick.

Part 2 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Contract Administrator.
- .2 Inform Contract Administrator 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 the Contract Administrator.

3.2 SYSTEMS INTEGRATION

.1 Install air barrier and vapour retarder sheeting around framing members to ensure continuity of protection and to lap and seal to main sheets.

.2 Install insulation in exterior wall framing cavities that will not be accessible after completion of framing.

.3 Install sill plate gasket in continuous lengths between concrete surfaces and wood framing.

3.3 FRAMING INSTALLATION

.1 Install engineered framing and plant fabricated structural wood components, including all hangers, connectors and fasteners, in accordance with accepted shop drawings and manufacturers' instructions.

.2 Install members true to line, levels and elevations, square and plumb.

.3 Construct continuous members from pieces of longest practical length.

.4 Install spanning members with "crown-edge" up.

.5 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.6 Countersink bolts where necessary to provide clearance for other work.

.7 Install specified panel product for each application.

.8 Install wall sheathing in accordance with manufacturer's printed instructions and accepted shop drawings.

.9 Install roof sheathing in accordance with requirements of NBC and accepted shop drawings.

.10 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

3.4 FURRING AND BLOCKING

.1 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding, electrical equipment mounting boards, and other work as required.

.2 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.
.1 Align and plumb faces of furring and blocking to tolerance of 1:600.

.3 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.4 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.

.5 Install sleepers as indicated.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning.

3.6 WASTE MANAGEMENT

.1 Separate waste materials for recycling and reuse in accordance with the General Conditions.

.2 Re-use scrap lumber to the greatest extent possible. Separate scrap lumber for use on site as accessory components, including: shims, bracing, and blocking.

.3 Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill. Prevent saw dust and wood shavings from entering the storm drainage system.

.4 Do not burn scrap lumber that has been pressure treated.

.5 Do not send lumber treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by rough carpentry installation.

NMS 061753 – SHOP FABRICATED WOOD TRUSSES

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 11 – Rough Carpentry.

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA)
- .1 CAN/CSA O80 Series-08, Wood Preservation.
- .2 CSA O86 Consolidation-09, Engineering Design in Wood.
- .3 CSA O141-05 (R2009), Softwood Lumber.
- .4 CSA S307-M1980 (R2001), Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
- .5 CSA S347-99 (R2009), Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
- .6 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel.
- .7 CAN/CSA-Z809-08, Sustainable Forest Management.

.2 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.3 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber 2010.

.4 National Research Council Canada (NRC)
- .1 National Building Code of Canada 2015 (NBC).
- .2 Canadian Construction Materials Centre (CCMC)-on-line edition, Registry of Product Evaluations.

.5 Truss Plate Institute of Canada (TPIC)

.1 TPIC - 2007, Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).

.6 Sustainable Forestry Initiative (SFI)
.1 SFI-2010-2014 Standard.

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 wood trusses 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 the Province of Ontario, Canada.
.2 Include on drawings:
.1 Each shop drawing submission showing connection details.
.2 Indicate special structural application and specification as according to local authorities having jurisdiction.
.3 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates.
.4 Indicate species, sizes, and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.
.5 Submit stress diagram or print-out of computer design indicating design load for truss members. Indicate allowable load and stress increase.
.6 Provide certification that trusses meet requirements of CSA S307 and CSA S347.
.7 Indicate arrangement of webs or other members to accommodate ducts and other specialties.
.8 Show location of lateral bracing for compression members.
.9 Test reports: submit certified test reports for prefabricated wood trusses from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
.10 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.11 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Qualifications:
.1 Fabricator for trusses to show evidence of quality control program such as provided by regional wood truss associations, or equivalent.
.2 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.

.2 Sustainable Standards Certification:
.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

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, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect wood trusses from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for wood truss chords and webs in accordance with engineering properties in CSA O86.

.2 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for truss joint designs to test engineering properties in accordance with CSA S347 and listed in CCMC Registry of Product Evaluations.

.3 Design trusses, bridging, and bracing in accordance with CSA O86.1 for building locality as ascertained by Ontario Building Code (OBC), Climatic Information for Building Design in Ontario and minimum uniform and minimum concentrated loadings stipulated in NBC commentary and for loads indicated on the contract drawings.

.4 Limit live load deflection to 1/360th of span where gypsum board or plaster ceilings are hung directly from trusses.

.5 Limit live load deflections to 1/240th of span unless otherwise specified or indicated.

.6 Provide camber for trusses as indicated.

2.2 MATERIALS

.1 Lumber: SPF, No1/2, softwood, S4S, with maximum moisture content of 19% at time of fabrication and to following standards:
- .1 CSA O141.
- .2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.
- .3 CAN/CSA-Z809 or FSC or SFI certified.

.2 Fastenings: to CSA O86.

.3 Preservative: N/A.

.4 Fire retardant: N/A.

2.3 FABRICATION

.1 Fabricate wood trusses in accordance with reviewed shop drawings.

.2 Provide for design camber and roof slopes when positioning truss members.

.3 Connect members using metal connector plates.

.4 Apply preservative and/or fire retardant in accordance with CAN/CSA O80 Series.

2.4 SOURCE QUALITY CONTROL

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

.2 Certify by agency accredited by Standards Council of Canada that fire retardant and preservative treated wood in accordance with CAN/CSA O80 Series.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Contract Administrator.
- .2 Inform Contract Administrator 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 Contract Administrator.

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 ERECTION

.1 Erect wood trusses in accordance with reviewed shop drawings.

.2 Handling, installation, erection, bracing and lifting in accordance with manufacturer’s instructions.

.3 Make adequate provisions for handling and erection stresses.

.4 Exercise care to prevent out-of-plane bending of trusses.

.5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.

.6 Install permanent bracing in accordance with reviewed shop drawings, prior to application of loads to trusses.

.7 Do not cut or remove any truss material without approval of Contract Administrator.

.8 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
- .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.
- .2 Manufacturer's field services: 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 Schedule site visits to review work at stages listed:
  - .1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.
  - .2 Twice during progress of work at 25% and 60% complete.
- .2 Upon completion of work, after cleaning is carried out.
- .3 Obtain reports within three days of review and submit immediately to Contract Administrator.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

NMS 062000 – FINISH CARPENTRY

Special Provision

Part 1 General

1.1 REFERENCES

.1 ANSI A208.1-1989 Particleboard, Matformed Wood.

.2 CAN3-O188.1-M78 Interior Mat Formed Wood Particleboard.

.3 CAN3-O437.0/0437.1-M85 Waferboard and Strandboard/Test methods for Waferboard and Strandboard.

.4 CAN4-S104-M80(R1985) Fire Tests of Door Assemblies.

.5 CAN4-S105-M85 Fire Door Frames.

.6 CAN/CGSB-11.3-M87 Hardboard.

.7 CAN/CSA-O141-91 Softwood Lumber.

.8 CAN/CSA-G164-M92 Hot Dip Galvanizing of Irregularly Shaped Articles.

.9 CSA B111-1974 Wire Nails, Spikes and Staples.

.10 CSA O115-M1982 Hardwood and Decorative Plywood.

.11 CSA O121-M1978 Douglas Fir Plywood.

.12 CSA O151-M1978 Canadian Softwood Plywood.

.13 National Hardwood Lumber Association (NHLA) Rules for the Measurement and Inspection of Hardwood and Cypress January 1998.

.14 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber 1987.

.15 Quality Standards for Architectural Woodwork published by the Architectural Woodwork Manufacturers Association of Canada (AWMAC), 1998 edition.

1.2 WORK INCLUDED

.1 Fabricate work of this Section in the shop or on site (Contractor's choice). Job measure site conditions when shop fabricated. Install on site. Included are items of both interior and exterior finish carpentry.

.2 Examine Drawings thoroughly to determine extent of items in this section. Include complete supply and installation of all items of finish carpentry indicated.

.3 Work under this Section shall also include:
- .1 Installation only of finish hardware for all doors. Hardware supplied under Section 08 71 00 Door Hardware.
- .2 Installation only of miscellaneous specialty items listed in Division 10 - Specialties, unless specified to be installed by others.
- .3 Supply and installation of wood trims and closet shelving.

1.3 SAMPLES

.1 Submit samples of the following in accordance with Section 01 33 00 – Submittal Procedures:
- .1 Items Duplicate 300 x 300 mm (12" x 12") samples of each type of paneling and each type of solid wood or plywood scheduled to receive stain or natural finish.
- .2 Duplicate 300 mm (12") long samples of each type of trim and molding.as requested.

1.4 SHOP DRAWINGS

.1 Submit shop drawings for any prefabricated carpentry items specified in this section in accordance with Section 01 33 00 – Submittal Procedures.

.2 Clearly indicate details of construction, profiles, jointing, fastening and other related details.

Part 2 Products

2.1 LUMBER MATERIAL

.1 Lumber generally: All lumber to have a maximum moisture content of between 5% and 9% for interior work and between 10% and 15% for exterior work. Lumber selected for natural or clear finish shall be to AWMAC, premium grade. Lumber selected for opaque finish shall be to AWMAC custom grade. See "End Uses" clause of this Section for material grades.

.2 Softwood lumber: to CAN/CSA 0141 and National Lumber Grades Authority requirements,

species as follows:
.1 Type 1: Spruce-pine-fir
.2 Type 2: Cedar
.3 Type 3: Redwood
.4 Type 4: Ontario Pine
.5 Type 5: Finger jointed Ontario Pine.
.6 Type 6: Clear western pine
.7 Type 7: White jack pine.

.3 Hardwood lumber: to National Hardwood Lumber Association (NHLA) requirements, species as follows:
.1 Type 1: Red oak
.2 Type 2: White Oak
.3 Type 3: Birch
.4 Type 4: Mahogany
.5 Type 5: Cherry
.6 Type 6: Maple.

2.2 PANEL MATERIAL

.1 Canadian softwood plywood (CSP): to CSA O151, species limited to those listed in that Standard, grades as indicated under "Panel Material - End Uses" clause of this section.

.2 Douglas fir plywood (DFP): to CSA O121, grades as indicated under "End Uses."

.3 Mahogany plywood: industry standard for use as an underlay.

.4 Mat-formed wood particleboard: to CAN3-O188.1 Grade R, S, T and H, sanded faces, of thickness indicated.

.5 Hardboard: to CAN/CGSB-11.3 Type 2, (tempered), thickness as indicated (minimum 3mm (1/8") thick).

.6 Perforated hardboard: to CAN/CGSB-11.3 Type 2, (tempered), 6 mm thick with 7 mm holes @ 25 mm oc. each way (1/4"thick with 5/16" holes @ 1" oc. each way).

.7 MCP Board: Particleboard to CAN3-O188.1, with plastic laminate factory bonded to all faces. See Section 06 40 23.10 - Plastic Laminates, for laminate grades.

2.3 FASTENERS

.1 Nails and staples: to CSA B111; galvanized for exterior work, interior highly humid areas and for treated lumber; plain finish elsewhere.

2.4 ADHESIVES

.1 As recommended by wood panel manufacturer.

2.5 FINISHING HARDWARE

.1 Finishing Hardware: Supplied by Section 08 71 00 – Door Hardware for installation by this Trade.

2.6 FINISHES

.1 Specified under Section 09 91 00 – Painting & Coatings, to match Contract Administrator's samples.

Part 3 Execution

3.1 GENERAL

.1 Do all finish carpentry work to AWMAC standards.

.2 Set nails and screws, apply wood filler to indentations, sand smooth and leave ready to receive finish.

.3 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

3.2 END USES AND MATERIAL GRADES

.1 Provide grades of material for the following end uses and scheduled finishes: See Drawings for dimensions and extent; see Room Finish Schedules on Drawings or Section 09 91 00 – Painting and Coatings, for finishes description for various surfaces.
- .1 Any wood trim scheduled to receive an opaque finish: softwood type 5.
- .2 Any wood trim scheduled to receive a clear or stained finish: hardwood type 1.

3.3 ERECTION

.1 Set and secure materials and components in place, rigid plumb and square.

.2 Provide heavy duty fixture attachments for wall mounted cabinetwork.

.3 Prepare external exposed and semi-exposed surfaces ready for sealing, staining and varnishing or painting.

.4 Prepare internal non-exposed surfaces ready for sealing with varnish or shellac.

.5 Apply water resistant building paper or bituminous coating over wood framing members in contact with masonry or cementitious construction.

3.4 CLEAN-UP

.1 At the completion of the work of this Section, remove any excess materials, debris and equipment from the site.

NMS 064000 – ARCHITECTURAL WOODWORK

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 013300 – Submittal Procedures.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)
  .1 ANSI A208.1-99, Particleboard.
  .2 ANSI A208.2-94, Medium Density Fiberboard (MDF).

.2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
  .1 AWMAC Quality Standards for Architectural Woodwork, 1994.

.3 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.4 Canadian Standards Association (CSA)
  .1 CSA B111-74(R1998), Wire Nails, Spikes and Staples.
  .2 CSA O112.4-M1977 (R1999), Standards for Wood Adhesives.
  .3 CSA O121-M89 (R1998), Douglas Fir Plywood.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 013300 – Submittal Procedures.

.2 Indicate details of construction, profiles, jointing, fastening and other related details.

.3 Indicate materials, thicknesses, finishes and hardware.

.4 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials of this section in accordance with General Requirements.

.2 Protect millwork against dampness and damage during and after delivery.

.3 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

Part 2 Products

2.1 MATERIALS

.1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:
  .1 CAN/CSA-O141.
  .2 NLGA Standard Grading Rules for Canadian Lumber.
  .3 AWMAC custom premium grade, moisture content as specified.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Hardwood lumber: moisture content 15% or less in accordance with following standards:
  .1 National Hardwood Lumber Association (NHLA).
  .2 AWMAC custom grade, moisture content as specified.

.4 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.5 Laminated plastic for flatwork: GP grade, matte finish. Manufactured by Formica from

standard colour range or Contract Administrator approved equivalent.

.6 Nails and staples: to CSA B111.

.7 Wood screws: plated steel, type and size to suit application.

.8 Splines: wood.

.9 Sealant: clear silicone.

.10 Laminated plastic adhesive: contact adhesive to CAN/CGSB-71.20.
- .1 Test for acceptable VOC emissions in accordance with ASTM D 2369 and ASTM D 2832.
- .2 Acceptable materials: ECP-44.

.11 Counter tops: solid surfacing, 12.7mm thick, matte finish
- .1 Product: Corian, colour: to be selected by Contract Administrator from manufacturer's standard range.
- .2 Acceptable alternates: Contract Administrator approved equal.

2.2 MANUFACTURED UNITS

.1 Casework.
- .1 Fabricate caseworks to AWMAC premium quality grade.
- .2 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.
  - .1 S2S is acceptable for concealed locations.
  - .2 Board sizes: "Standard" or better grade.
  - .3 Dimension sizes: "Standard" light framing or better grade.
- .3 Case bodies (ends, divisions and bottoms).
  - .1 Softwood and poplar plywood square edge, 19 mm thick.
  - .2 All exposed faces and edges covered with plastic laminate.
- .4 Backs.
  - .1 Softwood and poplar plywood square edge, 12 mm thick.
  - .2 Exposed faces and edges covered with plastic laminate.
- .5 Shelving.
  - .1 Softwood and poplar plywood square edge, 19 mm thick.
  - .2 Exposed faces and edges covered with plastic laminate.

.2 Drawers
- .1 Fabricate drawers to AWMAC premium grade supplemented as follows:
- .2 Sides and Backs.
  - .1 Softwood and poplar plywood square edge, 12 mm thick.
- .3 Exposed faces covered with plastic laminate.
- .4 Edges fitted with vinyl colour matched moulding, full thickness of panel material, minimum thickness 3 mm, rounded profile.
- .5 Bottoms.
  - .1 Softwood and poplar plywood 12 mm thick.
- .6 Fronts.
  - .1 Softwood and poplar plywood square edge, 19 mm thick.

.3 Casework Doors
- .1 Fabricate doors to AWMAC premium grade supplemented as follows:
- .2 Softwood and poplar plywood square edge, 19 mm thick.
- .3 Exposed faces covered with plastic laminate.
- .4 Edges fitted with vinyl colour matched moulding, full thickness of panel material, minimum thickness 3 mm, rounded profile.

.4 Counter tops and work surfaces
- .1 Solid surfacing, 32 mm thick, matte finish, with eased edges and field solvent welded and filled joints for monolithic appearance.
- .2 Provide 100 high back splash, and side splashes in same material and finish when installed at a kitchen area.
- .3 Provide 75 mm diameter plastic grommets at holes where cables pass through surface to equipment and outlets located below counters.

.5 Window sills
- .1 19 mm plywood with plastic laminate on exposed surfaces and edges.

2.3 FABRICATION

.1 Provide metal filing drawer sides, bottom and backs with adjustable stops.

.2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.

.3 Shelving to cabinetwork to be adjustable unless otherwise noted.

.4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

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

.6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.

.7 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.8 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 3000 mm. Keep joints 600 mm from sink cutouts.

.9 Form shaped profiles and bends as indicated, using post forming grade laminate to laminate manufacturer's instructions.

.10 Use straight self-edging vinyl strip for flatwork to cover exposed edge of core material.

.11 Apply laminate backing sheet to reverse side of core of plastic laminate work.

.12 Apply laminated plastic liner sheet to interior of cabinetry.

Part 3 Execution

3.1 INSTALLATION

.1 Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.

.2 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.

.3 Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.

.4 Use draw bolts in countertop joints.

.5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

.6 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant.

.7 Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.

.8 Scribe base and filler pieces to adjacent construction within 2 mm gap.

.9 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

.10 Site apply laminated plastic to window sills as indicated. Adhere laminated plastic over entire surface. Make corners with hairline joints. Use full sized laminate sheets. Make joints only where approved. Slightly bevel arises.

.11 For site application, offset joints in plastic laminate facing from joints in core.

3.2 CLEANING

.1 Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.

.2 Remove excess glue from surfaces.

3.3 PROTECTION

.1 Protect millwork and cabinet work from damage until final inspection.

NMS 064023.10 – PLASTIC LAMINATES

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 20 00 – Finish Carpentry.

.2 Section 06 40 00 – Architectural Woodwork.

1.2 REFERENCES

.1 CAN3-A172-M79 High Pressure Paper Base, Decorative Laminates.

.2 CAN/CGSB-71.20-M88 Adhesive, Contact, Brushable.

.3 CSA O112 Series-M1977 CSA Standards for Wood Adhesives.

.4 CSA O121-M1978 Douglas Fir Plywood.

.5 CSA O151-M1978 Canadian Softwood Plywood.

1.3 SAMPLES

.1 Submit duplicate samples of joints, edging, cutouts and postformed profiles in accordance with Section 01300 – Submittals.

1.4 MAINTENANCE DATA

.1 Provide maintenance data for laminated plastics work for incorporation into Operation and Maintenance Manual specified in Section 01300 – Submittals.

1.5 PRODUCT HANDLING

.1 Cover finished laminated plastic surfaces with heavy kraft paper or put in cartons during shipment. Protect installed laminated surfaces by approved means. Do not remove until immediately before final inspection.

.2 Do not store or install materials in areas where relative humidity is less than 25% or greater than 60% at 22 deg C.

Part 2 Products

2.1 GENERAL

.1 Products manufactured by one of the following companies are suggested for use on this project.
- .1 Cyanamid Canada Inc., Montreal (Formica).
- .2 Domtar Construction Materials, Arborite Division, LaSalle Quebec (Arborite).
- .3 Wilsonart International, Temple, Texas (Wilsonart).
- .4 Nevamar Corporation, Odenton Md.

2.2 MATERIALS

.1 Laminated plastic for flatwork: to CAN3-A172, Grade GP, Type SD, 1.25mm (0.050") thick; based on solid colour range with velour finish. Acceptable products:
- .1 Formica Laminate Grade 10.
- .2 Nevamar H-5 General Purpose Grade.
- .3 Wilsonart General Purpose HGS Type 107.

.2 Laminated plastic for postforming work: to CAN3-A172, Grade PF, Type S, 1.07mm (0.042") thick, based on solid colour range with velour finish. Acceptable products:
- .1 Formica Laminate Grade 12.
- .2 Nevamar HF-5 Horizontal Post Forming Grade.
- .3 Wilsonart Postforming Type 350.

.3 Laminated plastic backing sheet: supplied by same manufacturer as facing sheet; not less than 0.508 mm (0.02") thick and same colour as face laminate. Sanded one side. Acceptable products:
- .1 Formica Laminate Grade 20.

.4 Laminated plastic cabinet liner sheet material or for MCP Board or Cladboard material: supplied by same manufacturer as facing sheet, not less than 0.760 mm (0.028") thick, white colour. Products:

.1 Formica Laminate Grade 20.
.2 VF-3 Vertical Post Forming Grade by Nevamar.
.3 Wilsonart Vertical Surface Type 335.

.5 Plywood core: Douglas Fir Plywood to CSA-O121 or Canadian Softwood Plywood to CSA-O151 solid two sides, 19 mm (¾") thick.

.6 Particleboard core: to CAN3-O188.1, Grade R, sanded faces, of thickness indicated.

.7 Adhesive for laminated plastic: to be CSA approved and one of the following types as selected by the laminate manufacturer as being suitable for the application:
.1 Urea resin adhesive to CSA O112 Series.
.2 Contact adhesive to CAN/CGSB-71.20.
.3 Resorcinol resin adhesive to CSA O112.
.4 Polyvinyl adhesive to CSA O112.
.5 Two component epoxy thermosetting adhesive.

.8 Sealer: water resistant sealer or glue acceptable to laminate manufacturer.

.9 Sealant: of a type recommended by the laminate manufacturer and in accordance with Section 07900 - Joint Sealers; colour to be selected by the Contract Administrator.

.10 Draw bolts and splines: as recommended by fabricator.

2.3 SHOP FABRICATION

.1 Shop fabricate and shop apply all plastic laminate work on this project.

.2 Comply with CAN3-A172, Appendix 'A'.

.3 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.

.4 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.5 Adhere laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 2400 mm (8ft). Keep joints 600 mm (24") from sink cutouts.

.6 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.

.7 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 deg. Do not mitre laminated edges.

.8 Apply laminate backing sheet to reverse side of core of plastic laminate work.

.9 Apply laminated plastic liner sheet to interior of cabinetry, including all exposed surfaces such as gable ends, doors and drawers, and where otherwise indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install work plumb, true and square, neatly scribed to adjoining surfaces.

.2 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.

.3 Use draw bolts and splines in countertop joints. Maximum spacing 450 mm (18") oc, 75 mm (3") from edge. Make flush hairline joints.

.4 Provide cutouts for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.

.5 At junction of laminated plastic counter back splash and adjacent wall finish, apply small bead of sealant.

.6 Where laminated plastic is site applied, adhere laminated plastic over entire surface. Make corners with hairline joints. Use full sized laminate sheets. Make joints only where indicated or approved. Slightly bevel arises. Cap exposed edges with anodized aluminum extrusions.

.7 For site application, offset joints in plastic laminate facing from joints in core.

NMS 066116 – SOLID SURFACING FABRICATIONS

Special Provision

Part 1 General

1.1 GENERAL

.1 Section Includes: Composition quartz surfaces.

1.2 RELATED SECTIONS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 06 40 00 – Architectural Woodwork.

.3 Section 07 92 00 – Joint Sealants.

.4 Division 15.

1.3 REFERENCES

.1 ASTM C920-05: Standard Specification for Elastomeric Joint.

.2 Sealants ASTM E84-05e1: Standard Test Method for Surface Burning Characteristics of Building Materials.

.3 NFPA 255-2006: Standard Method of Test of Surface Burning Characteristics of Building Materials.

.4 NSF/ANSI 51-2002: Food Equipment Materials.

1.4 SUBMITTALS

.1 Submit shop drawings, product data as specified in Division 1.

.2 Shop Drawings: including plans, sections, and large scale details, and indicating methods of fabrication and attachment.

.3 Product Data: manufacturer's standard data sheets for composition quartz materials; and illustrating full range of standard colors.

1.5 SAMPLES

.1 Submit samples as specified in Division 1.

.2 Samples: 4" x 4" (100 x 100 mm) size samples, illustrating color availability for final selection by Architect.

1.6 QUALITY ASSURANCE SUBMITTALS

.1 Submit fabricator qualification certificates, test reports and manufacturer's instructions as specified in Division 1.

.2 Fabricator Qualification Certificates: proof of fabricator qualifications, including ISO certifications.

.3 Test Reports: including copies of flammability tests reports and food preparation zone test reports.

.4 Manufacturer's Instructions: including copies of manufacturer's standard fabrication and installation guidelines.

1.7 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals as specified in Division 1.

.2 Closeout Submittals: including care and maintenance instructions, and extended warranties; for inclusion in operating and maintenance manuals.

1.8 QUALITY ASSURANCE

.1 Fabricator/Installer Qualifications: minimum three years' experience in fabricating and installing composition quartz surface materials, or a distributor's certification comprised of content.

.2 Manufacturer's Certification: current ISO 9001 and 14001 certificates.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Refer to Division 1.

.2 Do not deliver materials until spaces are ready for installation.

1.10 ENVIRONMENTAL REQUIREMENTS

.1 Maintain areas at normal occupancy temperature and humidity levels for a minimum of 72 hours prior to and immediately following installation.

1.11 WARRANTY

.1 Submit a manufacturer's extended warranty in accordance with the General Conditions of the Contract.

.2 Manufacturer's Extended Warranty: Commercial 10-Year Limited Warranty against manufacturing defects in sheet material. HanStone Quartz offers a Residential Lifetime Limited Warranty.

Part 2 Products

2.1 MANUFACTURERS

.1 Manufacturers of composition quartz surfacing having material considered acceptable for use.
- .1 Hyundai L&C, as distributed by Hans Stone Quartz.

2.2 MATERIALS

.1 Composition Quartz Sheet: 1 1/4"thick, comprised of silicon dioxide quartz chips set in a proprietary matrix; and meeting the following criteria:
- .1 Flammability: Class A when tested to NFPA 255, Class A when tested to ASTM E84.
- .2 Hardness (Mohs Scale): 7
- .3 Density (KSF 2530): 2.465 g/cm2
- .4 Stain Resistance (ANSI Z124.6.5.2): Pass
- .5 Tensile Strength (ASTM D638): 17.8 MPa
- .6 Compressive Strength (ASTM C170): 203 MPa wet, 209 MPa dry
- .7 Food Equipment Material Compliance: Food Zone to NSF/ANSI 51.
- .8 Finish: Polished.
- .9 Color: as selected by Architect.
- .10 Product and Manufacturer's Name: HanStone Quartz by Hyundai L&C.
- .11 Brackets and Supports: cold-formed steel, galvanized finish; pre-drilled for fasteners; profiles and sizes as noted on shop drawings.

2.3 ACCESSORIES

.1 Adhesive for Bonding Composition Quartz Surfacing: two component premium grade adhesive, color to match quartz surfacing.

.2 Adhesive for Bonding Quartz to Other Materials: one-component silicone, to ASTM C920.

.3 Joint Sealant: mildew-resistant silicone sealant, as specified in Section 07 92 00.

2.4 FABRICATION

.1 Fabricate components in shop to greatest extent practical, to sizes and profiles indicated in approved shop drawings.

.2 Form joints between components to be inconspicuous in appearance and without voids.

.3 Provide holes and cutouts for bowls, sinks, plumbing fixtures and accessories as indicated on drawings. Finish edges to remove saw marks, nicks and scratches.

.4 Ensure no cracking, chipping or breakage of components during forming.

Part 3 Execution

3.1 EXAMINATION

.1 Examine substrate upon which quartz surfacing is to be installed. Verify that support framing is sufficient to support quartz surfacing and is level to within 1/8" (3 mm) in 10’ (3.0 metres).

.2 Beginning of work implies acceptance of existing conditions.

3.2 INSTALLATION

.1 Install materials plumb and level. B. Secure materials to substrate in accordance with manufacturer’s installation guidelines.

.2 Form field joints using manufacturer’s recommended adhesive.

.3 Avoid placing joints within 12" (300 mm) of quartz surface edges and terminations.

.4 Install backsplashes and endsplashes fabricated from 3/4" (20 mm) thick composition quartz surfacing material. Adhere to substrate with approved adhesive, and seal joint along countertop.

.5 Seal between wall and components with joint sealant, as specified in Section 07920.

.6 Coordinate connection of plumbing fixtures with Division 15.

3.3 ADJUSTING AND CLEANING

.1 Repair minor imperfections and cracked seams and replace areas of severely damaged surfaces in accordance with manufacturer’s guidelines.

.2 Remove excess adhesive and sealant from visible surfaces.

.3 Final Cleaning: Clean quartz surfaces in strict accordance with manufacturer’s instructions.

3.4 PROTECTION

.1 Protect quartz surfaces from damage with heavy paper or cardboard covers. Maintain protection until date of Substantial Completion.

NMS DIVISION 7 SPECIFICATIONS

Special Provision

The following Division 7 National Master Specifications are included in this Contract.

NMS 072113 – BOARD INSULATION

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 07 21 16 – Blanket Insulation.

.2 Section 07 27 00 – Air Barriers.

.3 Section 07 55 00 – Modified Bituminous Membrane Roofing.

.4 Section 07 92 00 – Joint Sealants.

.5 Division 15 – Insulation for mechanical work.

1.2 REFERENCES

.1 ASTM E96-00 Standard Test Methods for Water Vapor Transmission of Materials.

.2 CAN/CGSB-51.26-M86 Thermal Insulation, Urethane and Isocyanurate, Boards, Faced.

.3 CAN/CGSB-51.33-M89 Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.

.4 CAN/CGSB-51.34-M86 Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

.5 CAN/ULC-S701-97 Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.6 CGSB 51-GP-21M-78 Thermal Insulation, Urethane and Isocyanurate, Unfaced.

.7 CGSB 71-GP-24M-77 Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.

1.3 WORK INCLUDED

.1 Above grade board insulation to perimeter walls, fascia and soffits wherever rigid board insulation material is indicated.

.2 Below grade board insulation to perimeter foundations.

.3 Rigid flat board and sloping roof insulation material is specified with the roofing under Section 07 55 00 – Modified Bituminous Membrane Roofing.

.4 Board insulation that is factory installed in fabrications such as hollow metal doors or overhead doors, is specified in those respective sections.

.5 For board insulation material directly related to mechanical and electrical work or equipment see Division 15 – Mechanical and Division 16 – Electrical.

.6 For Foam Insulation in cavity walls, see Section 07 21 29 – Sprayed Insulation.

1.4 JOB CONDITIONS

.1 Adhere strictly to rigid insulation board manufacturer's instructions with regard to environmental considerations, product handling and substrate preparation.

Part 2 Products

2.1 INSULATION BOARDS – BELOW GRADE APPLICATIONS

.1 Type RB-1: Extruded polystyrene to CAN/ULCS-701 Type 4, CCMC06525-L, compressive strength of 30 psi, aged RSI value 0.88 per 25.4mm (R-5.0 per 1"), thickness as indicated, 2'x8' sheets, square edges. Acceptable products:
.1 Styrofoam SM by Dow.
.2 Contract administrator approved equivalent.

.2 All insulation board under concrete slabs to be closed cell rigid board insulation to the thickness shown on the contract drawings with a minimum compressive strength of 40 psi. Example product: HiLoad 40 by DOW. Ship lap and tape all joints in below grade insultation

2.2 INSULATION BOARDS – ROOF APPLICATIONS

.1 See Section 07 55 00 – Modified Bituminous Membrane Roofing.

2.3 ADHESIVES

.1 Type A (for all types of insulation boards): synthetic rubber base, solvent type, trowel consistency, fast setting, cream coloured, to CGSB 71-GP-24M, Type 2, Class C. Acceptable products:
.1 Type 230-21 by Bakelite.
.2 Foilbond 24 by Canadian Hanson.
.3 Contract administrator approved equivalent.

2.4 VAPOUR BARRIER MATERIAL

.1 Polyethylene film to CAN/CGSB-51.34.

2.5 AIR BARRIER MATERIAL

.1 See Section 07 27 00 – Air Barriers, for material.

2.6 ACCESSORIES

.1 Insulation fasteners: non corrosion susceptible insulation fasteners with washer.

.2 Sealant: to CAN/CGSB-19.21, plus or minus 5% movement. See Section 07 92 00 - Joint Sealants, for acceptable products.

.3 Sealing Tape: PVC, 3M No. Y-8086 Contractors Sheathing Tape, or as otherwise recommended by the insulation and adhesives manufactures.

.4 Staples: 12.5 mm (½") minimum leg.

.5 Nails: to CSA B111, galvanized steel, length to suit insulation plus 25 mm (1").

2.7 MATERIAL END USES

.1 Below grade insulation: Type RB-1.

.2 Roofing: See Section 07 55 00 – Modified Bituminous Membrane Roofing.

.3 Pipes and Ducts: See Division 15 – Mechanical.

Part 3 Execution

3.1 WORKMANSHIP

.1 Install insulation after building substrate materials are dry, except over adhesive type air barriers.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 Keep insulation minimum 75 mm (3") from heat emitting devices such as recessed light fixtures.

.5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.6 Offset both vertical and horizontal joints in multiple layer applications.

.7 Do not enclose insulation until it has been inspected and approved by the Contract Administrator.

3.2 EXAMINATION

.1 Examine substrates and immediately inform the Contract Administrator in writing of defects.

.2 Prior to commencement of work ensure: Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 BOARD INSTALLATION AT BELOW GRADE

.1 Interior application: Fit tight against foundation wall with no gaps. Extend boards below bottom of slab on inside face of perimeter foundation walls using no adhesive, to thickness and extent shown on the Drawings.

3.4 BOARD INSTALLATION AT FLAT ROOF AREAS

.1 Installation procedure is specified under Section 07 55 00 – Modified Bituminous Membrane Roofing.

3.5 AIR BARRIER INSTALLATION.

.1 See Section 07 27 00 – Air Barriers.

NMS 072116 - BLANKET INSULATION

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

.2 Section 07 21 13 – Board Insulation.

.3 Section 07 27 00 – Air Barriers.

1.2 REFERENCES

.1 ASTM C533-99, Standard Specification for Mineral-Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.

.2 ASTM C665-98, Standard Specification for Mineral-Fibre Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.3 CAN/CGSB-51.23-92 Spray-Applied Rigid Polyurethane Cellular Plastic Thermal Insulation.

.4 CAN/CGSB-51.34-M86 Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

.5 CSA B111-1974 Wire Nails, Spikes and Staples.

1.3 WORK INCLUDED

.1 Work specified under this Section shall include supply and installation of glass or mineral fibre batt insulation to:
- .1 Inside perimeter walls between metal or wood studding,
- .2 Exterior soffits and fascia.
- .3 Enclosed ceiling spaces where indicated.
- .4 Between Z girts where metal siding is installed over masonry.
- .5 Miscellaneous locations indicated.

.2 Include vapour barrier film related to batt and blanket type insulation.

.3 Provide foamed-in-place foam insulation around exterior door and window openings indicated.

.4 Roof related insulation material is specified with the roofing under Section 07 55 00 – Modified Bituminous Membrane Roofing.

.5 Insulation that is factory installed in fabrications such as hollow metal doors or overhead doors, is specified in those respective sections.

.6 For insulation material directly related to mechanical and electrical work or equipment, see Division 23 – Mechanical (HVAC) and Division 26 – Electrical.

.7 See Schedule in Part 3 of this Section for types and locations.

1.4 JOB CONDITIONS

.1 Adhere strictly to Batt and Blanket Insulation manufacturer's instructions with regard to environmental considerations, product handling and substrate preparation.

Part 2 Products

2.1 INSULATION

.1 Type MF-1: Mineral fibre to CAN/ULC-S702-97, batts, 39 kg/cu m density, purpose made to suit fabrications in which they are placed, RSI and thickness indicated. Acceptable products:

.1 Rockwool Comfortbatt Steel Stud Insulation by Rockwool.
.2 Contract Administrator approved equivalent.

.2 Type MF-2: Mineral fibre acoustic insulation to CAN/ULC-S702-97, batts, 38kg/cu m density, purpose made to suit fabrication in which they are placed, RSI and thickness indicated. Acceptable products:
.1 Rockwool Safe'n'Sound Fire and Soundproof Insulation by Rockwool.
.2 Contract Administrator approved equivalent.

2.2 VAPOUR BARRIER FILM

.1 Polyethylene film to CAN/CGSB-51.34. Thicknesss: 10 mil.

2.3 AIR BARRIERS

.1 See Section 07 27 00 – Air Barriers, for material.

2.4 ACCESSORIES

.1 Nails: galvanized steel, length to suit insulation plus 25 mm (1"), to CSA B111.

.2 Adhesive: as recommended insulation manufacturer.

.3 Sealing Tape: PVC, 3M No. Y-8086 Contractors Sheathing Tape, or as otherwise recommended by the insulation and adhesives manufacturers.

.4 Sealant: to CAN/CGSB-19.21, plus or minus 5% movement, acoustical type. See Section 07 90 00 - Joint Sealers, for acceptable products.

.5 Staples: 12 mm (½") minimum leg.

Part 3 Execution

3.1 INSTALLATION

.1 Install insulation to manufacturer's instructions and to specifications herein to maintain continuity of thermal protection to building elements and spaces.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Do not unreasonably compress insulation to fit into spaces.

.4 Keep insulation minimum 75 mm (3") from heat emitting devices such as recessed light fixtures and heating ducts or chimneys.

.5 Seal shim spaces around windows and doors using foamed-in-place urethane.

3.2 VAPOUR BARRIER INSTALLATION

.1 Install on warm side of insulation as indicated and tight to insulation.

.2 Secure to wood or metal framing members with staples or adhesive. Lap joints 150mm (6") minimum and tape seal. Ensure joints occur over framing members.

.3 Tape seal areas where nails or staples penetrate vapour barrier and at points of penetration. Attach warning labels to walls with vapour barrier.

.4 Extend vapour barrier tight to perimeter of windows, of membrane. Tape seal.

.5 Install purpose made material at electrical boxes.

.6 Vapour barrier to insulation in liner panels at composite metal siding by metal panel supplier. See Section 06 64 00 – PVC Paneling.

3.3 AIR BARRIER INSTALLATION

.1 See Section 07 27 00 – Air Barriers.

3.4 INSPECTION

.1 Do not enclose insulation until it has been inspected and approved by the Contract Administrator.

NMS 072129 – SPRAYED INSULATION

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 22 23 – Architectural Concrete Unit Masonry.

.2 Section 05 12 23 – Structural Steel for Buildings.

.3 Section 06 10 11 – Rough Carpentry.

.4 Section 09 29 00 – Gypsum Board.

.5 Division 16 – Electrical.

1.2 REFERENCES

.1 CAN/CGSB 51.23-92 Spray-Applied Rigid Polyurethan Cellular Plastic Thermal Insulation.

.2 CAN/CGSB 51.39-92 Spray Application of Rigid Polyurethane Cellular Plastic Thermal Insulation for Building Construction.

1.3 TEST REPORTS

.1 Submit test reports, verifying qualities of insulation meet or exceed requirements of this specification, in accordance with Section 01 33 00 – Submittals.

1.4 QUALIFICATIONS OF APPLICATION

.1 Application of insulation only by applicators certified by material manufacturer as being a qualified installer of their material.

1.5 PROTECTION

.1 Ventilate area as required to create safe working conditions.

.2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hours after application to maintain non-toxic, unpolluted, safe working conditions.

.3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.

.4 Protect workers as recommended by insulation manufacturer.

.5 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

.6 Dispose of waste foam daily and decontaminate empty drums in accordance with foam manufacturer's instructions.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

Part 2 Products

2.1 MATERIALS

.1 Insulation: spray polyurethane to CAN/ULC S705.1-15 and CAN/ULC S770-09. Acceptable products:
- .1 WalltiteCM01 by BASF Canada Inc., Toronto, Ontario.
- .2 Contract Administrator approved equivalent.

.2 Primers: in accordance with sprayed urethane manufacturer's recommendations for surface conditions.

Part 3 Execution

3.1 APPLICATION

.1 Apply insulation to clean surfaces in accordance with CAN/CGSB 51.39 and the manufacturer's printed instructions. Use primer where recommended by manufacturer.

.2 Apply sprayed foam insulation over exterior face of wood stud walls and structural steel and deck as indicated on the Drawings.

.3 Maintain thickness indicated within the cavity to a tolerance of 3mm (1/8") in 3m (10 ft). Remove or add to material that exceeds these tolerances.

NMS 072700 – AIR BARRIERS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 22 23 – Architectural Concrete Unit Masonry.

.2 Section 06 10 11 – Rough Carpentry.

.3 Section 07 21 13 – Board Insulation.

.4 Section 07 21 16 – Batt & Blanket Insulation.

.5 Section 07 92 00 – Joint Sealants.

.6 Section 08 11 13 – Hollow Metal Doors and Frames.

.7 Section 08 11 16 – Aluminum Doors Frames and Screens.

.8 Section 08 51 13 – Aluminum Windows.

1.2 REFERENCES

.1 CAN/CGSB-19.13M-M87 – Sealing Compound, One Component, Elastomeric Chemical Curing.

.2 CAN/CGSB-19.18M-M87 – Sealing Compound, One Component, Silicone, Base Solvent Curing.

.3 CAN/CGSB-19.24M-M80 – Sealing Compound, Multi-Component, Chemical Curing.

.4 CGSB 19-GP-14M-76 – Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.

.5 Sealant and Waterproofer's Institute – Sealant and Caulking Guide Specification.

1.3 WORK INCLUDED

.1 Self-adhering sheet Air Barrier material installed over masonry.

.2 Self-adhering sheet Air Barrier material installed over exterior surface of exterior gypsum sheathing at transition points as indicated on the Drawings.

1.4 REGULATORY REQUIREMENTS

.1 Air Barrier System shall comply with requirements of OBC 5.4.1.2.

1.5 QUALITY ASSURANCE

.1 Perform Work in accordance with Sheet Air Barrier manufacturers requirements for materials and installation.

.2 Applicator shall be a company specializing in performing work of this section with minimum 5 years documented experience and approved by material manufacturer.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Do not install solvent curing sealants or vapour release adhesive materials in enclosed spaces without ventilation.

.2 Maintain temperature and humidity recommended by materials manufactures before, during

and after installation.

1.7 SEQUENCING

.1 Sequence work to permit installation of materials in conjunction with related materials and seals.

1.8 COORDINATION

.1 Coordinate work of this section with all sections referencing this section.

1.9 WARRANTY

.1 Warranty: Include three year coverage of installed sealant and sheet materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

Part 2 Products

2.1 AIR BARRIER MATERIALS

.1 TYPE A: May be one of the following three:
- .1 Self-Adhering (peel & stick) type, modified bituminous sheet membrane, 40mm (1mm) thick, supplied in 36" wide rolls, suitable for self-adhesive (peel & stick) installation directly over surfaces. Acceptable products:
  - .1 Sealtight Air-Shield by W. R. Meadows.
  - .2 Blueskin SA by Bakor.
  - .3 3M Air & Vapour Barrier 3015.
  - .4 Contract Administrator approved equivalent.

2.2 ACCESSORIES

.1 Use sealants, primers, adhesives, thinners and cleaners recommended by the air barrier material manufacturer as being suitable for and compatible with this application.

.2 Sealing tape for Insulated Sheathing: PVC type, 3M No. Y-8086 Contractor's Sheathing Tape, or as recommended by insulation board manufacturer, purpose made for sealing any cut or square joints in insulation sheathing boards.

.3 Self-Adhering (peel & stick) type, modified bituminous sheet membrane, 40mm (1mm) thick, reinforced, suitable for self-adhesive (peel & stick) installation directly over surfaces. Acceptable products:
- .1 Blueskin TWF through wall flashing, yellow by Bakor.
- .2 Contract Administrator approved equivalent.

Part 3 Execution

3.1 PREPARATION

.1 Verify that surfaces and conditions are ready to accept the Work of this section.

.2 Remove loose or foreign matter which might impair adhesion of materials.

.3 Clean and prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

3.2 INSTALLATION – GENERAL

.1 Install materials in accordance with manufacturer's instructions.

.2 Apply sealant within recommended application temperature ranges. Consult Contract Administrator and manufacturer when product cannot be applied within these temperature ranges.

3.3 BITUMINOUS MEMBRANE TYPE AIR BARRIER

.1 Prime surface with manual sprayer or roller over ana area to be covered with membrane that same day. Follow recommendations of membrane manufacturer.

.2 Apply sheet to primes surfaces by removing release paper and rolling membrane firmly in place. Lap joints minimum 50mm (2"). Ensure material is fully adhered and remove all wrinkles and fish-mouths.

.3 Cut neatly around projections and seal with mastic.

3.4 PROTECTION OF FINISHED WORK

.1 Do not permit adjacent work to damage work of this section.

NMS 074213 – METAL WALL PANELS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 07 27 00 – Air Barriers.

.2 Section 07 62 00 – Sheet Metal Flashing and Trim.

.3 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

.1 ASTM A653/653M- 00 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A792/A792M- 99 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Aloy-Coated by the Hot Dip Process, General Requirements (Metric).

.3 ASTM A924/A924M-99 Standard Specification for Steel Sheet Metalic-Coated by the Hot Dip Process.

.4 CSA S136- 94 Cold Formed Steel Structural Members.

.5 CSSBI 20M, Standard for Sheet Steel Cladding for Architectural and Industrial Applications.

1.3 WORK INCLUDED

.1 Provide the following under this Section:

.1 Prefinished metal wall cladding, including all related closures, trim, flashings, subgirts, accessories and fastenings, installed over structural steel framing. Provide 1 exterior profile on this project.
.2 Transparent clerestorey daylighting panels.

1.4 SAMPLES

.1 Submit minimum 300 x 300 mm (12" x 12") size samples of each type of siding and roofing material, of colour and profile specified, in accordance with Section 01 30 00 - Submittals. Samples to include seam construction where applicable.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Detail any siding and roofing profiles indicated, including dimensions, material thicknesses, metal surface preparation and finish specifications, sealant types, attachment methods, wall elevations, trim, closure pieces and other related work.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver all material properly packaged and adequately protected from damage during shipment and storage on site. Protect from adverse job conditions prior to installation and protect from other trades during and after installation

1.7 WARRANTY – SHEET METAL

.1 Provide a four year limited warranty against defects in materials and workmanship as delivered issued by the Manufacturer or his Licencee. This Warranty shall begin on the date of Substantial Performance.

.2 Provide also a separate one year limited warranty against defects in installed materials and workmanship, including water integrity issued by the Manufacturer. This Warranty shall begin on the date of Substantial Performance.

Part 2 Products

2.1 EXTERIOR FACE SHEETS

.1 Prefinished metal cladding: Vertical, Z275 coating steel to ASTM A653M, Section properties to CSA-S136-07, Silicone modified polyester finish with 30 year finish warranty.

.2 Profiles:
a. PMS1 – Exterior Metal Siding (Vertical) Vicwest 0.51 mm (24 GA.) 36mm CL 6025 Non-Ribbed Profile Exposed Fastener Metal Siding.
b. PMS2 Exterior Metal Siding (Horizontal) Vicwest 0.51 Mm (24 Ga.) 36mm CL 725 Non-Ribbed Profile Exposed Fastener Metal Siding.
c. PMS3 Exterior Metal Siding (Horizontal) Vicwest 0.51 Mm (24 Ga.) 36mm CL 6025 Non-Ribbed Profile Exposed Fastener Metal Siding.

.3 Acceptable materials:
a. Vicwest SuperVic.
b. Contract Administrator approved equivalent.

2.2 ACCESSORIES

.1 Factory Applied Sealants: (for interlocking side joints) as recommended by the siding fabricator.

.2 Other Sealants: in accordance with Section 07 92 00 - Joint Sealers. Coloured to match exterior face sheets where exposed.

.3 Exposed trim, closures, corner flashings and cap pieces: of same material and colour as siding, unless otherwise specified.

.4 Fasteners, miscellaneous clip angles and Z-Girts: manufacturer's standard for system specified, as detailed and otherwise required.

2.3 PAINTED FINISHES

.1 Exterior Face Sheets – Steel:
- .1 Cleaned and pretreat all preformed galvanized steel exterior face sheets, roof edge and flashing materials (required to be coloured) and all related trim and accessories prior to fabrication. Apply an inhibitive primer and paint finish equal to the following:
  - .1 Standard 2000 series silicone modified polyester paint.

2.4 COLOUR

.1 Submit samples for approval. Colours from Manufacturer’s standard colour range.

.2 Confirm availability of colour selected by the Contract Administrator prior to ordering or fabrication of siding.

2.5 DESIGN – METAL PANELS

.1 Design preformed metal wall panel system in accordance with Reference Standards previously specified herein and to the following requirements:
- .1 Positive wind load support: 1.915 kPa (40 psf).
- .2 Negative wind load support: 1.436 kPa (30 psf).
- .3 Deflection: not to exceed 1/180 of the span.
- .4 Tensile stress: 138 MPa (20,000 psi) for the steel exterior element but in any case shall not exceed the values permitted by CSA S136.
- .5 Insulated systems minimum U-Value: 0.116 btu/hr/sq ft/deg F

.2 Submit test data verifying the above structural, thermal and permeance characteristics to the Contract Administrator upon request.

2.6 FABRICATION – METAL SIDING

.1 Assemble Preformed Metal Siding so as to provide a continuous, protected, waterproof, dustproof, sealed side joint.

.2 Manufacture all interior and exterior panel sheets by roll forming; press breaking of these elements is not acceptable.

.3 Fabricate all sheet metal material for flashings, closures and accessories for both interior and exterior panels to the same material, gauge and finish as the exterior panels unless otherwise specified or called for on the Drawings.

.4 Place closures at the top and bottom of all panel runs.

2.7 TRANSPARENT DAYLIGHT PANELS

.1 Clear corrugated polycarbonate panels with trims and closures as required.
  .1 Acceptable products: Vic West Suntuf, clear, profile to match wall panels or Contract Administrator approved equivalent.

Part 3 Execution

3.1 COOPERATION

.1 Co-operate with all trades to ensure rapid installation of metal panels and flashings as soon as preceding work is ready to receive same.

.2 Give timely instructions and information in writing of the requirements necessary for surfaces, materials or bases prepared and/or supplied by other trades which will affect the work of this Section.

.3 This Contractor shall bear the cost of any cutting, patching or making good required as a result of failure to carry out the provisions of this Clause.

3.2 INSTALLATION

.1 Install metal panels plumb, straight and true to adjacent work by the manufacturer's erection forces. Subletting of the erection of these materials will not be allowed unless express written consent is received from the Contract Administrator.

.2 Where panels are to be placed directly on framing, lay a ribbon of joint sealing compound on the face of the structural supports to provide an adequate tight seal. The interior face of the metal panel shall be tightly placed against the steel supports and secured with power-activated fasteners as per manufacturer's standards.

.3 Where face sheets cover solid masonry, steel stud or concrete, fasten "Z" girts to masonry or concrete walls with "red-head" type or equivalent anchors, as directed by the panel manufacturer.

.4 Match fastening system of existing panels.

.5 Siding units shall be full length to extent indicated. No laps will be permitted when installed vertically or on slope. Maximize lengths when installed horizontally.

.6 Install insulation as recommended by the manufacturer including all tapes, clips, fasteners, etc.

3.3 CLEANING OF PREFORMED PANELS

.1 Upon completion of the installation, clean down all preformed metal siding and flashings and leave all work installed under this Section clean.

.2 Use only cleaning agents recommended by the panel manufacturers.

NMS 074293 – SOFFIT PANELS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM A653/653M-00, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM A924/924M-99, Standard Specification for General Requirements for Steel Sheet Metallic - Coated by the Hot Dip Process.
- .3 ASTM D523-89(1999), Standard Test Method for Specular Gloss.
- .4 ASTM D822-96, Standard Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
- .2 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.
- .3 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 Canadian Standards Association (CSA)
- .1 CSA A123.3-M1979, Asphalt or Tar Saturated Roofing Felt.

.4 CSSBI
- .1 CSSBI 20M, Standard for Steel Sheet Cladding for Architectural and Industrial Applications.

1.3 WORK INCLUDED

.1 Provide preformed and prefinished steel fascia panels at building perimeter.

.2 Provide prefinished steel soffit panels at building perimeter.

.3 Include related fastenings, closures, trim, flashings and accessories.

.4 Provide matching roof edge flashings and copings to the roofer for fabrication and installation.

.5 Provide preformed and prefinished metal eavestrough and downspouts.

1.4 SAMPLES

.1 Submit samples in accordance with Division 1.

.2 Submit duplicate 300 x 300 mm (12 x 12") samples of each sheet metal material.

Part 2 Products

2.1 SHEET METAL MATERIALS

.1 Pre-finished steel coil.

2.2 SHEET METAL FINISH

.1 Factory applied paint: Acceptable products:
- .1 VicWest AD300, 24 Gauge. for Vehicle Maintenance Building.
- .2 VicWest Bellara Plank vented Soffit, 26 Gauge. for Material Storage Building and Auxilliary Storage Building.
- .3 Contract Administrator approved equivalent.

2.3 FABRICATION (STEEL SHEET)

.1 Fascia: preformed and prefinished aluminum.

.2 Perimeter soffits: residential grade prefinished steel soffit panels, vented.

.3 J trim: pre-formed and pre-finished steel.

2.8 GUTTER AND DOWNSPOUTS

.1 Prefinished metal as indicated complete with all necessary accessories.

2.9 SHEET METAL FLASHINGS

.1 Form individual pieces in 2400 mm maximum lengths. Make allowances for expansion at joints.

.2 Hem exposed edges on underside 12 mm. Miter and seal corners with sealant.

.3 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.4 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.

.5 Protect against oxidization by backpainting with isolation coating where indicated.

2.10 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB-37.5.

.3 Sealants: selected manufacturer’s standard.

.4 Rubber-asphalt sealing compound: to CAN/CGSB-37.29.

2.11 COLOURS

.1 Colour to be selected from manufacturer’s standard colour range by Contract Administrator.

Part 3 Execution

3.1 INSTALLATION

.1 Install eaves troughs and secure to building at 750 mm (2'-6") oc with eaves trough brackets and screws. Slope eaves troughs to downpipes as indicated. Seal joints watertight.

.2 Install downpipes and provide goosenecks back to wall. Secure downpipes to wall with straps at 1800mm (6ft)oc; minimum two straps per downpipe. Seal joint with plastic cement.

.3 Install soffit with 'J' trim to steel framing with coloured screws of same metal.

.4 Install fascia over steel framing with coloured screws of same metal.

NMS 075500 - MODIFIED BITUMINOUS MEMBRANE ROOFING

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 05 12 23 – Structural Steel.

.2 Section 06 10 11 – Rough Carpentry.

.3 Section 07 21 29 – Sprayed Insulation.

.4 Section 07 42 13 – Metal Wall Panels.

.5 Section 07 62 00 – Sheet Metal Flashing and Trim.

.6 Section 07 92 00 – Joint Sealants.

.7 Section 22 05 15 – Plumbing Specialties and Accessories.

1.2 REFERENCES

.1 Roofing and sheet metal work will be performed in conformance with the roofing manufacturer's written recommendations as well as the requirements of the ULC laboratories Class C, and Canadian Roofing Contractor's Association (CRCA).

.2 CGSB 37-GP-56M-80, Membrane Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

.3 CAN/CGSB-51-26-M86, Thermal Insulation, and Isocyanurate, Board, Faced.

1.2 COMPATIBILITY

.1 All waterproofing materials will be provided by the same manufacturer.

1.3 TECHNICAL DOCUMENTS

.1 Submit two (2) copies of the most current technical data sheets. These documents must

describe the materials' physical properties.

1.4 QUALITY ASSURANCE AND ENVIRONMENTAL MANAGEMENT

.1 The manufacturer of elastomeric bitumen products will provide proof of ISO 9001 and ISO 14001 Certifications.

1.5 CONTRACTOR QUALIFICATIONS

.1 The roofing contractor and his subcontractors, throughout the bid and installation periods, must be officially recognised as an approved contractor by the roofing product manufacturer and have been successfully installing their roofing systems for a minimum of 5 years.

.2 Only skilled and certified trade persons, officially employed by a roofing contractor operating adequate and necessary equipment, will be authorised to perform all roofing work.

.3 The roofing contractor and subcontractors must also be members of the Ontario Industrial Roofing Contractors Association for a minimum of 5 years and provide owner with a written declaration to this effect before roofing installation begins.

1.6 MANUFACTURER’S REPRESENTATIVE

.1 The roofing product manufacturer can delegate a representative to visit the work site at the start of roofing installation.

.2 The contractor must at all times enable and facilitate access to the work site by said representative.

1.7 PRE-INSTALLATION MEETING

.1 Hold a pre-installation meeting prior to start of waterproofing works, with the roofing contractor's representative, the manufacturer and the owner. The purpose of this meeting is to review particular installation conditions to each project. Establish a report for this meeting.

1.8 STORAGE AND DELIVERY

.1 All materials will be delivered and stored in conformance with the requirements described in the manufactures manual; they must remain in their original packaging, displaying the manufacturer's name, product name, weight, and reference standards, as well as all other indications or references considered standard.

.2 Store adhesives and emulsion-based waterproofing mastics at a minimum +5 0C. Store adhesives and solvent-based mastics at sufficiently high temperatures to ensure ease of application.

.3 Materials delivered in rolls will be carefully stored upright; flashing will be stored to avoid creasing, buckling, scratches or any other possible damage.

.4 Avoid material overloads that may affect the structural integrity of specific roof areas.

1.9 FIRE PROTECTION

.1 Respect safety measures described in the Soprema Manual as well as local association recommendations.

.2 At the end of each workday, use a heat detector gun to spot any smouldering or concealed

fire. Job planning must be organised to ensure workers are still on location at least three hours after torch application.

.3 Never apply the torch directly to old and dry wood surfaces. Please read the fire safety recommendations of the manufacturer and the CRCA.

.4 Throughout roofing installation, maintain a clean site and have one approved ABC fire extinguisher within 6 meters of each roofing torch. Respect all safety measures described in technical data sheets. Torches must never be placed near combustible or flammable products.

1.10 GUARANTEES

.1 Membrane manufacturer will issue a written and signed document in the owner's name, certifying all product performance properties and workmanship for a period of ten (10) years, starting from the date of acceptance. The warranty required for bituminous elastomeric membranes must wholly and completely cover the specified warranty period.

.2 The contractor will provide a warranty for this project, valid for a period of two (2) years covering labour, materials and workmanship for entire area of roofing project.

1.11 WIND UPLIFT

.1 All work under this section to conform to CSA A123.21-14: Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane Roofing Systems. Provide shop drawings and product data under Division 1 demonstrating compliance with this Standard for review.

Part 2 Products

2.1 MANUFACTURER

.1 All components of the roofing system shall be from one manufacturer and shall comprise a complete roof system. The specifications has been based on products from Soprema Limited. Alternate roof systems from the following manufacturers are also acceptable provided the products are and system is an equal to the specified product. Submit information on proposed alternative products before tender closing.
- .1 SOPREMA.
- .2 Contract administrator approved equivalent.

2.2 PRIMER

.1 Description: A stabilised bituminous emulsion primer, used to enhance adhesion of self-adhesive membranes.
- .1 Specified product: ELASTOCOL 500 by SOPREMA (for torch on membranes) or approved equal.
- .2 Specified product: ELASTOCOL STICK by SOPREMA (for self adhesive membranes) or approved equal.

2.3 ADHESIVE – INSULATION

.1 Two component, quick setting, low-expansion urethane foam adhesive that can be applied at any temperature. Specified Product: DUOTACK by SOPREMA.

2.4 VAPOUR RETARDER – STEEL DECKS

.1 Self-adhesive air/vapour barrier membrane composed of bitumen modified with thermoplastic

polymers and high-density polyethylene film. The self-adhesive underface is covered with a silicone release sheet. Minimum thickness is 0.8 mm.
Specified product: Sopravap'r by SOPREMA or approved equal.

.2 Metal supports for support of vapour retarder at roll ends accessory as recommended by manufacturer.

2.5 INSULATION

.1 Insulation: Polyisocyanurate plastic foam core inserted between two inorganic, monolithic,dimensionally stable fibreglass facers. Aged R value of minimum 5.6 per inch and 20 psi compressive strength. Insulation total thickness and aged R value as indicated on drawings. Specified product: SOPRA-ISO PLUS insulation by SOPREMA or contact administrator approved equal.

.2 Sump Insulation on Board for Drain Locations - Prefabricated sump insulation panel designed to facilitate proper drainage around roof drains. Size 1200 x 1200 with a minimum 2% slope at 25.4mm to 0.

.3 Tapered Insulation: Polyisocyanurate foam core laminated to heavy coated glass facers. Board size 1200 x 1200. Minimum thickness 13 mm tapered at 2% slope.

2.6 FASTENERS

.1 Roofing fasteners to steel and concrete decking: Cadmium-plated flat-headed, self-tapping screws, N°14, of Type A or AB, in conformance with CSA B35.3.

.2 Base membrane fasteners to steel decking (at perimeters only): Soprafix screws and plates in conformance with Factory Mutual's standard No. 4470 on corrosion and wind lift factors.

.3 Roofing nails: spiral nails with steel round-top cap 25 mm in diameter and 3 mm diameter shank, such as provided by SOPREMA; long enough to penetrate solid wood supports by at least 38 mm and plywood substrates by at least 20 mm.

2.7 COVERBOARD

.1 Bituminous boards:
Description: Multi-ply, semi-rigid asphaltic roofing substrate board composed of a mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners. Length 1200 mm x width 1500 x thickness 6.4 mm.
Specified product: SOPRABOARD by SOPREMA or approved equal.

.2 At parapets and curbs use 6.4 mm thick SOPRABOARD.

2.8 MEMBRANES

.1 System properties: base sheet and cap sheet membrane - MD

.1	Strain Energy (kN/m)		8.4/8.3
.2	Breaking Strength (kN/m)		18/16
.3	Ultimate Elongation (%)	55/56	
.4	Cold Bending (°C) initial	-30°C	
.5	90 days at 70°C		-30°C
.6	Plastic flow		105°C
.7	Static puncture (N)		380

.8 Prefabricated membrane, complies with CAN/CGSB 37-GP-56M, 9th draft

.2 Roof membrane base sheet:
.1 Specified products: COLVENT - 830 by SOPREMA or approved equal.

.3 Roof membrane base sheet flashing:
.1 Specified product: SOPRAFLASH FLAM STICK by SOPREMA or approved equal.

.4 Roofing membrane cap sheet and cap sheet flashing:
.1 ULC certifications, Class CULC certifications, Class C
.2 Specified products: COLVENT TRAFFIC CAP - 860 by SOPREMA standard white (light grey) colour or approved equal.

.5 Reinforcement membrane sheet (for drains, vents etc):
.1 Specified product: SOPRALENE FLAM 180 by SOPREMA or approved equal.

.6 Cover Strip - 330 mm (13") wide membrane strip made of SBS modified bitumen with a composite reinforcement in conformance with ASTM D6162. Both faces are covered with a thermofusible plastic film. Specified Product: SOPRALAP by SOPREMA or approved equal

2.9 WATERPROOFING MASTICS

.1 Waterproofing products: Mastic made of synthetic rubbers, plasticized with bitumen and solvents.
.1 Specified product: SOPRAMASTIC by SOPREMA or approved equal.
.2 Specified product: SOPRAMASTIC ALU by SOPREMA. (for exposed areas) or approved equal.

2.10 PITCH POCKET FILLER

.1 Description: Polyester made precast blocks of various sizes incorporating a single component, polyether-based mastic (SOPRAMASTIC PF) and sealant/adhesive (SOPRAMASTIC SP2).
.1 Specified Product: SOPRAMASTIC BLOCK SYSTEM by SOPREMA or approved equal.
.2 Specified products: COLVENT TRAFFIC CAP – 860 by SOPREMA standard white (light grey) colour or approved equal.

.2 Gas line supports. Specified product: Quick Block by A Better Idea Inc. Pre-fabricated injection molded polypropylene with extruded polystyrene base.

2.13 ROOF ACCESS HATCH

.1 Roof Hatch and Scuttle types on this project are identified on the Drawings and described as follows:
.1 Provide single leaf, insulated, roof access hatch and curb at locations shown on the Drawings.
.2 Roof access hatch to be Bilco Type E-50, 914 x 914, with insulated 305 mm curb.
.3 Similar hatches by Nystrom or Acudor Products Ltd. are acceptable.
.4 Cover shall be 2.3 mm aluminum, insulated with 25 mm glass fibre insulation, with a 1.0 mm aluminum liner.
.5 Curb shall be 2.3 mm aluminum, insulated with 25 mm fibreboard.
.6 Roof access hatch shall be completely assembled with heavy pintle hinges, positive snap latch with turn handles and padlock hasps inside, and a mechanically retained rubber gasket.
.7 Provide compression spring operators enclosed in telescopic tubes for smooth, easy controlled door operation.
.8 Supply and install aluminum Safe-T-Climb, Ladder Fall Prevention System,

as supplied by North Safety Products Canada or Contract Administrator approved equivalent, CSA approved system, to vertical ladders as noted on the Drawings, unless equipped with a safety cage.

.9 Fall prevention system to included telescoping safety post permanently mounted to the top of ladder.

.10 Provide two telescopic hand hold/safety device to extend and lock when hatch is open. Telescopic posts to be mounted on top two rungs adjacent to side rails, extending 1070 above adjacent roof surface.

.1 Product: Ladder UP Safety Post by Bilco or Ladder Safety Post by Nystrom, or Contract Administrator approved equivalent.

.11 Provide fixed roof hatch safety railing system, aluminum rail construction with powder coat paint finish, standard self-closing and latching gate, non-penetrating attachment to the roof hatch cap flashing.

.1 Product: Bil-Guard 2.0 Roof Hatch Safety Railing System or Roof Hatch Safety Railing by Nystrom, or Contract Administrator approved equivalent.

2.14 THERMAL BARRIER SHEATHING

.1 Exterior grade gypsum board sheathing, ½" thickness, mat facing. Acceptable products: Georgia Pacific Dens Deck Prime or approved equal or Contract Administrator approved equivalent.

2.15 SEALING PRODUCT

.1 Description: Bitumen/polyurethane waterproofing single component resin with a polyester reinforcement

.1 Specified Product: ALSAN FLASHING and ALSAN REINFORCEMENT by SOPREMA or approved equal

Part 3 Execution

3.1 SURFACE EXAMINATION AND PREPARATION

.1 Surface examination and preparation must be completed in conformance with recommendations in the manufacturers manual, particularly for fire safety precautions.

.2 Do not begin any work before surfaces are smooth, dry, and exempt of ice and debris. Use of calcium or salt is forbidden for ice or snow removal.

.3 No materials will be installed during rain or snowfall.

3.2 METHOD OF INSTALLATION

.1 Prepare surfaces and complete waterproofing work in conformance with manufacturers requirements, and the "Material Installation Guide"

.2 Install roofing elements on clean and dry surfaces, in conformance with manufacturer's instructions and recommendations.

.3 Roofing work must be completed in a continuous fashion as surfaces are readied and weather conditions permit.

.4 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 CLEANING

.1 The work site must be routinely cleared of rubbish and other materials that may hinder roof installation, performance or present a fire hazard.

3.4 EQUIPMENT FOR WORK EXECUTION

.1 Maintain all roofing equipment and tools in good working order.

3.5 APPLICATION OF ASPHALT PRIMER

.1 Roofing substrates of wood, metal, concrete, masonry or gypsum board surfaces will receive a coat of asphalt primer at a rate of 0.2 to 0.3 l/m2 (none required for factory-painted metals). All surfaces to be primed must be free of rust, dust or any residue that may hinder adherence. Cover primed surfaces with roofing membrane as soon as possible. Application temperature limit of +5°C for self-adhesive membranes and primers.

3.6 INSTALLATION OF VAPOUR RETARDER

.1 All surfaces must be free of rust, dust or any residue that may hinder adherence of vapour retarder. Install self-adhesive vapour retarder membrane onto the surface by peeling back the paper backing on the underside and adhering the membrane to the steel deck. Apply hand pressure over the surface of the membrane in order to remove any trapped air beneath the membrane. Apply pressure with specified metal roller to ensure perfect adhesion of the membrane to the surface. The overlap at edges and ends of the membrane strips must be at least 75 mm. Use metal supports for roll ends of vapour retarder as recommended by manufacturer.

3.7 INSTALLATION INSULATION

.1 Install insulation to vapour retarder with cold adhesive. Adhesive can be installed in ¾” wide stripes at 13” apart maximum or 9 spots of 4” per 3.28 sq. ft. (1 metre). Install boards by butting ends snugly and without warping.

.2 Install only as much insulation as can be covered in the same day with base sheet membrane.

.3 Around the drains lower the base insulation by 1" to create a sump 4' x 4' in area. Adhere prefabricated tapered sump panel using specified adhesive in continuous strips spaced at 12" O.C.

3.8 INSTALLATION OF MEMBRANES

.1 Install membrane in strict conformance with manufacturers installation instructions. See master specifications in the manufacturers manual, as well as the last edition of the Material Installation Guide.

3.9 INSTALLATION BASE SHEET

.1 Unroll base sheet at drain level with first side lap lined up with drain centre parallel to roof edge..2Adhere base sheet directly to insulation by removing release paper. Overlap side laps by 75 mm along lines provided to this end, and overlap end laps by 25 mm. Because of the nature of this system, for this type of base sheet, end joints can be aligned (no offset required) to facilitate installation of the cover strip. Seal end joints with 330 mm (13") wide cover strip centred on the joint.

.2 Install screw and plates around entire perimeter and large openings at 300 mm intervals. Cover the row of fasteners by extending the base flashing ply 75 mm past the fasteners.

.3 Apply pressure to top surface to ensure wrinkle free adhesion.

3.10 BASE SHEET FLASHING INSTALLATION

.1 Apply base sheet flashing on clean (**no asphalt**), dry, wood or new parapet overlay boards only once primer coat is dry.

.2 Install base sheet flashing in one- (1) metre widths to cover roofing substrate over 150 mm. Overlap side laps by 75 mm. Stagger side laps by at least 100 mm from base sheet overlaps on roof to avoid excessive layering.

.3 Apply base sheet flashing directly onto substrate by removing siliconed 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 and seams with metal membrane roller and aluminium applicator. Nail outside edge at 300 mm o/c.

.4 Avoid forming wrinkles, air pockets or fishmouths.

3.11 ROOF CAP SHEET INSTALLATION

.1 Once base sheet is applied and no defects are apparent, proceed with cap sheet installation, starting at the roof drains.

.2 Unroll cap sheet at drain. Carefully align first side lap (parallel to roof edge).

.3 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.

.4 Avoid overheating.

.5 Unless overlap widths differ between cap and base sheets, make sure joints between the two layers are staggered by at least 300 mm.

.6 Overlap cap sheet side laps by 75 mm and end laps by 150 mm. Cut off corners at end laps to be covered by next roll. All overlap surfaces must be granule-free or degranulated.

.7 Complete perfect welds between two membranes. Leave no zone unwelded. In cold weather, adjust welding time to obtain homogenous seam (it may be necessary to slow down in certain cases).

.8 Once cap sheet is installed, carefully check all overlapped joints.

.9 During installation, care should be taken to avoid excessive bitumen bleed-out at joints.

3.12 CAP SHEET FLASHING INSTALLATION

.1 Install cap sheet in one (1) -metre width. Overlap side laps by 75 mm. Stagger base and cap sheet overlaps on roof by at least 100 mm to avoid excessive layering. Roof overlaps will be 200 mm wide.

.2 Draw parallel chalk line 200 mm from upstand or parapet bases.

.3 Sink surface granules into bed of hot bitumen with torch and round-nosed trowel from chalk line on roof to upstand or parapet base as well as over granulated vertical parts to be overlapped.

.4 Torch weld cap sheet directly onto base sheet from top to bottom to soften both membranes and obtain homogenous seal.

.5 During installation, avoid overheating membrane and excessive bitumen bleed-out at joints.

3.13 WATERPROOFING AT DRAINS

.1 Mechanical drains:
- .1 Install mechanical drains in conformance with SOPREMA detail SOP12.

.2 Copper drains:
- .1 Install copper drains in conformance with SOPREMA detail SOP13.

.3 Drains with compressible connectors:
- .1 Install base sheet centred on drain. Cut opening of same diameter as downpipe for required water drainage.
- .2 Install drain on base sheet in a layer of adhesive. Mechanically fastened to support.
- .3 Torch weld Sopralene Flam 180 reinforcement band (1 metre x 1 metre) in a diagonal position to base sheet and previously primed drain flange. Apply manual pressure at drain connectors.
- .4 Install cap sheet to edge of opening.
- .5 Fasten dome to drain.

3.14 WATERPROOFING FOR VARIOUS DETAILS

.1 Install waterproofing membranes in conformance with various roofing details illustrated in the manufacturers installation manual.

3.15 INSTALLATION OF ACCESSORIES

.1 Install all accessories in conformance with the manufacturers written instructions.

3.16 INSTALLATION OF THERMAL BARRIER SHEATHING

.1 Apply thermal barrier sheathing to the entire steel roof deck area. Mechanically fasten to existing steel deck with fasteners recommended by manufacturer for a Factory Mutual FM -1-90 wind uplift rating.

NMS 076113 - STANDING SEAM SHEET METAL ROOFING

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

.2 Section 07 62 00 – Metal Flashing and Trim

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)
  .1 ASTM A653/653M-00, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  .2 ASTM A924/924M-99, Standard Specification for General Requirements for Steel Sheet Metallic - Coated by the Hot Dip Process.
.3 ASTM D523-89(1999), Standard Test Method for Specular Gloss.
  .4 ASTM D822-96, Standard Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
.2 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.
  .3 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 Canadian Standards Association (CSA)
.1 CSA A123.3-M1979, Asphalt or Tar Saturated Roofing Felt.

.4 CSSBI
  .1 CSSBI 20M, Standard for Steel Sheet Cladding for Architectural and Industrial Applications.

1.3 WORK INCLUDED

.1 Provide standing seam single skin prefinished steel sloping roof panels installed on metal building system.

.2 Provide preformed and prefinished steel fascia panels matching roof sheet.

.3 Include related fastenings, closures, trim, flashings, subgirts and accessories.

.4 Provide matching roof edge flashings and copings.

.5 Eavestrough, downspouts, snow guards and ridge vents matching roof material.

.6 Roof insulation and vapour barrier.

.7 Liner panel on underside roof structure.

.8 Provide snow and ice guards.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Provide seal of a professional engineer registered in the Province of Ontario verifying structural capabilities of the sheet metal roofing system.

.3 Indicate arrangements of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to structural frame.

.4 Detail material profiles indicated, including dimensions, material thicknesses, metal surface preparation and finish specifications, sealant types, attachment methods, elevations, trim, closure pieces and other related work.

.5 Provide soffit, fascia and ridge vent details.

.6 Provide eavestrough and downspout details.

.7 Provide snow/ice guard details. Guards to be designed by a professional engineer.

.8 Indicate colours of all materials, including flashings, and indicate where differences occur.

1.5 SAMPLES

.1 Submit samples in accordance with Section 01 33 00- Submittal Procedures.

.2 Submit duplicate 300 x 300 mm (12 x 12") samples of each sheet metal material.

1.6 WIND UPLIFT

.1 All work under this section to conform to CSA A123.21-14: Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane Roofing Systems. Provide shop drawings and product data under Division 1 demonstrating compliance with this Standard for review.

Part 2 Products

2.1 SHEET METAL MATERIALS

.1 Zinc coated steel sheet: to A653/A653M, grade 230,with Z275 designation zinc coating, smooth surface, prefinish as specified later in this section, core nominal thickness of bare metal to be 0.914 mm (0.036") minimum base metal thickness.

2.2 STANDING SEAM ROOF SYSTEM

.1 PMR1 – Metal Roofing Vicwest 0.45mm (26ga.) 38mm Prestige PR16 Non-Ribbed Profile Hidden Fastener Metal Roofing: 1. Design roof panels in accordance with CSA – S136 North American Specification for the Design of Cold-Formed Steel Structural Members.

.2 Design roof paneling system for a minimum roof slope as indicated on drawings.

.3 Design roof paneling system to support design live, snow, and wind loads.

.4 End wall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and/ or parapets as roof expands and contracts with temperature changes.

2.3 ROOF SYSTEM PERFORMANCE TESTING

.1 Meets UL Wind Uplift Classification Rating, UL 580: Class 90.

2.4 GUTTER AND DOWNSPOUTS

.1 Prefinished steel, matching roof material, provided by this trade to approximate profiles indicated, complete with all necessary accessories.

2.5 SHEET METAL FLASHINGS

.1 Form individual pieces in 2400 mm maximum lengths. Make allowances for expansion at joints.

.2 Hem exposed edges on underside 12 mm. Miter and seal corners with sealant.

.3 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.4 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.

.5 Protect against oxidization by back painting with isolation coating where indicated.

2.6 SNOW AND ICE GUARDS

.1 Basis of Design: X-Gard 1.0 manufactured by S-5! Metal Roof Innovations, Ltd. or Contract Administrator approved equivalent.

.2 Components:

.1 Clamps:

.1 Manufactured from 6061-T6 aluminum extrusions conforming to ASTM B221 or aluminum castings conforming to ASTM B85 and to AA Aluminum Standards and Data.

.2 Model: No. S-5-V.

.3 Set screws: 300 Series stainless steel, 18-8 alloy, 3/8 inch diameter, with round nose point.

.4 Attachment bolts: 300 Series stainless steel, 18-8 alloy, 10 mm diameter, hex flange bolt.

.2 Pipe Brackets:

.1 Manufactured from 6061-T6 or 6005-T5 alloy and temper aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data or cast aluminum.

.2 Model: X-Gard Bracket 2.0 for double cross member

.3 Cross Members:

.1 Manufactured from 6061-T6 or 6005-T5 alloy and temper aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data.

.2 Model: NEX 2.0 Pipe, Provide NEX 2.0 Splice connectors ensuring alignment

.4 Ice and Snow Clips:

.1 Aluminum, minimum 3 inches wide.

.1 Model: X-Clip II for standing seam heights 1” to 1.75”

.2 Model: X-Clip III for standing seam heights 1.75” to 3”

2.7 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB-37.5.

.3 Sealants: selected manufacturer’s standard.

.4 Rubber-asphalt sealing compound: to CAN/CGSB-37.29.

2.8 COLOURS

.1 To be selected from manufacturer’s standard colour range.

Part 3 Execution

3.1 INSTALLATION

.1 Use concealed fastenings except where approved by Contract Administrator before installation.

.2 Install sheet metal roof panels using fasteners spaced as indicated on Shop Drawings. Panels to be continuous length (no horizontal seams).

.3 Flash roof penetrations with material matching roof panels, and make watertight.

.4 Install snow guard brackets at each standing seam as per reviewed Shop Drawings. Run guards continuously around bottom edge of sloping sheet metal roof panels and mid span.

3.2 EAVESTROUGH AND DOWNSPOUTS

.1 Install eaves troughs and secure to building at 750 mm (2'-6") oc with eaves trough spikes through spacer ferrules. Slope eaves troughs to downpipes as indicated. Solder Seal joints watertight.

.2 Install downpipes and provide goosenecks back to wall. Secure downpipes to wall with straps at 1800mm (6ft)oc; minimum two straps per downpipe. Connect downpipes to drainage system and seal joint with plastic cement.

3.3 INSTALLATION SNOW AND ICE GUARDS

.1 Install snow and ice guards to manufacturer's written instructions and specifications.

NMS 076200 - SHEET METAL FLASHING AND TRIM

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 22 23 – Architectural Concrete Masonry Units.

.2 Section 06 10 11 – Rough Carpentry.

.3 Section 07 55 00 – Modified Bituminous Membrane Roofing.

1.2 REFERENCES

.1 ASTM A653/A653M-00 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A591/A591M-98 Standard Specification for Steel Sheet, Cold-Rolled, Electrolytic Zinc-Coated, for Light Coating Weight (Mass) Applications.

.3 ASTM A606-98 Standard Specification for Steel Sheet and Strip, High Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.

.4 ASTM A924/924M-99 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot Dip Process.

.5 ASTM D523-89(1999) Standard Test Method for Specular Gloss.

.6 ASTM D822-96 Standard Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

.7 CSA A123.3-M1979 Asphalt or Tar Saturated Roofing Felt.

.8 CSA B111-1974 Wire Nails, Spikes and Staples.

.9 CAN/CGSB-37.5-M89 Cutback Asphalt Plastic Cement.

.10 CAN/CGSB-51.32-M77 Sheathing, Membrane, Breather Type.

.11 Canadian Roofing Contractors Association (CRCA) Roofing Specifications Manual

1.3 WORK INCLUDED

.1 Work specified under this Section includes:
- .1 Supply and installation of all prefinished metal roof flashings. All metal flashings exposed to the exterior shall be fabricated from prefinished galvanized steel sheet.
- .2 Material specified in this Section shall be supplied to installers of membrane roofing and exterior cladding, for installation of appropriate products by that trade.

1.4 SAMPLES

.1 Submit duplicate 50 x 50mm (2"x2") samples of each type of sheet metal material, colour and finish in accordance with Section 01 30 00 – Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver all material properly packaged and adequately protected from damage during shipment and storage on site. Protect from adverse job conditions prior to installation and protect from work of other trades during and after installation.

1.6 WIND UPLIFT

.1 All work under this section to conform to CSA A123.21-14: Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane Roofing Systems. Provide shop drawings and product data under Division 1 demonstrating compliance with this Standard for review.

Part 2 Products

2.1 SHEET METAL MATERIALS

.1 Plain Galvanized Steel sheet: to ASTM A653/653M, with Z275 designation zinc coating. Core nominal thickness of bare metal to be minimum 0.61mm (0.024") (24ga). Material identified as plain galvanized shall be supplied with no finish other than galvanizing. Sheet metal cleats for cap flashing to be minimum 0.74mm (0.029”) (22 ga.) and continuous at all locations.

2.2 SHEET METAL FINISHES

.1 Prior to fabrication all roof edge and flashing materials required to be painted and all related trim and accessories shall receive a painted finish equal to the following:

.1 Standard 2000 series silicone modified polyester paint.

2.3 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB 37.5.

.3 Underlay for metal flashing: dry sheathing to CAN2-51.32 or asphalt laminated 3.6 to 4.5 kg kraft paper or No. 15 perforated asphalt felt to CSA A123.3.

.4 Sealants: in accordance with Section 07 90 00 - Joint Sealers.

.5 Cleats: of same material, and temper as sheet metal, minimum 50mm (2") wide. Thickness same as sheet metal being secured.

.6 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.

.7 Washers: of same material as sheet metal, 1 mm 90.040") (20 ga) thick with rubber packings.

.8 Touch-up paint: as recommended by metal flashing and trim manufacturer.

2.4 FABRICATION

.1 General:
- .1 Fabricate prefinished galvanized steel flashings and other sheet steel work in accordance with applicable CRCA ‘FL’ series specifications and to profiles indicated.

.2 Cap Flashing:
- .1 Fabricate all cap flashings, roof edge flashings and scuppers related to built-up roofing to profiles indicated, from prefinished 26g galvanized steel sheet.

.3 Pans:
- .1 Form pans from galvanized prefinished steel sheet metal with minimum 75 mm (3") upstand above finished roof and 100 mm (4") continuous flanges with no open corners. Solder joints. Make pans minimum 50 mm (2") wider than member passing through roof membrane.

.4 Reglets and Cap Flashings:
- .1 Form recessed or surface mounted reglets and metal cap flashings of 1mm (0.04") thick sheet metal to be built-in concrete or masonry work for base flashings as detailed and in accordance with CRCA FL series details. Provide slotted fixing holes and steel/plastic washer fasteners. Cover face and ends with plastic tape.

Part 3 Execution

3.1 INSTALLATION

.1 Install sheet metal work in accordance with CRCA specifications, and as detailed.

.2 Use concealed fastenings unless otherwise approved.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm (4").

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock or standing seams forming tight fit over hook strips, as detailed.

.5 Lock end joints and caulk with sealant.

.6 Install any surface mounted reglets indicated true and level, and caulk top of reglet with sealant.

.7 Insert metal flashing into reglets and under cap flashing to form weathertight junction.

.8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm (1"). Lead wedge flashing securely into joint.

.9 Caulk flashing at reglet and cap flashing with sealant.

.10 Install plastic pans, where shown around items projecting through roof membrane. Fill pans with plastic cement.

NMS 078400 - FIRESTOPPING

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 22 00 – Concrete Masonry Units.

.2 Section 04 23 22 – Architectural Concrete Unit Masonry.

.2 Section 09 29 00 – Gypsum Board.

.3 Divisions 15 & 16: Fire stopping and smoke seals within mechanical assemblies (i.e., inside ducts, dampers) and electrical assemblies (i.e., inside cable trays).

1.2 REFERENCES

.1 CAN4-S115-M85, Standard Method of Fire Tests of Firestop Systems.

1.3 SAMPLES

.1 Submit samples of actual firestop material proposed for this project in accordance with Division 1.

1.4 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Division 1.

.2 Shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

.3 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.

.4 Indicate products used and locations on As-Built Drawings.

1.5 MANUFACTURERS

.1 Materials of the following manufacturers are acceptable provided they meet requirements of this specification and are suitable for applications indicated:
- .1 3M Canada Inc.
- .2 A/D Fire Protection Systems Inc.
- .3 Canadian General Electric
- .4 Dow Corning Canada Inc.
- .5 Tremco Canada Ltd.

Part 2 Products

2.1 MATERIALS

.1 Fire stopping and smoke seal systems: in accordance with CAN4-S115.
- .1 Asbestos and PCB free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115 and not to exceed opening sizes for which they are intended.
- .2 Firestop system rating: as indicated on Drawings.

.2 Service penetration assemblies: certified by ULC in accordance with CAN4-S115 and listed in ULC Guide No. 40 U19.

.3 Service penetration firestop components: certified by ULC in accordance with CAN4-S115 and listed in ULC Guide No. 40 U19.13 and ULC Guide No. 40 U19.15 under the Label Service of ULC.

.4 Fire-resistance rating of installed fire stopping assembly not less than the fire- resistance rating of surrounding floor and wall assembly.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry (such as cables): elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

Part 3 Execution

3.1 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to a neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

3.3 SCHEDULE

.1 Firestop and smoke seal at:
- .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
- .2 Edge of floor slabs at applied exterior wall systems such as curtain wall, precast concrete panels, composite metal wall panels or E.I.F.S systems..
- .3 Top of fire-resistance rated masonry and gypsum board partitions.
- .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
- .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
- .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
- .7 Openings and sleeves installed for future use through fire separations.
- .8 Around mechanical and electrical assemblies penetrating fire separations.
- .9 Rigid ducts greater than 129 cm² fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

3.4 CLEAN UP

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

NMS 079200 – JOINT SEALANTS

Special Provision

Part 1 General

1.1 SUMMARY

.1 This Section specifies caulking and sealants not specified in other Sections.

.2 Refer to other sections for other caulking and sealants.

1.2 REFERENCES

.1 CAN/CGSB-19.2-M87 Glazing Compound, Nonhardening, Modified Oil Type.

.2 CGSB 19-GP-5M-76 Sealing Compound, One Component, Acrylic Base, Solvent Curing.

.3 CAN/CGSB-19.6-M87 Caulking Compound, Oil Base.

.4 CAN/CGSB-19.13-M87 Sealing Compound, One-component, Elastomeric, Chemical Curing.

.5 CGSB 19-GP-14M-76 Sealing Compound, One Component, Butyl-polyisobutylene Polymer Base, Solvent Curing.

.6 CAN/CGSB-19.17-M90 One-Component Acrylic Emulsion Base Sealing Compound.

.7 CAN/CGSB-19.18-M87 Sealing Compound, One Component, Silicone Base, Solvent Curing.

.8 CAN/CGSB-19.20-M87 Cold-applied Sealing Compound, Aviation Fuel-resistant.

.9 CAN/CGSB-19.21-M87 Sealing and Bedding Compound Acoustical.

.10 CAN/CGSB-19.22-M90 Mildew Resistant, Sealing Compound for Tubs and Tiles.

.11 CAN/CGSB-19.24-M90 Multi-component, Chemical Curing Sealing Compound.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.4 ENVIRONMENTAL AND SAFETY REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Labour Canada.

.2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.3 Ventilate area of work as directed by the Contract Administrator by use of approved portable supply and exhaust fans.

1.5 WARRANTY

.1 Contractor to warrant caulking work for three years.

Part 2 Products

2.1 MATERIALS

.1 Primers: type recommended by sealant manufacturer so as to be totally compatible with sealants.

.2 Joint backing rod: Soft, closed cell polyethylene foam supplied in continuous rod shaped lengths, diameter min. 25% larger than intended joint width, compatible with primers and sealants. Acceptable products:
- .1 Sealtight Cera-Rod Sealant Backer Rod by W.R.Meadows of Canada Ltd.
- .2 Contract administrator approved equivalent.

.3 Bond breaker: pressure sensitive plastic tape, which will not bond to sealants. Acceptable products:
- .1 Type 470 or 481 Tape by 3M Canada.
- .2 Contract administrator approved equivalent.

.4 Joint cleaner: xylol, methylethyleketon (MEK) or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

2.2 SEALANT TYPES:

.1 Type A: One component, acrylic base, solvent cured, conforming to CGSB 19-GP-5M: Acceptable Products:
- .1 Tremco Mono 555.
- .2 Contract administrator approved equivalent.

.2 Type B: Multi-component, polyurethane base, chemical curing, conforming to CAN/CGSB-19.24 Type 2, Class B. Acceptable Products:
- .1 Tremco Dymeric 240, 863-200.
- .2 Contract administrator approved equivalent.

.3 Type C: One component, elastomeric base, chemical curing, conforming to CAN/CGSB-19.13 Type MCG, Class 240: Acceptable Products:
- .1 Tremco Spectrum IX Silicone Sealant 946-108 MCG 2-40-A-L.
- .2 Contract administrator approved equivalent.

.4 Type D: One component, polyurethane base, chemical curing conforming to CAN/CGSB-19.13, Type MCG, Class 2-25: Acceptable Products:
- .1 Tremco Dymonic MCG-2-25.
- .2 Contract administrator approved equivalent.

.5 Type E: Acoustic type, to CAN/CGSB 19.21: Acceptable Products:
- .1 Tremco Acoustical Sealant 931-70X.
- .2 Contract administrator approved equivalent.

.6 Type F: Acrylic/Latex type, fast setting, pliable, acrylic emulsion compound, conforming to CAN/CGSB 19.17. Acceptable Products:
- .1 Tremco Acrylic Latex Caulk 941-19X.
- .2 Contract administrator approved equivalent.

.7 Type G: fire resistant type, one component, non-sag, purpose made, tested in accordance with CAN4-S115 and CAN4-S102: Acceptable Products:
.1 Fyre-Shield by Tremco.
.2 Contract administrator approved equivalent.

.8 Type H: Mildew Resistant for Tubs and Tile, conform to CAN/CGSB-19.22: Acceptable Products:
.1 Tremco Silicone Tub and Tile Sealant 942-200 Line.
.2 Contract administrator approved equivalent.

2.3 COLOURS

.1 Unless otherwise specified, colours of sealants shall match the colour of the predominant material to which the sealant is being applied.

Part 3 Execution

3.1 PROTECTION

.1 Protect installed work of other trades from staining or contamination.

3.2 PREPARATION OF JOINT SURFACES

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.6 APPLICATION

.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 Apply sealant in continuous beads.

.4 Apply sealant using gun with proper size nozzle.

.5 Use sufficient pressure to fill voids and joints solid.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.7 Tool exposed surfaces before skinning begins to give slightly concave shape.

.8 Remove excess compound promptly as work progresses and upon completion.

3.7 CURING

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

3.8 CLEANUP

.1 Clean adjacent surfaces immediately and leave work neat and clean.

.2 Remove excess and droppings, using recommended cleaners as work progresses.

.3 Remove masking tape after initial set of sealant.

3.9 SCHEDULE

.1 Use Type A Sealant at interior joints at door frames, windows and screens that are subject to dynamic movement.

.2 Use Type B Sealant at sleeves where conduits pass through exterior masonry.

.3 Use Type C or H Sealant at plumbing fixtures where they abut the floor or wall finish, at all kitchen cabinet tops and vanity tops where they abut walls and hard surface floors and at all locations where wood wall base meets the floor finish in bathrooms and kitchens.

.4 Use Type D Sealant at exterior applications.

.5 Use Type E (acoustical) Sealant at all sound resistant wall and ceiling locations.

.6 Use Type F Sealant at all non-moving interior joints intended to be painted over. Apply between hollow metal or wood door and window frames and adjacent interior wall finish.

.7 Use Type G Sealant at all service penetrations of fire separations.

NMS DIVISION 8 SPECIFICATIONS

Special Provision

The following Division 8 National Master Specifications are included in this Contract.

NMS 081113 – HOLLOW METAL DOOR AND FRAMES

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 04 20 00 – Masonry.

.2 Section 07 92 00 – Joint Sealants.

.3 Section 08 71 00 – Finish Hardware.

.4 Section 08 81 00 – Glazing.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CSA A370-94, Connectors for Masonry.
- .2 CSA A440 Series 98, Windows.
- .3 CSA G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steels/Structural Quality Steels.
- .4 CSA W59-M1989 (R1999), Welded Steel Construction (Metal Arc Welding).

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.181-92, Ready-Mixed Organic Zinc-Rich Coating.
- .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .3 CAN/CGSB-51.20-M87, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .4 CGSB 51-GP-21-M78, Thermal Insulation, Urethane and Isocyanurate, Unfaced.
- .5 CAN/CGSB-82.5-M88, Insulated Steel Doors.

.3 American Society for Testing and Materials (ASTM)
- .1 ASTM C553-99 Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
- .2 ASTM A653/A653M-00 Standard Specification for General Requirements for Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM C665-98 Standard Specification for Mineral Fibre Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .4 ASTM A1008/A1008M-00 Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .5 ASTM B29-92(1997) Standard Specification for Pig Lead.
- .6 ASTM B749-97 Standard Specification for Lead and Lead Alloy Strip, Sheet and

Plate Products.

.7 ASTM E2074-00 Standard Method for Fire Tests of Door Assemblies Including Positive Pressure Testing of Side Hinged and Pivotted Swinging Door Assemblies.

.4 Underwriters' Laboratories of Canada (ULC).
- .1 CAN4-S104-1980(R1985), Fire Tests of Door Assemblies.
- .2 CAN4-S105-1985(R1992), Fire Door Frames Meeting the Requirements Required by CAN4-S104.

.5 Canadian Steel Door and Frame Manufacturers' Association, (CSDFMA).
- .1 CSDFMA, Specifications for Commercial Steel Doors and Frames, 1990.
- .2 CSDFMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 1990.

.6 National Fire Protection Association (NFPA).
- .1 NFPA 80-1992, Fire Doors and Windows.
- .2 NFPA 252-1990, Door Assemblies Fire Tests of.

1.3 WORK INCLUDED

.1 Work of this Section includes complete supply and installation of the following:
- .1 Interior and exterior hollow metal doors and frames.
- .2 Interior and exterior hollow metal door frames and screens.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

.1 Steel fire rated doors and frames: labeled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 and NFPA 252 for ratings specified or indicated.

.2 Provide fire labeled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with CAN4-S104, ASTM E2074 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/ Factory Inspection Manuals issued by listing agency to individual manufacturers.

.3 Install any exterior hollow metal window openings in the Air Barrier system to CSA A440 and A440.1.

1.5 DESIGN REQUIREMENTS

.1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.

1.6 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Indicate each type of door material, steel core thicknesses, mortises, reinforcements, location of exposed fastenings and finishes, any glazed or louvred openings, arrangement of hardware and required fire rating, if any.

.3 Indicate each type frame material, steel core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.

1.7 MANUFACTURERS

.1 All Steel Doors and Frames specified in this Section to be manufactured by one company.

Part 2 Products

2.1 MATERIALS

.1 Plain sheet steel: cold rolled commercial grade steel to ASTM A1008/A1008M, matte finish.

.2 Galvanized steel sheet (Type 1): to ASTM A653/A653M with coating designation Z275.

.3 Door Face Sheet Materials:
- .1 Interior doors: plain steel sheet, Type 1, 1.2 mm (18 ga) base metal thickness.
- .2 Exterior doors: galvanized steel sheet, Type 1, 1.6 mm (16 ga) base metal thickness.

.4 Door Core Materials:
- .1 Honeycomb: Standard structural core consisting of kraft paper having 20 mm (3/4") cell size to thickness indicated.
- .2 Steel stiffened: hollow steel construction vertically stiffened with steel ribs and voids filled with semi-rigid fibrous insulation.
- .3 Insulated (Bonded): Rigid urethane foam core bonded under pressure to both door face sheets, compressive strength 122 kg/sq m (25 psi), RSI 1.9 (R-11.1), U:0.09.

.5 Frame Materials:
- .1 Interior frames (commercial quality): plain galvanized steel sheet, Type 1, 1.6 mm (18 ga) base metal thickness.
- .2 Exterior frames: galvanized steel sheet, Type 1, 1.6 mm (16 ga) base metal thickness. Frames to be thermally broken with integral thermal break.

.6 Glazing stops: in accordance with CSDFMA requirements, minimum 1 mm (20 ga) base thickness sheet steel finished to match door, tamperproof screw fixed.

.7 Glass: type and size indicated and as specified in Section 08 81 00 – Glazing.

.8 Touch-Up Primer:
- .1 For plain steel sheet: CAN/CGSB-1.40.
- .2 For galvanized steel sheet: to CAN/CGSB-1.181, zinc-rich organic coating.

.9 Floor anchors and channel spreaders: galvanized steel sheet, minimum 1.6 mm (16 ga) base metal thickness.

.10 Wall anchors: to CSA A370, galvanized, purpose made to suit frame size and wall thickness indicated, wire type or corrugated.

2.2 FABRICATION

.1 Fabricate steel doors and frames as detailed, in accordance with CSDFMA "Canadian Manufacturing Specifications for Steel Doors and Frames" for hollow steel core, honeycomb core and insulated core construction.

.2 Doors:
- .1 Make provision for louvres and/or glazing that may be indicated and provide necessary glazing stops.
- .2 Construct matching panels if indicated in same manner as doors.
- .3 Fabricate doors with longitudinal edges seamless, welded, filled and sanded flush.

.4 Fabricate with top and bottom channels flush and filled solid, extending full width of door and welded to both faces.

.3 Door Frames:
- .1 All steel door frames on this project to be welded.
- .2 All fire labeled frames to be welded construction.
- .3 Provide adjustable jamb anchors for fixing at floor.
- .4 Install 3 bumpers on strike jamb for each single door and 2 bumpers at head for pairs of doors.
- .5 Cut mitres and joints accurately and weld continuously on inside of frame profile.
- .6 Grind welded corners and joints to flat plane, fill with metallic paste filler and sand to uniform smooth finish.

Part 3 Execution

3.1 INSTALLATION

.1 Doors:
- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.
- .2 Adjust operable parts for correct function.
- .3 Install glazing or door grilles where scheduled.

.2 Frames:
- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction. Provide a minimum three wall anchors per jamb.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm (4 ft) wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.3 Fire Doors and Frames:
- .1 Install in accordance with NFPA-80, Volume 4, produced by National Fire Protection Association (NFPA).

3.2 FINISH REPAIRS

.1 Touch-up with primer any galvanized finish damaged during installation. Do not prime or paint over fire labels.

3.3 SCHEDULE

.1 Door and frame sizes, glazing, fire labels, finish requirements and profiles are indicated on the Door, Frame and Hardware Schedule on the Drawings.

.2 Reference the Materials column on the Door, Frame and Hardware Schedule for hollow metal door and frame construction types. Not all references applicable to this project. Select as follows:
- .1 Door construction:
  - .1 M: honeycomb core and insulated core, slab door.
  - .2 L: honeycomb core and insulated core, slab door with louvre.
  - .3 NL1 and NL2: honeycomb core, narrow half upper lite.
  - .4 G: honeycomb core and insulated core, full lite.

.2 Frame construction:
.1 F1: all welded, exterior locations with thermal break, refer to drawings for profile and attachment detail.

NMS 081116 – ALUMINUM DOORS, FRAMES AND SCREENS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 07 27 00 – Air Barriers.

.2 Section 07 92 00 – Joint Sealants.

.3 Section 08 51 13 – Aluminum Windows.

.4 Section 08 71 00 – Finish Hardware.

.5 Section 08 81 00 – Glazing.

1.2 REFERENCES

.1 AA (Aluminum Association) DAF 45 1980 Designation System For Aluminum Finishes.

.2 ASTM E330-97e1 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

.3 CAN/CGSB-1.108-M89 Bituminous, Solvent Type Paint.

.4 CAN/CGSB-1.40-M89 Primer, Structural Steel, Oil Alkyd Type.

.5 CAN/CGSB-12.1-M90 Tempered or Laminated Safety Glass.

.6 CAN/CGSB-12.8-M90 Insulating Glass Units.

.7 CAN/CGSB-12.11-M90 Wired Safety Glass.

.8 CSA A440-98 Windows.

.9 CSA G40.20/G40.21-M92 Structural Quality Steels.

.10 CAN/CSA-G164-98 Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 WORK INCLUDED

.1 Work of this Section includes interior fixed storefront framing, interior glazed aluminum doors, sidelights, and screen frames.

.2 For other fixed windows, see Section 08 51 13 – Aluminum Windows.

1.4 DESIGN CRITERIA

.1 Products installed in the Air Barrier System shall comply with CSA A440 and A440.1.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Indicate each type of door, frame and screen, extrusion profiles, method of assembly, section and hardware reinforcement, locations of exposed fasteners and finishes.

.3 Submit catalogue details in accordance with Division 1 for each type of door and frame illustrating profiles, dimensions and methods of assembly.

.4 Indicate alloy, temper, surface preparation and finish specifications for all aluminum components specified under this Section.

1.6 MAINTENANCE DATA

.1 Provide maintenance data for cleaning and maintenance of aluminum finishes for incorporation into maintenance manual specified in Division 1.

1.7 PROTECTION

.1 Apply Manufacturer's standard temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.

1.8 WARRANTY

.1 Provide written warranty against defective workmanship and materials of the work of this Section for a period of three years from the date of Substantial Completion as defined in the General Conditions.

Part 2 Products

2.1 MATERIALS

.1 Aluminum alloys for both extrusions and sheet material shall have suitable metallurgical characteristics and surface qualities for the application of any protective or decorative coatings by anodizing or any other coating specified in this Section.

.2 The aluminum alloy, temper and surface treatment methods to be used for applications under this Section shall be agreed upon by the Manufacturer and the Contract Administrator and shall fall within the applications guidelines set down by The Aluminum Association Incorporated (AA).

.3 Generally, alloy and temper for tensile strength and corrosion resistance for extruded products shall be AA6063-T5 and for sheet products shall be AA1100. The use of special alloys developed by the Manufacturer for specific finishes is to be approved by the Contract Administrator.

.4 Steel reinforcement: to CSA G40.20/G40.21, Grade 300W galvanized.

.5 Fasteners: aluminum or stainless steel, finished to match adjacent material where exposed. Use aluminum or stainless steel for alum. to alum. contact; stainless steel for alum. to steel contact.

.6 Weatherstrip: replaceable design, manufacturer's standard for framing system specified.

.7 Isolation coating: to CAN/CGSB-1.108, Type 2, alkali resistant or bituminous paint or epoxy solution.

.8 Glass and Glazing Materials: in accordance with Section 08 81 00 – Glazing.

.9 Sealants: multi-component urethane to CAN/CGSB-19.24, coloured to match framing.

2.2 ALUMINUM FRAMES AND SCREENS

.1 Interior Screen Frames: extruded profile, suitable for glazing with single or insulated glass units, sizes as indicated. Provide door jamb fillers at door locations. Acceptable products:
- .1 Tri-Fab II 450 Series (1 3/4" x 4 ½") profile.
- .2 Contract administrator approved equivalent.

.2 Provide optional manufacturer's standard adjustable sidelight base where indicated. When used, adjust to match bottom rail height of adjacent door.

2.3 ALUMINUM FINISHES

.1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System or Aluminum Finishes or with Manufacturer's finishes designation where specifically called for.

.2 Anodic Finishes:
- .1 Anodic finish: clear anodized.

2.4 OTHER FINISHES

.1 Finish steel clips and reinforcing steel with 380 g/sq m zinc coating to CSA G164. Framing manufacturer to determine need for reinforcement to meet performance requirements of system.

2.5 FABRICATION

.1 Construct doors, transom panels, frames and screens to profiles and maximum face sizes as shown. Provide minimum 22 mm (7/8") bite for factory-sealed double-glazed units.

.3 Make allowances for deflection of structure. Ensure that structural loads are not transmitted to aluminum work.

.4 Provide structural steel reinforcement for strength, stiffness and connections.

.5 Fit intersecting members to flush hairline weather tight joints and mechanically fasten together, except where indicated otherwise.

.6 Conceal fastenings from view. Exposed fastenings only where indicated.

.7 Form cut-outs, recesses, mortising or milling for finishing hardware to templates supplied. Reinforce with aluminum or galvanized steel plates.

.8 Field apply isolation coating to aluminum in contact with dissimilar metals or cementitious materials.

.9 Provide replaceable weatherstripping at door openings. Weatherstrip bottom of doors with

pile sweep strip applied to door rail.

.10 Place manufacturer's name plates in semi-concealed locations.

Part 3 Execution

3.1 INSTALLATION

.1 Install work plumb, square, level, free from warp, twist and superimposed loads.

.2 Secure work in required position. Do not restrict thermal movement.

.3 Install hardware required to be installed under this Section in accordance with templates.

.4 Adjust operable parts for correct function.

.5 Isolate from cementitious materials.

.6 Where products of this Section occur in an air barrier system, install in accordance with CSA A440 and A440.1.

3.2 GLAZING

.1 Glaze fixed interior aluminum screens and sidelight frames on site. Aluminum swing doors to be factory glazed by the manufacturer.

.2 Glass material and glazing methods are specified under Section 08 81 00 – Glazing. See door and screen elevations on the Drawings for types and locations.

3.3 CAULKING

.1 Where required seal between members of aluminum work.

.2 Apply sealant in accordance with Section 07 92 00 – Joint Sealers. Conceal sealant within the aluminum work except where exposed use is permitted by the Contract Administrator.

NMS 081423.16 – PLASTIC LAMINATED WOOD FACED DOORS

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section includes:
- .1 Solid core doors with high pressure plastic laminate.
- .2 Factory finishing wood doors.
- .3 Fire rated wood doors.

1.2 SUBMITTALS

.1 Submit required submittals in accordance with Division 1.
- .1 Product data sheets:
  - .1 Product data sheets for Products proposed for use in the work of this section.

1.3 CERTIFICATION

.1 Submit test reports or certification of compliance that manufacturer doors have been tested and third party certified to meet or exceed performance duty level for door construction specified.

1.4 SHOP DRAWINGS

.1 Indicate door location using numbering system per door schedule, size, and hand of each door, elevation of each door type; undercuts, bevelling, construction type core and edge construction not covered in product data; and special blocking requirements.

.2 Indicate dimensions and locations of factory machining criteria for hardware, extent of hardware blocking.

.3 Indicate dimensions and locations of cut-outs including trim for openings.

.4 Indicate doors to be factory finished and finish requirements.

.5 Indicate fire ratings for fire rated doors.

1.5 VERIFICATION SAMPLES

.1 Submit samples of proposed plastic laminate door faces for each colour, texture and pattern selected.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Manufacturer shall be a member in good standing of the Architectural Woodwork Institute or the Architectural Woodwork Manufacturers Association of Canada or the Woodwork Institute.

.2 Quality standard:

.1 Work shall be in accordance with the Architectural Woodwork Standards, Edition 1, 2009, Premium Grade.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Door numbers shall be marked with door numbers used on shop drawings in the top hinge cavity created by the machining for hinges.

.2 Identify doors with labels. Package with resilient packaging.

.3 Store doors flat at the Place of the Work in piles with bottom face on bottom of pile. Protect from moisture by placing water resistant material under skids supporting piles. Cover top of piles and provide air at sides of piles.

.4 Deliver the wood doors only after the building is closed and dry and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period. Do not receive the doors in a damp area. Do not drag the doors on the ground, floor or across one another.

1.8 EXTENDED WARRANTY

.1 Warrant work of this section in accordance with Division 1 for a period of 2 years.

.2 Repair or replace wood doors that fail or are defective within the specified warranty period. The warranty includes re-installation of hardware, re-hanging fitting, and finishing.

.3 Failures shall include but not be limited to out of true alignment, failure to operate and swing freely, smoothly, and easily, to remain stationary at any point, to close evenly and tightly against stops without binding, and to latch positively when doors are closed with moderate force.

.4 Defects shall include, but not be limited to, delaminating, telegraphing of core construction in face veneers exceeding 0.254 mm (0.01”) in a 75 mm (3”) span, and warp exceeding 3 mm (1/8”) in a 1066 mm (42”) x 2133 mm.

Part 2 Products

2.1 MANUFACTURER

.1 Algoma Hardwoods, Inc.

.2 Baillargeon Doors, Inc.

.3 DoorLam Manufacturing.

.4 Eggers Industries.

.5 JWS Manufacturing Inc.

.6 Lambton Doors.

.7 Marshfield Door Systems.

.8 Mohawk Flush Doors, Inc.

.9 Contract administrator approved equivalent.

2.2 PERFORMANCE/DESIGN REQUIREMENTS FIRE RATING REQUIREMENTS

.1 Fire rated doors shall be fabricated, labelled and listed by an organization accredited by Standards Council of Canada in conformance with ULC CAN4-S104-M80 and ULC CAN4-S105-M85 for fire protection ratings as scheduled.

.2 Install fire rated doors in accordance with NFPA 80.

2.3 GENERAL

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

2.4 FABRICATION DOOR CONSTRUCTION

.1 Performance duty level:
  .1 Doors shall meet the requirements of WDMA I.S. 1A-04 for Extra Heavy Duty

Performance Level unless otherwise indicated or scheduled.

.2 Non-rated doors: solid particle board core, high pressure decorative laminate faced, non fire rated and 20 minute fire rated wood door construction to Architectural Woodwork.

.2 Standards Manual, Section 9 and as follows:

.1 Type PC-HPDL-5, particle core to ANSI A208.1-1999 LD-2.

.3 Fire rated doors: solid fire resistant core; high pressure decorative laminate faced:

.1 Construction; high pressure decorative laminate; 45, 60 and 90 minute rated wood doors: Architectural Woodwork Standards Manual, Section 9, Type FD-HPDL-5.

.4 Bonding:

.1 Bond stiles and rails to core; abrasive sand core assembly to achieve uniform thickness prior to lamination of door faces.

.5 Panel edge types:

.1 High pressure decorative laminate faced doors:

.1 For vertical edges (stiles) and exposed horizontal edges (rails). (Exposed horizontal edges are those edges that can be viewed from floors above.):

.1 Edge Type A

.2 Minimum 11 mm (7/16") thick, closed grain, solid hardwood edge.

.1 Wood edge transparent finish to match face.

.3 Non-rated or 20 minute fire rated doors: Solid hardwood edge to be laminated to minimum 25.4 mm (1") structural composite lumber backer.

.4 For 45, 60, or 90 minutes fire rated doors: Solid hardwood edge to be rated doors.

.5 For unexposed horizontal edges (rails):

.1 Non rated or 20 minute fire rated doors: Minimum 25 mm (1") structural composite lumber.

.2 45, 60, or 90 minute fire rated doors: fire rated material for fire rated doors.

.6 Blocking:

.1 Supply and install hardware blocking for doors as follows:

.1 Non-rated or 20 minute fire rated doors: Structural composite lumber for hardware blocking.

.2 Fire rated material for hardware blocking.

.3 HB-1, minimum 125 mm (5") wide, full door width, top-rail blocking for closure devices or flush bolts or for sliding door hardware.

.4 HB-2, minimum 125 mm (5") wide, full door width, bottom-rail blocking for doors with protection plates, concealed door seals, pivots or floor bolts.

.5 HB-4, minimum 114 mm (5") wide x 250 mm (10") high blocking for doors with mortise locks and pockets.

.6 HB-5, minimum 114 mm (5") wide x 250 mm (10") high blocking for hinges.

.7 HB-6, minimum 125 mm (5") wide, full door width, mid-rail blocking for exit devices.

.8 HB-7, minimum 125 mm (5") wide, full door height, for doors with continuous type hinges.

.7 Thickness:

.1 45 mm (1-3/4") minimum unless otherwise indicated or scheduled.

2.5 PLASTIC LAMINATE FACED DOORS

.1 Type: Grade 10 General Purpose, ANSI/NEMA LD3-2005.

.2 Thickness: 1.2 mm.

.3 Colours and patterns: to be selected at a later date by Contract Administrator from manufacturer's standard colour range. Plastic laminate by Formica or Contract Administrator approved equivalent.

.4 Surface finish: to be selected at a later date by Contract Administrator from manufacturer's standard finish range.

2.6 ACCESSORIES

.1 Finishing hardware: in accordance with Section 08 71 00 – Finish Hardware.

.2 Glass lite kit. Standard wood moulding, birch, clear finish. Acceptable products: Baillargeon Doors, Type S standard wood molding or Contract Administrator approved equivalent.

2.7 FABRICATION

.1 Fire rated doors shall be fabricated, labelled and listed by an organization accredited by Standards Council of Canada in conformance with ULC CAN4-S104-M80 and ULC CAN4-S105-M85 for fire protection ratings as scheduled.

.2 Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
- .1 Clearances: Refer to Part 3 for clearance tolerances.
- .2 Fit doors for automatic door bottoms.
- .3 Comply with NFPA 80 for fire-rated doors.
- .4 Bevel non-fire-rated doors 3-1/2 degrees (1/8 inch in 2 inches) at lock and hinge edges.
- .5 Bevel fire-rated doors 3-1/2 degrees (1/8 inch in 2 inches) at lock edge; trim stiles and rails only to extent permitted by labelling agency.

.3 Fabricate doors with hardware blocking as specified in Part 2 of this Section.

.4 Factory machine doors for finish hardware that is not surface applied. Do not machine for surface hardware. Locate hardware to comply with Door and Hardware Institute (DHI) edition. Comply with final reviewed hardware schedules, door and frame shop drawings and hardware templates.
- .1 Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- .2 Metal astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire rated doors.

.5 Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes.

.6 Factory cut and trim openings:
- .1 Glazing: Factory install glazing in doors indicated to be factory finished.

2.8 FACTORY FINISHING

.1 Finish work in factory in accordance with Architectural Woodwork Standards Manual, Section

9 and referenced quality standard.

.2 Prior to finishing, handling marks or effects of exposure to moisture removed with a thorough final sanding over surfaces of the exposed portions, using appropriate grit sandpaper, and shall be cleaned prior to applying sealer or finish. Sanding shall be completed just prior to stain or finishing application.

.3 Seal top and bottom door edges.

Part 3 Execution

3.1 EXAMINATION

.1 Supply and install necessary grounds, bracing and strapping for fitting and adequate for securing of the work.

.2 Cooperate with work of other sections to ensure fastenings set by others are provided and located, their work is installed to their specifications and that those responsible for back priming are notified in sufficient time for them to schedule work.

3.2 INSTALLATION – GENERAL

.1 Execute installation and assembly at the Place of the Work using skilled forces under supervision of a competent joinery foreperson.

.2 Install work plumb, level and straight, and fasten it securely to backing to support itself and anticipated superimposed loads.

.3 Build into construction as indicated, or specified in other sections of this specification, or both.

.4 Adequately fasten units and secure in place with concealed fixings wherever possible. Include grounds and furring where required.

3.3 INSTALLATION – DOORS/FRAMES

.1 Install wood doors after finishing of walls.

.2 Install fire rated doors in accordance with NFPA 80.

.3 Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00 – Finish Hardware.

.4 Align and fit doors in frames with uniform clearances as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

.5 Pilot drill screw and bolt holes.

3.4 INSTALLATION – FINISHING HARDWARE

.1 Install finishing hardware in accordance with Section 08 71 00.

.1 Clearances: Provide 3.2 mm (1/8”) maximum at heads, jambs, and between pairs of doors. Provide 3.2 mm (1/8”) maximum from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, 6.4 mm (1/4”) minimum from bottom of door to top of threshold unless

otherwise indicated and a maximum of 12.7 mm (½").

3.5 ADJUSTING AND CLEANING

.1 Adjust doors to swing freely, smoothly and easily, to remain stationary at any point, to close evenly and tightly against stops without binding, and to latch positively when doors are closed with moderate force.

.2 Adjust hardware so that latches and locks operate smoothly and without binding, and closers act positively with the least possible resistance in use. Lubricate hardware if required by instructions.

.3 Ensure that doors equipped with closers operate to close doors firmly against anticipated wind and building air pressure, and to enable doors to be readily opened as suitable for function, location and traffic.

.4 Clean hardware after installation in accordance with instructions.

.5 Seal top and bottom edges of wood doors are re-sealed if they are cut to fit, in accordance.

3.6 SCHEDULE

.1 Door and frame sizes, glazing, fire labels, finish requirements and profiles are indicated on the Door, Frame and Hardware Schedule on the Drawings.

.2 Reference the Materials column on the Door, Frame and Hardware Schedule for plastic laminated wood door construction types. Select as follows:

.1 Door construction:

.1 WD1: slab door.

.2 WD2: slab door with glazing.

NMS 083113 - ACCESS DOORS AND FRAMES

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 07 92 00 – Joint Sealants.

1.2 COORDINATION

.1 Provide inserts and anchoring devices that will be built into other Work for installation of access door assemblies.

.2 Coordinate delivery with other Work to avoid delay.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures

.2 Shop Drawings:
- .1 Door and panel units: Show types, elevations, thickness of metals, full size profiles of door members.
- .2 Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations and types of operating hardware, and details of installation.
- .3 General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of door and panel units.

.3 Product Data:
- .1 Manufacturer’s technical data for each type of access door and panel assembly, including setting drawings, templates, fire-resistive characteristics, finish requirements, and details of anchorage devices.
- .2 Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.

.4 Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

1.4 WARRANTY

.1 Provide manufacturer's written warranty.

.2 Warrant materials and fabrication against defects after completion and final acceptance of Work.
- .1 Repair defects, or replace with new materials, faulty materials or fabrication developed during the warranty period at no expense to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Provide and maintain dry, off-ground weatherproof storage.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with General Conditions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused paint and sealant materials from landfill to an approved, official hazardous material collections site.

.5 Do not dispose of unused paint and sealant materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

.6 Divert unused metal materials from landfill to an approved metal recycling facility.

.7 Divert unused wood materials from landfill to an approved recycling facility.

.8 Damaged or broken glazing materials are not recyclable. These materials must not de disposed of with materials destined for recycling.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURERS

.1 Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of Acudor Products Inc or consultant approved equivalent.

.2 Similar products by Bauco Access Panel Solutions, Nystrom Building Products or Cendrex Inc. of same materials, metal gauge and finishes are considered equal. All other products subject to Contract Administrator approval.

2.2 MATERIALS

.1 Flush Non-Rated Access Doors and Frame with exposed flanges (non-rated insulated access door with gasket).

- .1 Basis-of-Design Product: Subject to compliance with requirements, provide Acudor LT-4000, aluminum specialty door.
- .2 Location: Ceiling.
- .3 Door Size: 610mm x 914mm (24"x36").
- .4 Material: Aluminum
  - .1 Door: 1.6mm (0.064"), flush to edge of frame, 33mm (1-5/16") mitered aluminum extrusion flange.
  - .2 Mounting Frame: 2mm (.080"), 38mm (1-1/2") deep.
  - .3 Hinge: Doors with width 610mm (24") or less to have concealed pin hinge. Doors with width over 610mm (24") to have continuous aluminum piano hinge with exposed knuckle, set to open to 180 degrees.
- .5 Insulation: 19mm (3/4") Type 3 Expanded Polystyrene (EPS) Foil Lined Insulation, with a 3.18 R Value.
- .6 Gasket: 3mm (1/8") x 9.5mm (3/8") closed cell neoprene gasketing.
- .7 Standard Latch: Screwdriver operated cam latch.
- .8 Finish: Mill finish.

Part 3 Execution

3.1 EXAMINATION

.1 Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

.1 Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

.1 Adjust doors and hardware, after installation, for proper operation.

NMS 083613 – SECTIONAL DOORS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 07 92 00 – Joint Sealant.

.3 Section 08 71 00 – Finish Hardware.

1.2 REFERENCES

.1 ASTM A653/653M -00 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process.

.2 ASTM A1008/A1008M-00 Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

.3 ASTM D523-89(R1999) Standard Test Method for Specular Gloss.

.4 ASTM D822-96 Standard Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

.5 CAN/CGSB-1.105-M91, Quick-Drying Primer.

.6 CAN/CGSB-1.181-M92, Ready-Mixed Organic Zinc-Rich Coating.

.7 CAN/CGSB-1.213-95, Etch Primer (Pretreatment Coating) For Steel and Aluminum.

.8 CAN/CSA S16.1-94(R2000), Limited Satates Design of Steel Structures.

.9 CSA G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 DESIGN CRITERIA

.1 Design exterior door assembly to withstand wind load as specified in the latest adopted version of the Ontario Building Code with a maximum horizontal deflection of 1/240 of opening width.

.2 Design door panel assemblies with thermal insulation factor 2.84 RSI (R-16.4).

.3 Steel door sections, stiles, back panels and tracks to meet ASTM A653/653M.

.4 Door assembly to withstand minimum 200,000 door cycles or 10 years, when service/replacement program has been performed.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Indicate materials, operating mechanisms, required clearances and electrical connections.

1.5 MAINTENANCE DATA

.1 Provide operation and maintenance data for overhead door hardware for incorporation into manual specified in Division 1.

1.6 MAINTENANCE MATERIALS SPECIAL TOOLS AND SPARE PARTS

.1 Provide spare parts in accordance with Division 1.

.2 Store where directed. Identify each part and reference to appropriate door.

Part 2 Products

2.1 MATERIALS

.1 Galvanized steel sheet: commercial quality to ASTM A653/653M with Z275 zinc coating.

.2 Steel sheet: commercial quality to ASTM A1008/A1008M unexposed (U), exposed(E), with baked enamel finish.

.3 Primer: Acceptable manufacturer's standard.

.4 Insulation: Polyurethane foam, CFC-11 free to meet above design criteria (R-16.4).

.5 Glazing: manufacturer’s standard acrylic panels in rubber gaskets, where scheduled.

.6 Cable: multi-strand galvanized steel aircraft cable.

2.2 DOORS

.1 Fabricated 44 mm (1.73") thickness high strength aluminum profiles, solid insulated aluminum frame construction for bottom panels, scratch resistance acrylic double glass, double sealed for infills glazing. Flush exterior face, thermally broken, weatherstrip and weatherseal.

.2 Use shop and field connections complying with CAN/CSA S16.1.

.3 Assemble components by means of spot or arc welding or coated rivet system or adhesive and self-tapping screws to manufacturer's recommendations.

.4 Apply shop coat of primer after fabrication of door. Fabricate doors from manufacturer's standard prepainted steel stock. Colour white.

.5 Acceptable products:
- .1 Assa Abloy OH1042F by Assa Abloy.
- .2 Contract administrator approved equivalent.

2.3 HEAVY DUTY INDUSTRIAL HARDWARE

.1 Track: hardware with 75 mm (3") size 3.1 mm (11 ga) core thickness Galvanized Steel track for torsion spring lifting and include ancillary hardware items.

.2 Rollers: full floating grease packed hardened steel, ball bearing 73 mm (2 7/8") diameter solid steel tire.

.3 Roller brackets: adjustable, minimum 3.1 mm (11 ga) galvanized steel.

.4 Double end style hinges and rollers with continuous track angles.

.5 Shaft and Spring: solid steel keyed shaft with 100,000 door cycles counter balancing springs.

.6 Cable: galvanized steel aircraft cable.

.7 Slide Locks in track surface mounted on door.

.8 Track guards.

.9 Chain Hoist.

2.4 ACCESSORIES

.1 Bumper leaf springs.

.2 Bulb type extruded neoprene weatherstrip for door sill section, full width.

.3 Weatherstrip for jambs and head, to manufacturer's standard.

.4 Finish ferrous hardware items with minimum zinc coating of 300 g/m² to CAN/CSA-G164.

2.5 POWER OPERATOR

.1 Electrical jack shaft side mounted type operator: operator to include motors, speed reducers with all gears running in oil, sheaves, racks, levers, cables and brake, disconnect switches, reversing starters, controls and all conduit and wiring to make all connections required for a complete installation.

.2 Provide operator with floor level disconnect device to allow for manual operation in event of power failure. Equip operator with electrical interlock switch to disconnect power to operator when in manual operation and built in chain hoist for operation in power failure.

.3 Electrical motors, controller units, remote push button stations, relays and other electrical components: to CSA approval with CSA enclosure type 1.

.4 Photo sensors and timer: UL approved, self-monitoring operator to open door when object is sensed and a timer to close function to close door at a programmable time from 5 seconds to 1 hour.

.5 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom section of door, to reverse door to open position when coming into contact with object on closing cycle.

.6 Door speed: 300mm per second.

.7 Control Transformer: for 24 V AC control voltage.

.8 Acceptable Products:
- .1 Richard-Wilcox, Dyna-Hoist DC750-100 Direct Drive.
- .2 Contract administrator approved equivalent.

Part 3 Execution

3.1 INSTALLATION

.1 Install doors and hardware to manufacturers' recommendations.

.2 Touch-up steel doors with primer where galvanized finish damaged during fabrication.

.3 Lubricate springs and adjust door operating components to ensure smooth opening and closing of doors.

.4 Adjust weatherstripping to form a weathertight seal.

NMS 085113 – ALUMINUM WINDOWS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

.2 Section 07 21 29 – Sprayed Insulation.

.3 Section 07 92 00 – Joint Sealants.

.4 Section 07 27 00 – Air Barriers.

.5 Section 08 81 00 – Glazing.

1.2 REFERENCES

.1 AA (Aluminum Association) DAF 45 1980 Designation System For Aluminum Finishes.

.2 ANSI/ASTM E330-97e1 Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

.3 ASTM C542-94(1999) Specification for Lock-Strip Gaskets.

.4 ASTM D2240-00 Test Method for Rubber Property - Durometer Hardness.

.5 ASTM E84-00a Test Method for Surface Burning Characteristics of Building Materials.

.6 CAN4-S106-1980(R1985) Fire Tests of Window and Glass Block Assemblies.

.7 CAN/CGSB-1.40-M89 Primer, Structural Steel, Oil Alkyd Type.

.8 CAN/CGSB-12.2-M76 Glass, Sheet, Flat, Clear.

.9 CAN/CGSB-12.3-M76 Glass, Polished Plate or Float, Flat, Clear.

.10 CAN/CGSB-12.4-M76 Glass, Heat Absorbing.

.11 CAN/CGSB-12.8-M76 Insulating Glass Units.

.12 CAN/CGSB-12.10-M76 Glass, Light and Heat Reflecting.

.13 CAN/CSA-G164-M92 Hot Dip Galvanizing of Irregularly Shaped Articles.

.14 CAN/CSA-Z91-M91 Safety Code for Window Cleaning Operations.

.15 CSA A440 Series -98 Windows.

.16 Flat Glass Manufacturers Association (FGMA) Glazing Manual.

.17 Laminators Safety Glass Association Standards Manual.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Clearly indicate materials and large scale details for head, jamb and sill, profiles of components, elevations of unit, anchorage details, glazing details, glass specifications, location of isolation coating, description of related components and fasteners and specifications for all exposed finishes.

1.4 TEST REPORTS

.1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications, for:
- .1 Windows classifications.
- .2 Finish, weathering characteristics wood preservative.
- .3 Air tightness.
- .4 Water tightness.
- .5 Wind load resistance.
- .6 Condensation resistance.
- .7 Sash strength and stiffness.
- .8 Forced entry resistance.

1.5 MAINTENANCE DATA

.1 Provide maintenance data for cleaning and maintenance of aluminum windows for incorporation into maintenance manual specified in Division 1.

1.6 WARRANTY

.1 Provide a warranty against leakage, defects and malfunction under normal usage in accordance with GC24, but for five years. Provide a 10 year warranty on manufacturer's standard insulating glass units.

Part 2 Products

2.1 MATERIALS

.1 Materials: to CSA A440 supplemented as follows:
- .1 Main frame: extruded aluminum sash, thermally broken.
- .2 Glass: See Section 08 81 00 - Glazing for glass material specifications.
- .3 Exterior aluminum sills: extruded aluminum brake formed aluminum sheet metal of type and size as detailed; minimum 3 mm (1/8") thick, complete with joint covers,

jamb drip deflectors, chairs, anchors and anchoring devices.
.4 Isolation coating: alkali resistant bituminous paint.
.5 Sealants: multi-component urethane to CAN/CGSB-19.24, coloured to match framing. See also Section 07 92 00 – Joint Sealers.
.6 Fasteners: Aluminum or stainless steel for aluminum to aluminum contact, stainless steel for aluminum to steel contact.

2.2 WINDOW TYPES, SIZES AND CLASSIFICATION

.1 Type 1 – Fixed and operable sash window:
.1 Extruded aluminum, thermally broken, interior applied stops, anodized factory finished on interior and exterior exposed surfaces, glazed with insulating glass units.
.2 Acceptable Products:
.1 Kawneer 5500 Fixed window.
.2 Contract administrator approved equivalent.

2.3 CLASSIFICATION RATING:

.1 All windows in this Section must meet the following classification ratings when tested in accordance with CSA A440.

.2 Air leakage: A3

.3 Water leakage: B7

.4 Wind load resistance: C5

.5 Condensation resistance: Temperature Index, I-58

.6 Forced Entry: F2

.7 Glazing: see Schedule in Part 3 of Section 08 81 00 – Glazing.

2.4 FABRICATION

.1 Fabricate in accordance with CSA A440 supplemented as follows:
.1 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm (1/16") for units with a diagonal measurement of 1800 mm (72") or less and plus or minus 3 mm (1/8") for units with a diagonal measurement over 1800 mm (72").
.2 Face dimensions detailed are maximum permissible sizes.
.3 Brace frames to maintain squareness and rigidity during shipment and installation.
.4 Finish steel clips and reinforcement with shop coat primer to CAN/CGSB-1.40.

2.5 ALUMINUM FINISHES

.1 Finish exposed areas of aluminum components in accordance with Aluminum Association or with manufacturer's finishes, designation where specifically called for Designation System for Aluminum Finishes.

.2 Anodized Finishes:
.1 Clear anodized.

.3 Aluminum sills: Clear anodized.

2.6 ISOLATION COATING

.1 Isolate aluminum from dissimilar metals except stainless steel, zinc, concrete, mortar, masonry, and wood, by means of isolation coating.

2.7 GLAZING

.1 Glaze windows in accordance with CSA A440.

.2 Site glaze windows with glass types as indicated on the Drawings and as specified in Section 08 8 1 00 Glass Glazing.

2.8 AIR BARRIER AND VAPOUR BARRIER

.1 Equip window frames with factory installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as follows:

- .1 Material: identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.
- .2 Material width: adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

Part 3 Execution

3.1 WINDOW FRAME INSTALLATION

.1 Install in accordance with CSA A440.

.2 Arrange components to prevent abrupt variation in colour.

.3 Windows installed in the Air Barrier system to comply with CSA A440 and A440.1.

3.2 ALUMINUM SILL INSTALLATION

.1 Install extruded aluminum sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use one piece lengths at each location.

.2 Cut sills to fit window opening.

.3 Secure sills in place with anchoring devices located at ends and at joints of continuous sills and evenly spaced 600 mm (24") oc in between.

.4 Fasten expansion joint cover plates and drip deflectors where required with self tapping stainless steel screws.

.5 Maintain 6 to 9 mm (approx. 1/4" to 3/8") space between butt ends of continuous sills. For sills over 1200 mm (48") in length, maintain 3 to 6 mm (1/8" to 1/4") space at each end.

3.3 CAULKING

.1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.

.2 Apply sealant in accordance with Section 07 92 00 Joint Sealants. Conceal sealant within aluminum work except where exposed use is permitted by the Contract Administrator.

NMS 087100 – FINISH HARDWARE

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Door and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

.1 Use ULC listed and labelled hardware for doors in fire separations and exit doors.

1.3 HARDWARE SCHEDULE

.1 A detailed Hardware Schedule shall be prepared and submitted to the Contract Administrator by the Contractor's hardware supplier following the award of Contract, for the Contract Administrator's approval.

.2 Clearly indicate manufacturer's name, catalogue identification description, purpose, location and finish for each item.

.3 Upon review and acceptance of the detailed Hardware Schedule, the list shall be tendered among three approved suppliers by the General Contractor, with the award of sub-contract to the lowest bidder.

1.4 TEMPLATES

.1 Upon award of the Contract, furnish promptly to applicable trades any patterns, templates, template information and manufacturer's literature required for proper preparation for and application of hardware, in ample time to facilitate the progress of work.

1.5 DELIVERY AND STORAGE

.1 Store hardware in locked, clean and dry area. Maintain inventory list with Hardware Schedule.

.2 Package each item of hardware separately or in like groups of hardware, and label each package as to item definition and location.

1.6 MAINTENANCE DATA

.1 Provide maintenance data, parts list, and manufacturer's instructions for door closers, locksets, door holders, and panic devices for incorporation into maintenance manual specified in General Requirements.

.2 Brief maintenance staff regarding proper care of hardware including cleaning, and general maintenance.

1.7 MAINTENANCE MATERIALS

.1 Provide two sets of wrenches for door closers and locksets. Include keys for panic devices with dogging feature.

Part 2 Products

2.1 QUALITY

.1 In every case, hardware shall be of quality, design and finish suitable for purpose to which it is intended, to the complete satisfaction of the Contract Administrator.

2.2 FINISHES

.1 Type and finish of hardware shall be in accordance with, and equal in all respects, to samples of hardware and finishes approved by the Contract Administrator.

.2 Metal finishes shall be free from defects, clean and unstained, and of uniform colour and finish for each type of finish required.

2.3 FASTENINGS

.1 Hardware shall be complete with screws, bolts, expansion shields and other fastening devices as required for satisfactory installation and operation of hardware.

.2 Fastening devices shall be of same finish as hardware which is to be fastened.

.3 Use countersunk oval head screws for fastening push, pull and kickplates.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

2.4 KEYING

.1 Lay out keying system in consultation with the Owner. Keying system shall include keying alike, keying differently, keying in groups, submaster keying and grand master keying locks as necessary to meet the requirements of the Owner.

.2 Keying chart and related explanatory data shall be prepared and submitted to the Owner for approval, and lock work shall not be commenced until written confirmation of keying arrangements is received from the Owner.

.3 Provide keys in duplicate for every lock.

.4 Provide three master keys for each MK or GMK group.

.5 Stamp keying code numbers on keys and cylinders.

.6 Provide cabinet for key control with two tag security system complete with key loan register, three-way cross reference index, and cabinet door locking device.

2.5 CONSTRUCTION CYLINDER CORES

.1 All locks shall be operated by a construction master key in construction cylinder cores while the building is under construction, but shall not operate when the temporary construction cores are replaced with permanent master keyed cylinders at completion of the building.

2.6 HARDWARE ITEMS

.1 Hinges: 5 knuckle, ball bearing, stainless steel, 114 mm x 102 mm. Exterior outswinging doors to have non-removable pins. Stanley or Consultant Approved equivalent.

.2 Locksets: Standard duty, lever lock, cylindrical design meeting standard ANSI A156.2, 1996, Series 4000, Grade 2, ULC listed for all functions up to 3 hours. Schlage AL series or Consultant Approved equivalent.

.3 Closers: Surface mounted, universal, heavy duty, fully adjustable, multi-sized, with cover, meeting barrier - free requirements. Norton series 7500 or Consultant Approved equivalent.

.4 Door Stops: Wall mounted, half dome design, stainless steel with rubber cushion, concealed fasteners.

.5 Thresholds: Mill finished aluminum, extruded shape, with bevelled edges, thermally broken, to full width of opening, minimum 127 mm wide. CT-75, K.N. Crowder or Consultant Approved equivalent.

.6 Weatherstripping: Extruded aluminum with neoprene rubber, K.N. Crowder W12 or Consultant Approved equivalent.

.7 Door Sweep: Extruded aluminum, anodized finish, with 25 mm nylon brush, K.N. Crowder W24S or Consultant Approved equivalent.

.8 Exit Device: Dor-O-Matic Model 1594, rim mounted, with exterior pull and night latch cylinder, satin nickel finish.

.9 Door Push/Pulls: Kawneer “Architects Classic”, mounted back-to-back on doors, or Consultant Approved equivalent.

.10 Automatic Entrance: Stanley Magic Swing electric operator, surface mounted with concealed internal wiring, jamb mounted push plate controls, two per operator, adjustable time delay, adjustable force closer, internal controller, 120 V, 1/4 hp gear drive, in anodized clear aluminum finish.

.11 Top and Bottom Flush Bolt: Manual Flish Bolts, Ives FB48 or Consultant Approved equivalent.

.12 Barrier free washroom installations: Provide integrated automatic power operator system complete with “Push to Lock” and “Push to Exit” pads illuminated with red and green halo lighting on the interior and “Push to Enter” on the exterior of the room, that will indicate when the room is occupied, and when is not. Include electric strikes and interconnection with operator to prevent operation when locked. Provide visual and audible alarm operated by a button within the washroom to alert staff to an emergency that will also unlock the door.

Part 3 Execution

3.1 INSTALLATION

.1 Carefully follow manufacturer's instructions for installation of finish hardware.

.2 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

.3 Hardware for access doors provided for the handicapped, and mounting heights, to conform with Code requirements for Barrier Free Design.

.4 Use butts with non-removable pins on exterior outswinging doors.

3.2 HARDWARE SET SCHEDULE

.1 Set 01:
- .1 3 – NRP Hinges
- .2 1 – Construction Core
- .3 1 – Lever Lockset, Storeroom Function
- .4 1 – Closer
- .5 1 – OH Stop
- .6 1 – Weatherstripping
- .7 1 – Threshold
- .8 1 – Door Sweep
- .9 2 – Kickplates
- .10 1 – Strike Latch Guard
- .11 1 – Electric Strike (Refer to Electrical)
- .12 1 – Punch Pad and Key Lock (Refer to Electrical)

.2 Set 02:
- .1 3 – NRP Hinges
- .2 1 – Construction Core
- .3 1 – Lever Lockset, Storeroom Function
- .4 1 – Weatherstripping
- .5 1 – Threshold
- .6 1 – Door sweep
- .7 2 – Kickplates
- .8 1 – Strike Latch Guard
- .9 1 – ADO c/w Push Plate Both Sides (Refer to Electrical)
- .10 1 – Electric Strike (Refer to Electrical)
- .11 1 – Punch Pad and Key Lock (Refer to Electrical)

.3 Set 03:
- .1 3 – NRP Hinges
- .2 1 – Construction Core
- .3 1 – Lever Lockset, Storeroom Function
- .4 1 – Closer
- .5 1 – OH Stop
- .6 1 – Weatherstripping
- .7 1 – Threshold
- .8 1 – Door Sweep
- .9 2 – Kickplates
- .10 1 – Strike Latch Guard
- .11 1 – Electric Strike (Refer to Electrical)

.12 1 – Punch Pad and Key Lock (Refer to Electrical)

.4 Set 04:
- .1 6 – Hinges
- .2 1 – Construction Core
- .2 1 – Lever Lockset, Entry Function (RH Leaf)
- .3 1 – Top and Bottom Flush Bolts, Concealed
- .4 1 – Closer
- .5 2 – OH Stop
- .6 4 – Kick Plates

.5 Set 05:
- .1 3 – Hinges
- .2 1 – Construction Core
- .3 1 – Lever Lockset, Entry Function
- .4 1 – Closer
- .5 1 – OH Stop
- .6 2 – Kickplates

.6 Set 06:
- .1 3 – Hinges
- .2 1 – Construction Core
- .3 1 – Lever Lockset, Privacy Function
- .4 1 – Closer
- .5 1 – OH Stop
- .6 2 – Kickplates

.7 Set 07:
- .1 3 – Hinges
- .2 1 – Construction Core
- .3 1 – Lever Lockset, Storeroom Function
- .4 2 – Kickplates
- .5 1 – ADO c/w Push Plate Both Sides (Refer to Electrical)
- .6 1 – Electric Strike (Refer to Electrical)
- .7 1 – Universal Washroom Kit

.8 Set 08:
- .1 3 – Hinges
- .2 1 – Lever Lockset, Passage Function
- .3 1 – Closer
- .4 1 – Floor Stop
- .5 2 – Kick Plates

.9 Set 09:
- .1 3 – Hinges
- .2 1 – Lever Lockset, Office Function
- .3 1 – Floor Stop
- .3 2 – Kickplates

.10 Set 10:
- .1 3 – Hinges
- .2 1 – Construction Core
- .3 1 – Lever Lockset
- .4 2 – Kickplates
- .5 1 – ADO c/w Push Plate Both Sides (Refer to Electrical)
- .6 1 – Electric Strike (Refer to Electrical)

3.3 KEYING SCHEDULE

.1 Keyset 1 – Doors w/ Access Control:
  .1 Door Numbers: 103-1, 108-1, 111-1, 111-2, 112-1, 112-2, 300-3

.2 Keyset 2 – Offices:
  .1 Door Numbers: 109-1, 110-1

.3 Keyset 3 – Service Spaces:
  .1 Door Numbers: 100-1, 101-1, 102-1

NMS 088100 – GLAZING

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 08 11 13 – Hollow Metal Doors.

.2 Section 08 11 16 – Aluminum Doors, Frames & Screens.

.3 Section 08 51 13 – Aluminum Windows.

1.2 REFERENCES

.1 ANSI/ASTM E330-97e1, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

.2 ASTM C542-94(1999) Standard Specification for Lock-Strip Gaskets.

.3 ASTM D1003 00 Standard Test Method for Haze and Luminous Transmittance of Plastics.

.4 ASTM D1929-96 Standard Test Method for Ignition Properties of Plastics.

.5 ASTM D2240-00 Standard Test Method for Rubber Property - Durometer Hardness.

.6 ASTM E84-00a Standard Test Method for Surface Burning Characteristics of Building Materials.

.7 ASTM F1233-98 Standard Test Method for Security Glazing Materials and Systems.

.8 CAN4-S106-1980(R1985) Fire Test of Window and Glass Block Assemblies.

.9 CAN/CGSB-12.1M90 Tempered or Laminated Safety Glass.

.10 CAN/CGSB-12.2-M91 Flat, Clear Sheet Glass.

.11 CAN/CGSB-12.3-M91 Flat, Clear Float Glass.

.12 CAN/CGSB-12.4-M91 Heat Absorbing Glass.

.13 CAN/CGSB-12.5M86 Mirrors, Silvered.

.24 CAN/CGSB-12.8-M90 Insulating Glass Units.

.15 CAN/CGSB-12.9-M91 Spandrel Glass.

.16 CAN/CGSB-12.10-M76 Glass, Light and Heat Reflecting.

.17 Flat Glass Manufacturers Association (FGMA) Glazing Manual.

.18 IGMAC Insulated Glass Manufacturers' Association of Canada.

.19 Laminators Safety Glass Association Standards Manual.

1.3 WORK INCLUDED

.1 Glass and glazing of interior and exterior:
- .1 Aluminum entrance doors.
- .2 Hollow metal and wood doors.
- .3 Exterior aluminum windows.

.2 See Schedule in Part 3 of this Section.

1.4 SAMPLES

.1 Submit duplicate 300 x 300mm (12" x 12") size samples of glass and related sealant material, in accordance with Section 01 33 00 – Submittal Procedures.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

.1 Where glazing is provided by the door or window manufacturer, he is responsible for determining glass thicknesses of exterior windows. Base design on local positive and negative wind loads. In all other instances, the glass supplier is responsible.

.2 Thicknesses of individual panes of glass in this specification are the minimum acceptable.

.3 Safety glass shall comply with the safety glazing requirements of the Hazardous Products Act and the OBC.

.4 Where glazing is used in fire related window assemblies, ratings are to be determined from test results of CAN4-S106.

1.6 MANUFACTURERS

.1 All gasketing materials and glazing sealants shall be supplied and installed by a single manufacturer in order to ensure material compatibility. Glazing sealants manufacturer shall certify compatibility of their products with the perimeter seal of Insulating Glass Units specified.

1.7 ENVIRONMENTAL CONDITIONS

.1 Glazing to be undertaken at temperatures recommended by the manufacturer of the glazing materials.

1.8 QUALIFICATIONS

.1 Double Insulating Glass Units shall comply with the recommendations of the Insulated Glass Manufacturers Association of Canada (IGMAC).

1.9 WARRANTY

.1 The Contractor shall warrant the Insulating Glass Units against failure of the seal of enclosed air space and deposits on inner faces of glass detrimental to vision in accordance with GC 12.3 - Warranty, but for five (5) years.

Part 2 Products

2.1 GLASS MATERIALS

.1 The following are single sheet glass material descriptions. Not all material listed is applicable to this project. For glass types used, as well as multi-layered applications and assemblies, see Schedule in Part 3 of this section.
- .1 Sheet Glass: to CAN/CGSB-12.2, AA quality; thickness as indicated.
- .2 Float Glass: to CAN/CGSB-12.3, glazing quality, thickness as indicated.
- .3 Fire Rated Glass (clear): ceramic construction, 5 mm (3/16") thick, clear, polished. Acceptable products:
- .4 FireLite Premium by Technical Glass Products, Toronto, Ontario.
- .5 Safety Glass, Laminated: to CAN/CGSB-12.1, Type 1, Class B. Thickness to be determined from the Performance Requirements of this Section.
- .6 Safety Glass, Tempered: to CAN/CGSB-12.1, Type 2, Class B. Thickness to be determined from the Performance Requirements of this Section.
- .7 Safety Glass, Double Insulating Units: to CAN/CGSB-12.8. All safety insulating glass units to incorporate Low-E Glass and an argon gas filled air space.
- .8 Heat Absorbing (standard tinted) Float Glass: to CAN/CGSB-12.4, Class A, B, C or D, Tint to be selected by the Contract Administrator, thickness as indicated.
- .9 Heat Absorbing (hi-performance tinted) Float Glass: to CAN/CGSB-12.4, Class A, B, C or D, Tint to be selected by the Contract Administrator, thickness as indicated.
- .10 Heat Reflecting (Low-E coated) Glass: to CAN/CGSB-12.10, clear or tinted glass with a low emissivity coating on one surface, Class A, B, C or D, used only in insulated sealed units.
- .11 Double Light Reflecting (coated) Glass: to CAN/CGSB-12.10, clear or tinted glass with a reflective coating applied Insulating glass units: to CAN/CGSB-12.8, incorporating two of glass types specified above and a hermetically sealed air space. All non-safety insulating glass units to incorporate Low-E Glass and an argon gas filled air space.
- .12 Mirrors: to CAN/CGSB-12.5, silvered, Type 1A (float), 6 mm (1/4") thick, unframed, ground and polished edges, supported with tamperproof concealed fasteners. Size of mirrors to be as indicated. Jobsite measure prior to installation to ensure a maximum 12.7 mm (½") clearance around the perimeter at adjacent walls.
- .13 Heat strengthened laminated safety glass for all openings requiring structural guards.

2.2 GLAZING AND SEALING COMPOUND MATERIALS

.1 Use glass manufacturer’s recommended glazing tapes, setting blocks, spacer shims, compression gaskets, primer-sealers and cleaners purpose made for use with specified glass products.

2.3 PRIVACY FILM

.1 See Section 08 87 00 – Window Films

Part 3 Execution

3.1 WORKMANSHIP

.1 Remove protective coatings and clean contact surfaces with solvent and wipe dry.

.2 Inspect all sash prior to glazing to ensure the opening is square, plumb and secure in order that uniform face and edge clearances are maintained. If any butt or mitre joints are open, seal with Type A sealant compound prior to glazing.

.3 Apply primer-sealer to all contact surfaces.

.4 Place glazing tapes, toe bead sealants and setting blocks as per manufacturer's instructions.

.5 Install glass, rest on setting blocks, ensure full contact and adhesion at perimeter.

.6 Install removable stops, without displacing tape or sealant.

.7 Provide edge clearance as recommended by the glass manufacturer but in no case less than 3 mm (⅛").

.8 Insert spacer shims to center glass in space. Place shims at 600 mm (24") oc and keep 6.5 mm (¼") below sight line.

.9 Apply bead sealants to uniform and level line, flush with sightline and tooled or wiped with solvent to smooth appearance.

.10 Do not cut or abrade tempered, heat treated, or coated glass.

3.2 GLAZING OF EXTERIOR OPENINGS

.1 Follow glass and window frame manufacturer’s recommendations and instructions for proper use of specialized glazing products and installation methods for glass installation for each application on this project.

.2 Aluminum punched and strip windows to be glazed on site unless otherwise indicated.

.3 Aluminum entrance doors to be factory glazed.

3.3 FINISHING

.1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.

3.4 SCHEDULE - SEE DRAWINGS FOR LOCATIONS.

.1 Type G-1: single unit, fire rated glass, minimum 6.5mm (¼") thick.

.2 Type G-2: single unit, safety glass, clear, tempered.

.3 Type G-3: sealed insulating unit, with an exterior layer of 6mm (¼”) thick tinted float, a sealed air space and an interior layer of clear float glass. Provide low E coatings on inside glass surfaces, argon gas filled cavity and high performance spacer. Total thickness of unit 25.4mm (1"). Grey tinted glass colour. Solarban 70XL or approved equal.

.4 Type G-4: sealed insulating unit, clear tempered float glass both layers; PPG Window or HIS equivalent.

NMS 088700 – WINDOW FILM

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 ASTM D 1004 – Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.

.2 ASTM D 1044 – Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).

.3 ASTM D 5895 – Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.

.4 ASTM E 84 – Standard Method of Test for Surface Burning Characteristics of Building Materials.

1.2 PERFORMANCE REQUIREMENTS

.1 Tear Resistance:
- .1 Minimum Graves Area Tear Strength of 1,000 lbs% as measured on coated film product, without liner, per ASTM D1004.

.2 Adhesion to Glass:
- .1 Minimum 8 lbs/in peel strength per ASTM D3330 (Method A).

.3 Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:
- .1 Flame Spread Index: no greater than 25.
- .2 Smoke Developed Index: no greater than 55.

.4 Abrasion Resistance:
- .1 Film shall have a surface coating that is resistant to abrasion such that less than 3 percent increase of transmitted light haze will result when tested in accordance to

1.3 SUBMITTALS

.1 Submit under provisions of Section 01 30 00.

.2 Product Data: Manufacturer's current technical literature on each product to be used, including:
- .1 Manufacturer's Data Sheets.
- .2 Preparation instructions and recommendations.
- .3 Storage and handling requirements and recommendations.
- .4 Installation methods.

.3 3rd Party Test Report Submittal Requirements. Submit the following 3rd Party test reports indicating compliance with the test values listed in this section.
- .1 Flammability Testing, ASTM E84.
- .2 Film Properties Testing, ASTM D882.
- .3 Abrasion Resistance Testing, ASTM D1044.
- .4 Peel Strength Testing, ASTM D3330.
- .5 Tear Resistance Testing, ASTM D1004.

.4 Verification Samples: For each film specified, two samples representing actual film color and pattern.

.5 Performance Submittals: Provide laboratory data of emissivity and calculated window UFactors for various outdoor temperatures based upon established calculation procedure defined by the ASHRAE Handbook of Fundamentals, Chapter 29, or Lawrence Berkeley Laboratory Window 5.2 Computer Program.

1.4 QUALITY ASSURANCE

.1 Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.
- .1 Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).

.2 Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.
- .1 Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.

.3 Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
- .1 Finish areas designated by Architect.
- .2 Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
- .3 Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Follow Manufacturer's instructions for storage and handling.

.2 Store products in manufacturer's unopened packaging until ready for installation.

.3 Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

.1 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.

1.7 WARRANTY

.1 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.

.2 In order to validate warranty, installation must be performed by an Authorized dealer and according to Manufacturer's installation instructions. Verification of Authorized dealer can be confirmed by submission of active dealer code number.

Part 2 Products

2.1 MANUFACTURERS

.1 Acceptable Manufacturer: 3M Commercial Solutions, which is located at: 3M Center Bldg. 220-12-E-04; St. Paul, MN 55144-1000; Toll Free Tel: 888-650-3497; Tel: 651-737-1081; Fax: 651 737 8241; Email: request info (jrice3@mmm.com); Web:http://www.3m.com/3M/en_US/architectural-designus/?utm_medium=redirect&utm_source=vanityurl&utm_campaign=www.3M.com/AMD|http://www.3m.com/3M/en_US/building-windowsolutions-us

.2 Substitutions: As Approved by contract administrator.

2.2 ARCHITECTURAL FINISH FILMS

.1 Architectural Finish Films: 3M CRYSTAL Glass Finishes as manufactured by 3M Company - Commercial Solutions.
- .1 Material Properties:
  - .1 General: Glass finishes field-applied application to glass or plastic material as visual opaque or decorative film.
  - .2 Film: Vinyl.
  - .3 Option to Electrocut (by other than Manufacturer).
  - .4 Adhesive: Acrylic, Pressure Sensitive, Permanent.
  - .5 Liner: Silicone-coated Polyester.
  - .6 Thickness (Film and Adhesive without Liner):
    - .1 Dusted - 3.2 mils (81 microns).
    - .2 Frosted - 4.7 mils (120 microns).
  - .7 Fire Performance: Surface burning characteristics when tested in accordance with ASTM E84, Class A:
    - .1 Flame Spread: 25 maximum.
    - .2 Smoke Developed: 450 maximum.
- .2 Optical Performance:
  - .1 CRYSTAL Dusted Decorative / Privacy Glazing Film:
    - .1 Ultraviolet Transmittance (ASTM E 903): 27 percent.
    - .2 Visible Light Transmittance (ASTM E 903, ASTM E308): 85 percent.
    - .3 Visible Light Reflectance (ASTM E 903): 79 percent.
    - .4 Solar Heat Transmittance: 76 percent.
    - .5 Solar Heat Reflectance: 7 percent.
    - .6 Shading Coefficient at 90 Degrees (Normal Incidence) (ASTM E 903): 0.93.

Part 3 Execution

3.1 EXAMINATION

.1 Film Examination:
- .1 If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

.1 Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.

.2 Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.

.3 Commencement of installation constitutes acceptance of conditions.

3.2 PREPARATION

.1 Clean surfaces thoroughly prior to installation.

.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

.3 Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.3 INSTALLATION

.1 Film Installation, General:
- .1 Install in accordance with manufacturer's instructions.
- .2 Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
- .3 Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
- .4 Apply film to glass and lightly spray film with slip solution.
- .5 Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
- .6 Bump film edge with lint-free towel wrapped around edge of a 5-way tool.
- .7 Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.
- .8 If completing an exterior application, check with the manufacturer as to whether edge sealing is required.

3.4 CLEANING AND PROTECTION

.1 Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

.3 After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

NMS DIVISION 10 SPECIFICATIONS

Special Provision

The following Division 10 National Master Specifications are included in this Contract.

NMS 100999 - MISCELLANEOUS SPECIALTIES

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

.2 Section 08 71 00 – Finish Hardware.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittals. Indicate location, type, size, hardware, installation or mounting details, frame or trim and accessories.

1.3 SCOPE

.1 Provide material scheduled under Part 3 of this section.

Part 2 Products

2.1 GENERAL

.1 Fabrication:

- .1 Manufactured items shall be shop fabricated according to the best shop practice and shall be finished with a paint prime coat or baked enamel finish according to manufacturer's literature unless stated otherwise herein.
- .2 Fit and assemble work in shop where possible. Execute work according to details and approved shop drawings. Where shop fabrication is not possible, make trial assembly in shop.
- .3 Do all welding in accordance with requirements of CSA W59. File or grind welds smooth and flush where exposed to view and where specifically indicated on drawings.
- .4 Fit joints and intersecting members accurately. Make work in true planes with adequate fastening.
- .5 Supply all fasteners, anchors, accessories required for fabrication and erection of work of this Section. Such items occurring on or in an exterior wall or slab shall be hot dip galvanized. Make thread dimensions such that nuts and bolts will fit without rethreading or chasing threads.
- .6 Make exposed metal fasteners and accessories of same material, texture, colour and finish as base metal on which they occur unless otherwise indicated. Keep exposed fastenings to absolute minimum, evenly spaced and neatly laid out. Make fastenings of permanent type unless otherwise indicated.

.2 Shop Painting

.1 Where other types of finishing or priming are not specified, thoroughly clean ferrous metals in accordance with SSPC-SP5-63 and apply one coat of primer to CGSB 1-GP-40M. Brush on thoroughly and work well into crevices and interstices.

Part 3 Execution

3.1 INSTALLATION

.1 Do work in accordance with manufacturer's instructions, to provide rigid, secure installation.

.2 Build and erect work plumb, true, square, straight, level, planar, flush and accurate to sizes detailed, to reviewed shop drawings, free from distortion or defects detrimental to appearance and performance.

.3 Insulate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metal and concrete. Use bituminous paint, butyl tape building paper or other approved means.

.4 Supply adequate instructions, templates, and if necessary, supervise installation of fastenings, accessories, components, etc, required to be built in by other Contractors and/or Subcontractors.

.5 After erection and installation, thoroughly clean work and apply field touch-up of same formula as shop coat primer to damaged or unpainted surfaces of shop primed

3.2 SCHEDULE

.1 EXTERIOR SIGNAGE: for fire route and barrier free parking. Metal signs with reflective graphics as indicated on drawings. Mounted on galvanized steel posts with anchors with all necessary hardware as indicated on drawings. Acceptable manufacturers:

.1 International Nameplate Supplies, London, Ontario.

.2 Contract administrator approved equivalent.

.2 INTERIOR SIGNAGE: for washrooms. Signs conforming to Ontario Building Code 3.7 Barrier Free including pictograms and braille and general male/female washroom identification. Acceptable manufacturers:

.1 International Nameplate Supplies, London, Ontario.

.2 Contract administrator approved equivalent.

.3 JANITORIAL SHELF: Broom/Mop Rack. Stainless steel, 20 gauge type 304 stainless steel No. 4 brushed finish, 3 mop or broom holders, 2 pail hooks and 5/16" dia. chrome plated cloth rod. 915mm (3’) long.

.1 Acceptable products: Frost 1115 or Contract Administrator approved equivalent.

.4 CORNER GUARDS:

.1 Stainless steel corner guards to be by Construction Specialties: Surface mounted guards to be 16 gauge stainless steel.

.2 Model CO-8 90° Stainless steel corner guard with 3 1/2" (88.9mm) legs. Mounted with construction adhesive standard, stainless steel screws optional. 8' (2.4m) height, variable angles.

.5 WASHBAY CURTAINS:
.1 Sampson 18 oz. Washbay Curtain by QSD.
.1 Length: 30m.
.2 Height: 6m.
.3 Provide 4-foot-tall transparent strip with the bottom 3 feet from ground.
.2 Contract administrator approved equivalent.

NMS 101116 - MARKERBOARDS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

.2 Section 09 91 00 – Painting & Coatings.

1.2 REFERENCES

.1 AA (Aluminum Association) DAF 45 1980 Designation System For Aluminum Finishes.

.2 ASTM A653/653M-00 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process.

.3 CSA O121-M1978 Douglas Fir Plywood.

.4 CSA O151-M1978 Canadian Softwood Plywood.

.5 CAN3-O188.1-M78 Interior Mat-Formed Wood Particleboard.

.6 CAN/CSA-A247-M86(R1996) Insulating Fibreboard.

.7 Porcelain Enamel Institute standards PEI S104, latest edition.

1.3 SAMPLES

.1 Submit samples in accordance with Division 1.

.2 Submit 300 x 300 mm (12" X 12") sample of each type of chalkboard specified and 300 mm (12") long sample of each type trim.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittals.

.2 Indicate location, type, size, panel arrangement, backing, hardware, anchor or mounting details, frame or trim and accessories.

1.5 MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into manual specified in Division 1.

.2 Affix removable maintenance instruction labels to chalkboards.

1.6 GUARANTEE

.1 Provide manufacturer's guarantee against defective material and workmanship for a period of 25 years from the date of final acceptance by the Owner.

Part 2 Products

2.1 MATERIALS

.1 Facing Sheets
- .1 Steel sheet: 0.84 mm (22 ga) (0.0336") thickness to ASTM A653/653M, with Z275 zinc finish , pre-cleaned and treated to ensure maximum adhesion of an acid resistant; porcelain enamel, Type B.

.2 Core Materials
- .1 Particleboard: to CAN3-O188.1, Grade R, 11.1mm (7/16") thick.

.3 Backing Sheet
- .1 0.44 mm (28 ga) (0.0187") thick galvanized steel sheet.

.4 Trim and Framing
- .1 Extruded aluminum: Aluminum Association alloy AA6063-T5, clear anodized. Minimum 1.5 mm (1/16") wall thickness.

.5 Other Materials
- .1 Laminating adhesive: to manufacturer's standard.
- .2 Joint reinforcement: concealed mechanical jointing system to provide straight, rigid, continuously supported, tight butt, flush joints at surface.
- .3 Anchor clips, brackets and fasteners: concealed type.

2.2 FINISHES

.1 Panel Surface Finishes
- .1 Chalkboards: porcelain enamel conforming to Porcelain Enamel Institute Standards PEI S104 regards durability, smoothness of texture, colour continuity. Minimum 0.09 mm (0.003") thick. Gloss factor of 6-8 as measured by 45 degree glossometer; black colour for all chalkboards.

.2 Aluminum Trim Finishes
- .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.
  - .1 Clear anodic finish: designation AAM32C12A31.
  - .2 Appearance and properties of anodized finishes designated by the Aluminum Association as Architectural Class 1, Architectural Class 2, and Protective and Decorative.

2.3 FABRICATION

.1 Fabricate chalkboard panels to sizes indicated.

.2 Factory laminate Facing Sheets, Core Materials and Backing Sheets using manufacturer's standard adhesives and pressure treatment methods. Total board thickness to be nominal 12.7mm (1/2").

.3 Make finished panels flat and rigid and fit with joint reinforcement.

.4 Fit joints between abutting chalkboard with joint reinforcement except where covering trim is required.

.5 Acceptable products:
- .1 Vit-Rite by Architectural School Products Ltd.
- .2 Martack Specialties Ltd. distributed by Gander Building Specialties Inc.
- .3 Contract Administrator approved equivalent.

2.4 FACTORY INSTALLED TRIM

.1 Install trim on panels in factory. Make mitres and joints to hair-line fit, free of rough edges. Use concealed brackets to reinforce and hold joints tight and flush. No exposed fasteners permitted.

.2 Overlap trim 6 mm (¼") onto panels. Provide closed ends for chalk troughs and open-end extrusions.

.3 Factory fit assemblies too large for shipment to site in one piece, disassemble for delivery and site assembly.

.4 Trim to be factory assembled complete with display rail and tray. Provide end caps for trays and rails. All whiteboards to be provided with top display rails. Acceptable products:
- .1 Architectural Preframed 800 Series by Architectural School Products Ltd.
- .2 Martack Specialties Ltd. E3 Markerboard.
- .3 Contract Administrator approved equivalent.

.5 Accessories:
- .1 All hooks and fastenings necessary for complete installation.

Part 3 Execution

3.1 INSTALLATION

.1 Install and whiteboards in accordance with manufacturer's instructions, plumb and level, provide rigid, secure writing surface.

.2 Install trim and framing, if indicated, around chalkboard and whiteboard panels. Make mitres and intersecting joints to hair-line fit, free of rough edges. Use concealed brackets to reinforce and hold joints tight and flush. No exposed fasteners permitted. Overlap trim 6 mm (¼") onto panels.

.3 Mechanical attachment:
- .1 To concrete or solid masonry use lag screw and expansion bolts or screws and fibre plugs as appropriate for stresses involved.
- .2 To hollow masonry use toggle bolts or equivalent.
- .3 To wood or sheet metal use screws. Secure into framing members in stud walls.
- .4 No adhesive attachment is allowed.

3.2 CLEANING

.1 Clean surfaces after installation using manufacturer's recommended cleaning procedures.

3.3 SCHEDULE

.1 See Drawings for configuration, number and location of products of this section.

NMS 101123 - TACKBOARDS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

.2 Section 09 29 00 – Gypsum Board.

1.2 REFERENCES

.1 AA Aluminum Association DAF 45 1980 Designation System for Aluminum Finishes.

.2 CGSB 41-GP-30M-82 Wallcoverings, Vinyl-Coated Fabrics.

.3 CAN/CSA-A247-M86 Insulating Fibreboard.

.4 CSA O121-M1978 Douglas Fir Plywood.

.5 CSA O151-M1978 Canadian Softwood Plywood.

.6 CAN3-O188.1-M78 Interior Mat-Formed Wood Particleboard.

.7 CAN/ULC-S102-1988 Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Division 1.

.2 Indicate location, type, size, panel arrangement, backing, hardware, anchor or mounting details, frame or trim and accessories.

Part 2 Products

2.1 BASIC MATERIALS

.1 Laminating adhesive: to manufacturer's standard.

.2 Joint reinforcement (where required): concealed mechanical jointing system to provide straight, rigid, continuously supported, tight butt, flush joints at surface.

.3 Anchor clips, brackets and fasteners: concealed type recommended by manufacturer for fixed mounting.

2.2 TACKBOARD FACINGS

.1 Krommenie cork with vinyl anti soil finish. Colour to be selected at later date from standard range of colours.

2.3 TACKBOARD CORE MATERIALS

.1 Backing sheet: integral heavy Hessian backing.

2.4 TACKBOARD FABRICATION

.1 Prelaminate all components in the factory. Surface layer to be natural cork sheet. Pressure laminate surface layer to substrate. Total thickness of unit approximately 12.7mm (½") thick.

2.5 TRIM AND FRAMING

.1 Extruded aluminum: Aluminum Association alloy AA6063-T5. Minimum 1.5 mm (1/16") wall thickness. Clear anodized finish.

2.6 FACTORY INSTALLED TRIM

.1 Where trim is required, install on panels in factory. Make mitres and intersecting joints to hair-line fit, free of rough edges with concealed brackets to reinforce and hold joints tight and flush. No other joints permitted unless approved. No exposed fasteners permitted.

.2 Overlap trim 6 mm (1/4") onto panels.

.3 Factory fit assemblies too large for shipment to site in one piece, disassemble for delivery and site assembly.

2.7 FABRICATION

.1 To sizes and locations indicated. Acceptable products:
- .1 Series 4000 "Delux" Model by Architectural School Products, Martack Specialties Ltd. distributed by Gander Building Specialties Inc. or approved equivalent.
- .2 Contract Administrator approved equivalent.

Part 3 Execution

3.1 INSTALLATION

.1 Install tackboards in accordance with manufacturer's instructions, to provide rigid, secure surface.

.2 Mechanical attachment:
- .1 To concrete or solid masonry use lag screw and expansion bolts or screws and fibre plugs as appropriate for stresses involved.
- .2 To hollow masonry use toggle bolts or equivalent.
- .3 To wood or sheet metal use screws. Secure into framing members in stud walls.

3.2 CLEANING

.1 Clean surfaces after installation using manufacturer's recommended cleaning procedures

3.3 SCHEDULE

.1 Refer to Drawings for size and locations. Colours to be determined.

NMS 102113.19 – TOILET COMPARTMENTS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 N/A

1.2 REFERENCES

.1 ASTM A167-99 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM A480/A480M-99b Standard Specification for General Requirements for Flat-Rolled Stainless Steel and Heat-Resisting Steel Plate, Sheet, and Strip.

.3 ASTM A653/653M -00 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process.

.4 CAN/CSA-B651-95 Barrier-Free Design.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Indicate fabrication details, plans, elevations, hardware, and installation details.

Part 2 Products

2.1 MANUFACTURERS

.1 Products manufactured by one of the following companies are acceptable for use on this project:
.1 Hadrian Manufacturing Inc., Oakville, Ont.

2.2 MATERIALS

.1 Construction: Doors, panels and pilasters shall be polyethylene solid plastic, meeting the fire test requirements of (NFPA) 286. The material shall contain no foaming agents, which can cause the formation of air pockets. The self-lubricating surface is resistant to marking and can be maintained effectively with ordinary household cleaners. Material is ideal for toilet partition installations, especially in high abuse and high moisture environments.

.2 Doors: Shall be (25mm) 1” thick by (1397mm) 55” high straight cut with fine radius edges.

.3 Panels: Shall be (25mm) 1” thick by (1397mm) 55” high straight cut with fine radius edges.

.4 Pilasters: Shall be (25mm) 1” thick by (2083mm) 82” high straight cut with fine radius edges.

.5 Headrail: Shall be 32mm (1.25”) by 44mm (1.75”) extruded anodized aluminum with anti-grip design. Wall thickness to be 1.5mm (0.060”) and shall be securely attached to wall and pilasters with manufacturer’s fittings in such a way as to make a rigid installation. All joints in headrails shall be made at a pilaster.

.6 Hardware and Fittings: Doors are installed with 1/8” thick heavy extruded clear anodized aluminum hinges, which wrap around both the door and pilaster. Hinges are fastened to door and pilaster with tamper-proof 6-lobe security head stainless steel thru-bolts and fastened to the edge of the door and pilaster with a #10 x 1” screw. Top hinges have adjustable nylon cams. Strike-keeper and throw latch are extruded clear anodized aluminum. Three heavy-duty aluminum brackets are used at the panel to wall connection and a full-height continuous aluminum channel is used at the panel to pilaster connection. Inswing doors shall be fitted with a zinc die cast, #4 brushed combined coat hook and bumper. Outswing doors shall be fitted with a #4 brushed stainless steel flat coat hook.
Fasteners are theft-proof 6-lobe security head stainless steel screws. Pilasters shall be securely and rigidly fastened to the floor with 3” (76mm) high stainless steel anchor shoes. Plastic anchor shoes are also available in colors to complement the partitions.

2.3 HARDWARE

.1 Hinges: concealed heavy duty chrome plated non-ferrous casting, adjustable door-open angle.

.2 Latch set: built-in combination latch, door stop, keeper and bumper chrome plated non-ferrous casting or anodized aluminum extrusion.

.3 Wall and connecting brackets: chrome plated non-ferrous casting or anodized aluminum extrusion.

.4 Coat hook: combination hook and door bumper, chrome plated non-ferrous casting or anodized aluminum casting.

.5 Door pull: barrier-free type suited for out swinging doors, chrome plated non-ferrous or anodized aluminum or stainless steel casting.

2.4 FINISHING

.1 Doors, panels, and pilasters shall be polyethylene with uniform color throughout. Color shall be as selected from Hadrian’s NFPA 286 color offerings.

Part 3 Execution

3.1 EXAMINATION

.1 The contractor must examine all site conditions that would prevent the proper application and installation of Toilet Partitions. Any defect must be immediately identified and corrected, prior to the installation of the Toilet Partitions.

3.2 FIELD QUALITY CONTROL

.1 After installation has been completed, provide for a site inspection of all Toilet Partitions to determine that all items have been supplied and installed as per the enclosed details. Also, check the operation and adjustment of all Toilet Partitions. Any discrepancies, or malfunctioning product, must be reported to the Contract Administrator immediately.

3.3 ADJUSTMENT AND CLEANING

.1 The Contractor must provide for the proper protection of all Toilet Partitions until the owner accepts the project as complete.

3.4 PROTECTION

.1 The Contractor must provide for the proper protection of all Toilet Partitions until the owner accepts the project as complete.

3.5 TOILET PARTITION SCHEDULE

.1 Provide Toilet Partitions as specified in all above sections and as per the detailed Architectural Drawings.

NMS 102813 – TOILET ACCESSORIES

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

.2 Section 06 40 00 – Architectural Woodwork.

1.2 SUBMITTALS

.1 Manufacturer's Data
- .1 Provide required number copies of:
  - .1 Product data sheets.
  - .2 Installation instructions.

.2 Shop Drawings:
- .1 Show fabrication and erection of compartment assemblies, to extent not fully described by manufacturer's data sheets.
- .2 Show anchorage, accessory items and finishes.
- .3 Provide location drawings for bolt hole locations in supporting members for attachment to toilet compartments.

1.3 SUMMARY OF WORK

.1 All washroom accessories in all washrooms.

Part 2 Products

2.1 MATERIALS

.1 **Grab Bars**. Grab Bar with Flanges for Concealed Mounting shall be fabricated of 18-8 stainless steel type 304; tubing shall be 32mm (1-1/4") dia. x 1.2mm (18 gauge). Flanges shall be heliarc welded to tubing with a continuous concealed bead and shall be 3mm (11 gauge). Three (3) tamper resistance 1/4-28 stainless steel hex socket set screws shall be supplied for each flange. Mounting tenon plates shall be fabricated of case hardened cadmium plated 2.3mm (13 gauge) steel. All exposed surfaces of bar shall have No 4 satin finish and shall be protected during shipment with a plastic bag. Non-slip finish (peened). Fabricated product shall be of adequate strength to support a load of 113.4kg (250 pounds). Mounting to the wall is a critical part of the system to meet this requirement. To withstand the shear, tension or pull-out, and torsion loads generated by the maximum loading, the fastener system must be adequately sized with anchors into blocking to support downward pull of 2.2 kN.

.1 Acceptable products: Frost Product Code No. 1001-NP (610mm (24") straight) and 1003-NP (762mm (30") ˈLˈ) or Contract Administrator approved equivalent.

.2 **Toilet Tissue Dispenses**

Jumbo toilet tissue dispenser, double roll, surface mounted, stainless steel.

.1 Acceptable products: Frost Product Code No.169 or Contract Administrator approved equivalent.

Toilet tissue dispenser, single roll, surface mounted, stainless steel.

.1 Acceptable products: Frost Product Code No.150 or Contract Administrator approved equivalent.

.3 **Feminine Napkin Disposal**

Surface mounted, stainless steel, pivoting self-closing lid.

.1 Acceptable products: Frost Product Code No. 662 or Contract Administrator approved equivalent.

.4 **Soap Dispenser**

Touch free soap/sanitizer dispenser, stainless steel, type 304, No. 4.

.1 Acceptable products: Frost Product Code No. 714S or Contract Administrator approved equivalent.

.5 **Coat Hook**

Single hook, stainless steel.

.1 Acceptable products: Frost Product Code No. 1146 or Contract Administrator approved equivalent.

.6 **Mirrors**.

Stainless steel, welded, angle frame mirror, Mirror shall be framed with one-piece, type-304, stainless steel angle 19 mm x 19 mm (3/4" x 3/4"). Frame shall be roll-formed construction with continuous integral stiffener on all sides. Frame shall have beveled design on front of angle to hold mirror tightly against frame to prevent exposure to sharp edges. Corners shall be heliarc welded, ground, and polished smooth. Exposed surfaces shall have satin finish with vertical grain. Mirror shall be No. 1 quality, 6-mm (1/4") float/plate glass. All mirror edges shall be protected with plastic filler strips. Mirror back shall be protected by fullsize, shock-absorbing, water-resistant, non-abrasive 3-mm (1/8") thick polyethylene padding. Galvanized steel back shall have integral hanging brackets for mounting on concealed one-piece rectangular wall hanger(s). Galvanized steel back shall be fastened to frame with concealed screws to permit glass replacement; attachment by rivets or tabs is not acceptable. Mirror shall be secured to hanger with concealed Phillips head locking setscrews in bottom of frame.

Manufacturer's service and parts manual shall be provided to building owner upon completion of project.

.1 Acceptable products: **Type 4** Frost Product Code No. 941-2430. **Type 4a** (fixed tilt) Frost Product Code No. 941-2430FT.

.7 **Paper Towel Dispenser**

Stainless steel, surface mounted, 200mm (8"), jumbo roll towels, front load c/w key lock.

.1 Acceptable products: Frost Product Code No. 109-70S.

.8 **Waste Receptacle**

Stainless steel, surface mounted, spring loaded door, liner.

.1 Acceptable products: Frost Product Code No. 303-3NL.

.9 **Shelf**

Heavy Duty, stainless steel shelf, 22 gauge, brushed no. 4 finish, rounded corners.

.1 Acceptable products: Frost 950-4-18.

.10 **Hand Dryer**

.1 Acceptable products: Frost Product Code No. 1193 or Contract Administrator approved equivalent.

.11 **Shower Rod**

.1 Acceptable products: Frost Product Code No. 1145-S or Contract Administrator approved equivalent.

.12 **Shower Curtain**

.1 Acceptable products: Frost Product Code No. 1144-503 or Contract Administrator approved equivalent.

Part 3 Execution

3.1 INSTALLATION

.1 **Grab Bars**. Tenon plates are secured to wall with a 6mm (1/4") bolt through an elongated slot that provides 25mm (1") vertical range and 5mm (3/16") horizontal range for fitting adjustment. Flanges are then fitted over tenon plates and secured by tightening the hex socket set screws. Appropriate anchoring, backing, and blocking must be provided in accordance with local building codes or as specified prior to wall finishing.

.2 Install other toilet accessories as recommended by manufacturer.

.3 Install all other washroom accessories indicated on the drawings.

NMS 105113 – METAL LOCKERS AND EQUIPMENT

Special Provision

Part 1 General

1.1 RELATED WORK

.1 Section 03 30 00 – Cast-In-Place Concrete.

.2 Section 04 20 00 –Masonry.

.3 Section 09 29 00 – Gypsum Board.

1.2 WORK INCLUDED

.1 Supply and Install: Provide all labor, materials, equipment and services to supply and install lockers indicated on the drawings and/or specified herein.

.2 Warranty: Elite lockers carry a two (2) year warranty against defective materials and workmanship. The warranty excludes problems related to environmental, ventilation, vandalism, abuse, fire, water and other acts of God.

1.3 QUALIFICATIONS

.1 Subject to compliance with the specifications, the following lockers will be acceptable: G.S.S. ELITE.

1.4 SUBMITTALS

.1 Drawings: Provide shop drawings clearly indicating the material being supplied and showing all gauges according to the enclosed specification.

.2 Installation Instructions: Provide all necessary instructions where lockers are to be attached to walls.

.3 Sample Lockers: The Contract Administrator reserves the right to request sample lockers for inspection for any alternates to specification.

Part 2 Products

2.1 MATERIALS AND PRODUCTS

.1 Size. Locker size 457.2mm wide (18") x 609.6mm (24") deep x 1828.8mm (72") high.

.2 Steel: Doors and Frames - new, cold rolled steel free from imperfections. Bodies: Prepainted Steel - where the prime coat and second coat of paint (GSS' standard 223 Oyster color) are applied at the mill in a continuous coil coating procedure bonding the paint to the steel and producing a harder paint finish than available with post painting.

2.2 FABRICATION

.1 Fabrication: Fabricate the work true to dimensions, square, plumb and level. Accurately fit members with hairline joints. Secure intersecting members with appropriate fasteners.

2.3 APPEARANCE AND PERFORMANCE

.1 Fabricate the finished work free from distortion and defects detrimental to appearances and performance.

2.4 BODIES

.1 Bodies shall be fabricated from 0.91 mm (20 gauge) prepainted steel in GSS' standard 223 Oyster colour. Sides to have offsets and backs flanged, formed and factory punched to provide necessary assembly holes. Tops, bottoms and shelves, made from 1.52 mm (16 gauge) steel, shall be flanged on all four sides with a formed under return at the front of the shelves. Single tier lockers to have a 1.52 mm (16 gauge) galvanneal steel bottom shelf. The

Double tier locker to have a 1.52 mm (16 gauge) galvanneal steel intermediate and bottom shelf.

2.5 FRAMES

.1 Frames shall be welded together from specially formed channel sections of prime cold rolled steel. Provide two rubber door grommets on the lock side of the frame. Ventilated slots shall be incorporated into the top and bottom frame members.

2.6 DOORS

.1 Doors shall be made with the 1.90 mm (14 gauge) outer door panel formed with channels on both sides and the top and bottom. The 0.91 mm (20 gauge) full width inner door panel shall cover over the back of the pocket to eliminate vandalism, be formed with channels on both sides, interlocked with the outer panel, and mig welded together at the top, bottom and both sides on the back surface edges of the door. The box welded door assembly shall be 28 mm (1.1”) thick. Single pan outer doors with partial inner door reinforcing pans are not acceptable. The door shall close on the 1.52 mm (16 gauge) frame member with a 16 mm (0.63”) wide closure strike the full height of the door and shall fit flush with the outside of the frame. The door shall be hung on a continuous one piece integral right hand Hinge and Frame. Every other knuckle of the hinge shall be staked to the 3 mm (0.12”) diameter steel hinge pin so the pin cannot be removed.

2.7 SINGLE POINT LATCHING

.1 Single point latching shall be through a single piece deep-drawn 304 stainless steel recessed pocket. The single piece 2.66 mm (12 gauge) channel formed hasp shall be welded to both legs of the 1.52 mm (16 gauge) channel frame member. Riveted hasps are not acceptable. Doors shall close on two sound deadening rubber grommets.

2.8 NUMBER PLATES

.1 Anodized Aluminum number plates shall be riveted onto the heavy duty nylon door pull and numbered as directed by the Contract Administrator.

2.9 SHELF LOCATIONS

.1 The Single Tier locker shall have a shelf located approximately 381 mm (15”) below the top. The Single Tier and Double Tier locker compartments shall have 3 zinc-plated round-tipped metal coat hooks, fastened to locker body. The Triple Tier shall have one double prong ceiling hook fastened to underside of each shelf.

2.10 TRIMS, SLOPE TOPS, END PANELS, BASES

.1 All Trims, Sloping Tops, End Panels and Bases will be manufactured from 1.52 mm (16 gauge) cold rolled steel. Bases shall be manufactured for 1.52 mm (16 gauge) galvanneal steel.

2.11 FINISH

.1 All cold rolled steel surfaces shall be pretreated with an iron phosphate corrosion inhibitor and finished with an abrasion and graffiti resistant Polymer Powder Coating cured to ensure a tough and durable finish. All surfaces shall meet or exceed a salt spray resistance of 300 hrs with a maximum of 3 mm creepage from scribe according to ASTM B117. Bodies shall be #223 Oyster color and all other components shall be selected from the manufacturer’s current color chart.

2.12 LOCKER BENCHES

.1 Acceptable manufacturers: Hadrian, or Contract Administrator-approved equal to following requirements:
  .1 Pedestals: Chrome-plated, free-standing type, 419 mm high.
  .2 Bench tops: Laminate solid maple or hardwood of 32 mm thickness x 241.3 mm width x lengths indicated on the Drawings.
  .3 Finish: One coat of sealer and one coat of clear lacquer.
  .4 Units to be complete with all hardware.

Part 3 Execution

3.1 INSTALLATION

.1 Lockers to be assembled on site using either nut and security bolt, or rivets (aluminum body c/w steel pin). Adjoining lockers shall be fastened to each-other and anchored to provide a rigid installation. Trim components such as end panels, slope tops, bases, fillers shall be secured in a manner to conceal fasteners where possible.
.2 Assemble locker benches and place in positions indicated on Drawings.

3.2. ADJUSTMENT

.1 Locker doors and benches to be adjusted for proper fit and function to prevent any metal to metal contact of moving parts. 3.1.3. Clean-up: Field touch-up of minor exterior scratches and abrasions will be made with factory approved and colour-matched coatings. All debris resulting from the locker installation shall be removed from the site.

NMS 109900 - WASH BAY CURTAINS

Special Provision

Part 1 General

1.1 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
  .1 Indicate location, type, size, panel arrangement, backing, hardware, anchor or mounting details, frame or trim and accessories.

1.2 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Meet requirements of Section 01 74 00 - Cleaning and Waste Management.

Part 2 Products

2.1 MISCELLANEOUS SPECIALTIES

.1 Wash bay curtains:

.1 Sampson 18 oz Wash bay Curtain by QSD.
  .1 Length: approx.30 meters (full length of wash bay).
  .2 Height: approx.. 6 meters (full height of wash bay).
  .3 Provide 1.2 meter tall transparent strip with the bottom 915 mm from ground.
.2 Contract Administrator approved equivalent.
.3 Wash bay curtain system to be provided in multiple sections to allow easy draw back and storage of the curtain
.4 Each section of the curtain shall include handling hardware and storage retention systems so each bay of the curtain system can be drawn back and retained individually.

Part 3 Execution

3.1 INSTALLATION

.1 Install miscellaneous specialities in accordance with the manufacturers printed installation instructions, data sheets, and standard details.

.2 Include all required accessories for a complete installation.

.3 Install securely to structure, plumb, true, level, and in alignment.

.4 Use stainless steel fastening systems for exterior locations.

.5 Protect installed work from construction damage, personnel traffic and other damage as required.

.6 Clean surfaces after installation using manufacturer's recommended cleaning procedures.

.7 Upon completion of the work, remove surplus materials, rubbish and debris resulting from the installation. Leave areas in neat clean and orderly condition.

NMS DIVISION 11 SPECIFICATIONS

Special Provision

The following Division 11 National Master Specifications are included in this Contract.

NMS 112010 – WATER TREATMENT SYSTEMS

Special Provision

Part 1 General

1.1 INTENT

.1 The intent of this specification is to provide details related to a fully complete and operational water treatment system. The treatment system shall include all materials, labour, software, hardware, equipment and design effort required for the design, supply, delivery, construction, installation, testing, startup, commissioning and operator training of two water treatment systems as specified herein. One water treatment system will be required for the well

servicing the plumbing fixtures of the Vehicle Maintenance Garage and another water treatment system will be required for the well servicing the wash bay of the Vehicle Maintenance Garage.

1.2 ALTERNATIVE PROPOSALS

.1 Alternate proposals and innovative designs may be considered in addition to the main proposal. Any deviations to the specifications herein shall be clearly identified in the alternative proposal, accompanied by a detailed explanation for the proposed deviation. If the alternative proposal is accepted, all process warranties and guarantees specified shall apply.

1.3 WORK INCLUDES

.1 This Specification is intended to cover the design, supply, delivery, installation, testing, startup, commissioning and operator training of two water treatment systems for the new Arnprior Maintenance Patrol Yard (MPY) near Arnprior, Ontario.

.2 The treatment system shall be supplied, installed, and maintained by a single Supplier.

.3 The Contractor shall be responsible for coordinating and completing all work necessary for a fully functional systems.

.4 The Contractor shall be responsible for sampling the raw water supply from each well and confirming that the Contractor designed treatment system is capable of meeting the Canadian Guidelines for Drinking Water Quality for both aesthetic and health based parameters for the well servicing the administration area. For the well servicing the vehicle wash bay the treatment system is expected to consist of filtration and UV disinfection only.

.5 The supply of the treatment system shall also include a two year maintenance contract including routine system maintenance, media changes, inspections and repairs throughout the two year period.

1.4 REFERENCE STANDARDS

.1 Equipment and work shall comply with the latest edition of all applicable codes, standards, and regulations including, but not limited to, the following:

- .1 National Sanitation Foundation (NSF).
- .2 American Water Works Association (AWWA).
- .3 Canadian Standards Association (CSA).
- .4 American Society of Mechanical Engineers (ASME).
- .5 American Gear Manufacture Association (AGMA).
- .6 Canadian Electrical Manufacturers Association (CEMA).
- .7 National Electrical Manufacturer Association (NEMA).
- .8 American Society for Testing and Materials (ASTM).
- .9 American National Standard Institute (ANSI).
- .10 Electrical and Electronic Manufacturers Association of Canada (EEMAC).
- .11 Hydraulic Institute Standards.
- .12 Ontario Building Code (OBC).
- .13 Underwriter’s Laboratories of Canada (ULC).
- .14 Guidelines for Canadian Drinking Water Quality (GCDWQ).
- .15 Ontario Design Guidelines for Drinking Water Systems.

1.5 RELATED WORKS AND PROCESS CONTROL

.1 Design criteria are specified herein. The Suppliers shall propose more stringent criteria if, in the opinion of the Supplier, more stringent criteria are required to achieve the requirements of

the Performance Guarantee stated in the Contract Documents.

.2 Process Logic Description (PLD).

.3 Raw water quality data for the new well sites are not currently available. The contractor shall draw samples from the new well systems prior to designing or procuring the treatment systems to confirm system requirements. The treatment system may need to remove the following: iron, hardness, sodium, chlorides, dissolved solids. Sulfur odour has been a noted issue in wells in the project area, the system shall be furnished to eliminate odours prior to the point of use.

1.6 QUALIFICATIONS OF EQUIPMENT MANUFACTURERS

.1 All items of equipment supplied shall be produced by companies regularly engaged in manufacturing this type of equipment and who maintain service and parts departments from which service, repairs and replacements may be obtained quickly at all times. Mechanical details of the equipment offered shall have been tried and tested by the actual construction and operation of mechanisms of the exact type and of comparable size and operating in similar service.

1.7 SAMPLES AND TESTS

.1 If the Contract Administrator has reason to believe that any product does not meet the specifications, contract documents or reference standards, he shall request samples to be provided by the Contractor to be tested. Should the results of the testing indicate that the product is in accordance with the aforementioned, the Contractor shall be reimbursed for the testing costs by the Owner (at no markup). Should the testing indicate that the samples are not in accordance with the aforementioned, the Contractor shall replace the defective products and re-test at their own expense. If requested by the Contract Administrator:

- .1 Before shipment to site, submit results of sieve analysis test for soundness of aggregates per ASTM C88, and Acid Solubility as per AWWA B100 Standards for each of the filter materials. Analysis shall be by an independent testing laboratory for sand and anthracite of the actual materials to be shipped to site. The number of samples shall be according to the AWWA B100 Standards. The independent testing laboratory may be chosen by the Supplier but must be acceptable to the Contract Administrator. Testing at the point of origin is not accepted as a substitute.
- .2 Sieve no less than 3 samples from each material regardless of quantity.
- .3 Test additional samples at no cost to the Owner if any sieve results are unsatisfactory.
- .4 Certify that all sieve analysis and tests submitted are carried out in accordance with the requirements of this specification and are a true representation of the results.

.2 Gravel, sand and anthracite shall be purchased from sources that are expressly qualified to produce and furnish these materials for potable water treatment and shall meet NSF61 Drinking Water System Components - Health Effects.

1.8 COORDINATION

.1 The General Contractor shall be responsible for overall supply, sampling, installation, construction, startup, testing and training. The General Contractor shall coordinate with all of his suppliers and sub-contractors to ensure a successful project completion. The General Contractor shall coordinate with the regulating authority to secure any required approvals to put the system into service.

.2 The Equipment Supplier shall provide all details and requirements pertaining to the installation, handling, storage, and operation of equipment to the Contract Administrator and the Contractor. Costs of providing such information shall be included in the Contractor's bid price.

Part 2 Products

2.1 TREATMENT SYSTEM PACKAGE

.1 The treatment system shall be designed to accept, regulate and treat raw water (groundwater) from a single production well located on the site with the ability to accept water from additional wells in the future. The system shall produce water that meets or exceeds the Guidelines for Canadian Drinking Water Quality (GCDWQ), and as specified herein. Where discrepancies exist in performance requirements, the more stringent shall apply.

.2 All equipment shall be CSA approved and all electrical wiring and controls performed by a licensed electrician to the requirements of the CEC.

.3 The system shall operate as a pressure system, with the capability to operate in-line, under pressure without the need for additional pumping or boosting.

.4 The treatment process must include, at a minimum, all necessary equipment and appurtenances to achieve the following:

- .1 Flow control valves.
- .2 Filtration for turbidity, iron and manganese reduction.
  - .1 Pressure media filter requiring no chemical regeneration.
- .3 Water softening;
  - .1 Pressure vessel complete with mineral tank and resin.
- .4 Greensand filtration (iron, manganese and hydrogen sulfide) (if required).
- .5 Filter/media backwashing.
- .6 Filter/media regeneration (if required).
- .7 UV disinfection (duty/standby) – to occur after water is drawn from the cistern
  - .1 Design dose: minimum 40 m2/cm2 at end of lamp life.
  - .2 Material: 304 stainless steel.
  - .3 Rated for a minimum operating pressure of 100 psi.
  - .4 Lamps: high output, low pressure.
  - .5 UV intensity monitor and controller per reactor.
  - .6 Duty and stand by UV disinfection is only required for the treatment system feeding the building plumbing fixtures. Only duty UV disinfection is required for the wash bay treatment system.
- .8 Automatic operation of treatment system.
- .9 Whole system reverse osmosis treatment to remove sodium (if required)
  - .1 If whole system RO treatment is required to remove salts it is only required for the treatment system feeding the building plumbing fixtures. The wash bay treatment system does not require RO treatment
- .10 Sulfur or Hydrogen Sulfide removal mechanism required to achieve no detectable sulfur smell at any plumbing fixture

.5 The scope of supply for the treatment package shall include all items necessary to achieve the desired performance. This may include:

- .1 Filter vessels.
- .2 Support gravels, filter media.
- .3 Valving.
- .4 Interconnection piping.
- .5 UV disinfection.
- .6 Control panel complete with alarms.

2.2 DESIGN PARAMETERS

.1 Average Day Design Flow: 6,800 L/day for the wash bay treatment system
5000 L/day for the building plumbing fixture treatment system

.2 Design Flow: 38.0 L/min (10 GPM) for the wash bay treatment system
37 L/min (15 GPM) for the building plumbing fixtures treatment system

.3 Raw Water Feed:
.1 Raw water will be fed directly from the well to the treatment systems, where flow to the treatment system will be controlled by valving and pressure switches supplied under this contract.

.4 Backwash water (if required) will be provided from the existing domestic water plumbing inside the mechanical room (40-55 psi). Any tankage for backwash water volume required by the system should be provided under this contract.

.5 The treatment system shall treat the raw water and provide potable water that meets the Canadian Drinking Water Quality Guidelines and the maximum acceptable limits presented in Table 1 (as measured in the softener effluent).

Water Quality Parameter	**Objectives and Warranty Targets**
Colour (TCU)	< 5
Turbidity (NTU)	< 1.0
Total Iron (mg/L)	< 0.3
Total Manganese (mg/L)	< 0.02
Sulphide (mg/L)	< 0.05
pH	7-9
Hardness (mg/L $CaCO_3$)	< 100
Alkalinity (mg/L $CaCO_3$)	> 40

.6 The treatment system will be located indoors in a heated area.

2.3 TREATMENT SYSTEM COMPONENTS

.1 Filtration equipment shall meet the requirements of ANSI/AWWA C653 Standards for Disinfection of Water Treatment Plants. An integral and overall control system shall be provided and plant functions shall be automated to the extent specified herein and in the Preliminary Process Control Description in the contract documents.
.1 All filter materials and their installation procedures shall meet the requirements of ANSI/AWWA B100 Standards for Filter Materials.
.2 Design Parameters:
.1 Number of media filters: 1 duty, 1 standby. Note standby filters are only required for the treatment system feeding the building plumbing fixtures. The wash bay treatment system only required duty filtration.
.2 Only one filter shall be backwashed at a time.
.3 Filtered water turbidity shall not exceed 1.0 NTU when operating at the design rate.
.3 Extra Quantities:
.1 Supply an additional 10% of filter/greensand media, above and beyond the required amount in 50 lb bags.
.2 Double bag the material in 6 mil plastic bags. Deliver the bags to the site and store in a place to be determined by the Contract Administrator.

2.4 EQUIPMENT CONTROL PANEL

.1 All processes shall be automated by a controller. Provide a PLC system(s) that allows automatic and manual control of the well and treatment system.

.2 General faults shall be annunciated by flashing light on a display screen or dedicated strobe.

.3 The system shall be capable of receiving inputs from all instrumentation and equipment whether supplied under this contract or through another.

.4 The control system shall include, but not be limited to, the necessary relays, timers, indicators, software, programming and controls necessary to monitor, operate and control the packaged plant.

.5 The package plant shall be supplied complete with integral panel boards and PLC based control panel located on the package plant structure. The control panel shall be factory assembled and pre-wired.

2.5 MATERIALS

.1 All materials shall be suitable their intended use under normal and upset conditions (including, pressure, flows, temperature, pH, chlorine concentration).

.2 All components shall be corrosion resistant.

.3 All materials and coatings shall be suitable for use in potable water.

.4 Control panel enclosure to be NEMA 4.

2.6 STANDARD OF ACCEPTANCE

.1 Filtration:
- .1 Katalox.
- .2 Culligan Filtration.
- .3 Approved equal.

.2 Softener:
- .1 Waterite.
- .2 Culligan Softener.
- .3 Approved equal.

.3 Chemical Injection System:
- .1 Qdos.
- .2 Approved equal.

.4 UV System:
- .1 UV Dynamics.
- .2 Trojan.
- .3 Approved equal.

.5 Wellfield PLC:
- .1 Micrologix.
- .2 Approved equal.

.6 Flow Meter
- .1 Neptune.
- .2 Sensus.
- .3 Approved equal.

Part 3 Execution

3.1 EQUIPMENT HANDLING

.1 The Contractor shall include costs associated with loading, shipping, insuring, delivering, unloading and storing all equipment to the site. The Contractor shall be responsible for receiving unloading and setting into place all equipment.

.2 Provide instructions to the Contract Administrator for loading, unloading and storage requirements emphasizing any precautions or procedures required. These instructions to precede delivery of equipment to site by minimum five (5) business days.

.3 Coordinate delivery and unloading with contractor to prevent double handling.

3.2 SUPERVISION AND START-UP

.1 The contractor shall be responsible for organizing, coordinating, directing and general oversight of the start and commissioning process.

.2 The supplier shall provide a skilled factory trained technician to inspect the installation of the equipment and to provide start-up services and conduct operator training.

.3 Start-up for each piece of equipment shall consist of inspecting the installation, starting and running the equipment and making any adjustments. Start-up for each piece of equipment shall be considered complete when the Contract Administrator is notified, in writing, by the Supplier that the equipment is installed, checked and in working order and ready to be put in continuous operation.

.4 Each filter shall undergo at least 3 full cycles during commissioning. Filtered water shall be sampled for turbidity, general chemistry, bacteriological, metal scan, THMs, bromodichloromethane, TOC and pH. The sample locations and times shall be coordinated in advance with the Owner. All results shall be in accordance with the performance requirements listed in this section.

.5 The site visit schedule for the factory trained technician shall be the following, unless otherwise specified by the Contract Administrator during construction:
- .1 The supplier shall be responsible for providing any technical assistance during installation/construction, and oversee/direct startup, testing, commissioning and training.
- .2 Submit a report to the Contract Administrator following successful start-up and testing and confirming equipment has been installed correctly and in full accordance with manufacturer’s instructions within five working days.

3.3 PERFORMANCE, GUARANTIES AND WARRANTIES

.1 Refer to Contract Documents and herein for warranties on workmanship, materials, equipment and performance guarantee. The treatments systems shall have a 2 year warranty on workmanship, materials, equipment and performance guarantee.

.2 The supplier and contractor guarantees and warrants that all equipment covered by or supplied pursuant to his submission shall:
- .1 Comply with the specifications for said equipment.

.2 Be free from defects in design, manufacture, workmanship or materials.
.3 Have any breakage, damage, defects or deterioration (other than those due to the direct negligence of parties other than the supplier or contractor or to the imposition on the equipment of extraordinary working conditions or to normal wear and tear) in the said equipment that occur or are detected and are reported to the Supplier within the guarantee/warranty period referred to above made good promptly by the Supplier at his entire expense including the expense of all necessary labour, supervision, traveling, replacement parts and transportation. (To assist the Supplier in having work carried out on installed equipment or in removing or replacing installed equipment or parts thereof, the Owner will take all reasonable steps to provide the Supplier with ready access to such equipment.).
.4 Meet or exceed the parameters identified in this specification and the Canadian Drinking Water Quality Guidelines.

.3 The Contractor shall, to the satisfaction of the Owner, rectify any defects in the work or which may appear therein during the warranty period.

.4 Treatment performance shall be achieved with no more than 2% of treated water being required for filter backwashing on a daily basis.

NMS DIVISION 12 SPECIFICATIONS

Special Provision

The following Division 12 National Master Specifications are included in this Contract.

NMS 122413 – ROLLER WINDOW SHADES

Special Provision

Part 1 General

1.1 SUBMITTALS

.1 Submit product data sheets of each item specified indicating
.1 Performance criteria, compliance with appropriate reference standard(s), characteristics, limitations, and finishes.
.2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings: Submit shop drawings indicating elevations, sections and details of opening size, clearances, handling of operating components, anchorage, dimensions, gauges, materials, and finishes.

.3 Samples: Submit two 300 x 300 mm samples of fabric type.

.4 Closeout submittals: Submit cleaning and maintenance instructions for incorporation into Operations and Maintenance Manuals for the following:
.1 Functional description detailing operation and control of components.
.2 Performance criteria and maintenance data.
.3 Operating instructions and precautions.

.4 Safety precautions.

1.2 WARRANTY

.1 Manufacturer shall provide warranty that all components are free of manufacturing defects for two years from date of installation. This warranty is void if the product has been improperly installed or subjected to improper care.

Part 2 Products

2.1 MANUAL ROLLER SHADES

.1 Roller shade system, solar reflective sun control system by one of the following acceptable manufacturers:
- .1 Solarfective operable roller shade manufactured by Mecho Shades and supplied by Patry Products Inc. Tel: (416) 283-6444, Fax (416) 283-3250, Contact: Kevin Booth. Colour: to be selected by Contract administrator from manufacturer's standard range at a later date.
- .2 Moduline operable roller shade manufactured by SunProject Canada Inc. Tel: (905) 660-3117, Fax (905) 660-3365. Colour: to be selected by contract administrator from manufacturer's standard range at a later date.
- .3 Contract administrator approved equivalent.

.2 Shade fabric: Dense vertical weave, 3% openness factor to suit orientation and glazing. Single sunscreen shadeband with specified weave. Shade cloth shall meet requirements for fire retardancy and be anti-microbial without topical treatment. Shade cloth seconds or shade cloth manufactured using reprocessed materials are not acceptable. Colour to be selected by Contract administrator from manufacturer's standard range at a later date.

.3 Mounting: header-mounted.

.4 Exposed metal components, including the box, shall be clear anodized aluminium.

.5 Accessories without exposed fastening: Single fascia: One-piece extruded aluminium.

.6 Operating chain shall not extend lower than 1.1m above finished floor.

Part 3 Execution

3.1 INSTALLATION

.1 Install roller window shades in accordance with authorities having jurisdiction, reviewed shop drawings, and manufacturer's written instructions.

.2 Install shades in locations shown using specified fasteners, plumb, true, square, straight, and level in proper planes, complete with all fascias/soffits, trims and accessories.

3.2 ADJUSTMENT AND CLEANING

.1 The shade cloth fabric shall hang flat, without buckling or distortion. The edge, when trimmed, shall hang straight without ravelling. 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.

.2 Adjust, correct and lubricate fabric shade as required, to provide smooth and efficient

operation without binding.

.3 Clean shade surfaces and remove all finger marks and smudges from fascia, soffits, and trim surfaces. Remove all protective films.

.4 Leave fabric shade in raised position and in first-class condition upon completion of the Work of this Section.

NMS DIVISION 21 SPECIFICATIONS

Special Provision

The following Division 21 National Master Specifications are included in this Contract.

NMS 210501 – COMMON WORKS RESULTS FOR MECHANICAL

Special Provision

Part 1 General

1.1 REFERENCES

.1 Unless otherwise noted, refer to the latest references and standards listed herein adopted by the local authority having jurisdiction.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop drawings to show:
- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:
- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.4 In addition to transmittal letter referred to in Section 01 33 00 – Submittal Procedures: use the Mechanical Contractors Association of Canada (MCAC) "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.5 Closeout Submittals:
- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
- .2 Operation and maintenance manual reviewed by, and final copies deposited with, Consultant before final inspection.

.3 Operation data to include:
- .1 Control schematics for systems including environmental controls.
- .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.

.4 Maintenance data to include: servicing, maintenance, operation and trouble-shooting instructions for each item of equipment:
- .1 Data to include schedules of tasks, frequency, tools required and task time.

.5 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 as specified.
- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 Testing, Adjusting and Balancing for HVAC.

.6 Reviews
- .1 Submit two (2) copies of draft Operation and Maintenance Manual to the Consultant for review. Submission of individual data will not be accepted unless directed by the Consultant.
- .2 Make changes as required and re-submit as directed by The Consultant.

.7 Additional data
- .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records
- .1 The Consultant will provide white prints of the mechanical drawings. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
- .2 Transfer information weekly to white prints, revising white prints to show work as actually installed.
- .3 Use different colour waterproof ink for each service.
- .4 Make available for reference purposes and inspection.

.9 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 The Consultant for review 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.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with General Conditions.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal
  .1 Construction/Demolition Waste Management and Disposal: in accordance with General Conditions.

Part 2 Products

– Not Applicable

Part 3 Execution

3.1 PAINTING REPAIRS AND RESTORATION

.1 Painting in accordance with Section 09 91 00 – Painting

3.2 CLEANING

.1 Clean interior and exterior of all systems including strainers.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests and submit report as described in Part 1 - Submittals.

.2 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 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 Schedule site visits, to review Work, as directed in Part 1 Quality Assurance.

3.4 DEMONSTRATION

.1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 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.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

3.5 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

NMS 212400 – FIRE EXTINGUISHERS

Special Provision

Part 1 General

1.1 REFERENCES

.1 American National Standard Institute (ANSI)
  .1 ANSI/NFPA 10-2013: Portable Fire Extinguishers

.2 Underwriters' Laboratories of Canada (ULC)
  .1 CAN/ULC-S508-02 (R2016): Standard for the Rating and Testing Fire Extinguishers

1.2 ACTION AND INFORMATION SUBMITTALS

.1 Submittals: in accordance with 01300 Submittals.

.2 Product Data:
  .1 Submit manufacturer's instructions, printed product literature and data sheets for fire extinguishers and include product characteristics, performance criteria, physical sizes, finish and limitations.

.3 Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence, and cleaning procedures.

.4 Shop Drawings:
  .1 Indicate on drawings:
    .1 Equipment and capacity.
    .2 Dimensions, internal and external construction details, recommended method of installation, sizes and location of mounting bolt holes.

.5 Closeout Submittals:
  .1 Provide maintenance data for incorporation into manual specified in SP5 – Operation and Maintenance Manuals.

Part 2 Products

2.1 MULTI-PURPOSE DRY CHEMICAL FIRE EXTINGUISHERS

.1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for A, B and C class protection, USCG approved with proper bracket, red powder paint finish, nameplates, rechargeable, pressure gauge, c/w wall mounting bracket.

.2 Acceptable Product: Pyro-chem or approved equivalent.

.3 Refer to drawings for fire extinguisher locations, types and sizes.

2.2 EXTINGUISHER BRACKETS

.1 Type recommended by extinguisher manufacturer.

2.3 IDENTIFICATION

.1 Identify extinguishers in accordance with recommendations of NFPA 10.

.2 Attach tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

Part 3 Execution

3.1 INSTALLATION

.1 Install extinguishers in complete accordance with NFPA 10.

NMS DIVISION 22 SPECIFICATIONS

Special Provision

The following Division 22 National Master Specifications are included in this Contract.

NMS 221118 – DOMESTIC WATER PIPING COPPER

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation for hard drawn copper domestic hot and cold water service inside a building.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
- .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
- .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).

.3 Canadian Standards Association (CSA International)
- .1 CSA B64 Series, Backflow Preventers and Vacuum Breakers.

.4 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)
- .1 MSS SP 80, Bronze Gate, Globe, Angle and Check Valves.

.5 National Research Council (NRC)/Institute for Research in Construction
.1 NRCC 38728, National Plumbing Code of Canada (NPC) complete with Saskatchewan Amendments.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit product data for following: valves.
.3 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

.4 Submit pressure test results to CA for record.

Part 2 Products

2.1 DOMESTIC WATER COPPER TUBING

.1 Tubing
.1 Domestic hot and cold water system, within building.
.2 Above ground: copper tube, hard drawn, Type L: to ASTM B88M.

.2 Fittings
.1 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.
.2 Cast copper, solder type: to ANSI/ASME B16.18.

.3 Joints
.1 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
.2 Solder: 95/5 tin copper alloy.
.3 Teflon tape: for threaded joints.
.4 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.

.4 Valves
.1 Ball – Isolation: NPS 2 and under:
.1 Class 150/600WOG
.2 Brass and or bronze body, full port, TFE seats, double O-ring design or PTFE packing, chrome plated solid bronze ball, lever handle, soldered ends or threaded ends
.3 Acceptable material:
.1 Soldered: Kitz 59; Toyo 5049A
.2 Threaded: Kitz 58, Toyo 5044A.

.5 Strainers
.1 NPS 2 and under, bronze body, Y-Pattern, stainless steel screen with 0.8 mm perforations.
.2 Acceptable material:
.1 Soldered: Mueller, Kitz.
.2 Threaded: Mueller, Kitz, Toyo, Spirax Sarco.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Saskatchewan Amendments of the NPC and local authority having jurisdiction.

.2 Install in accordance with manufacturer's recommendations and as specified.

.3 Install pipe work in accordance with Section 23 05 05 – Installation of Pipework, supplemented as specified herein.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.2 VALVES

.1 Isolate equipment, fixtures and branches with ball valves.

.2 Remove internal parts before soldering.

3.3 STRAINERS

.1 Install with sufficient room to remove basket.

3.4 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01 – Common Work Results – Mechanical.

.2 Test pressure: greater of 1.5 times maximum system operating pressure or 860 kPa.

.3 Test results to be submitted to the CA for record.

3.5 FLUSHING AND CLEANING

.1 Flush the addition to the system for eight hours. Let stand for twenty-four (24) hours, and then draw one (1) sample off longest run. Submit to testing laboratory to verify that system is clean to Provincial potable water guidelines. Let system flush for additional two (2) hours, then draw off another sample for testing.

3.6 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start up.

.2 Verify that system can be completely drained.

3.7 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.

.2 Upon completion, provide laboratory test reports on water quality for Departmental Representative review.

3.8 TESTING AND ADJUSTING

.1 Timing
- .1 After start-up deficiencies rectified.
- .2 After certificate of completion has been issued by authority having jurisdiction.

.2 Backflow preventers

.1 Test tightness, accessibility for O&M of cover and of valve.
.2 Simulate reverse flow and back pressure conditions to test operation of backflow preventers.
.3 Verify visibility of discharge from open ports.
.4 Test in accordance with CSA-B64.

.3 Strainers
.1 Clean out repeatedly until clear.
.2 Verify accessibility of cleanout plug and basket.
.3 Verify that cleanout plug does not leak.

3.9 PERFORMANCE VERIFICATION

.1 Timing
.1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.

.2 Procedures
.1 Verify that pressure meet Design Criteria.
.2 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.3 Reports:

.1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

NMS 221316– STORM PIPING – CAST IRON

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 23 05 05 Installation of Pipework.

1.2 REFERENCES

.1 ASTM International (ASTM)
.1 ASTM B32- [20], Standard Specification for Solder Metal.
.2 ASTM C564- [20a], Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
.2 CSA Group (CSA)
.1 CSA B67- [1972 (R1996)], Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
.2 CAN/CSA-B70- [2012 (R2016)], Cast Iron Soil Pipe, Fittings and Means of Joining.
.3 CAN/CSA-B125.3- [18], Plumbing Fittings.

.3 South Coast Air Quality Management District (SCAQMD), California State
.1 SCAQMD Rule 1168, Adhesive and Sealant Applications.

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 piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with General Conditions and manufacturer recommendations.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Store at temperatures and conditions recommended by manufacturer.

Part 2 Products

2.1 CAST IRON PIPING AND FITTINGS

.1 Above ground storm and vent: to CAN/CSA-B70.
.1 Joints:
.1 Hub and spigot:
.2 Caulking lead: to CSA B67.
.2 Mechanical joints:
.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

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 In accordance with Section 23 05 05 – Installation of Pipework.

.2 Install in accordance with National Plumbing Code and authorities having jurisdiction.

3.3 TESTING

.1 Hydraulically test to verify grades and freedom from obstructions.

.2 Pressure test systems in accordance with Provincial Plumbing Code and local Authority Having Jurisdiction.

.3 Provide copies of test reports to the Contractor Administrator.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:
.1 Ensure accessible and that access doors are correctly located.
.2 Open, cover with linseed oil and re-seal.
.3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:
- .1 Verify domes are secure.
- .2 Ensure weirs are correctly sized and installed correctly.
- .3 Verify provisions for movement of roof system.

.4 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, vent) c/w directional arrows every floor or 4.5 m (whichever is less). Ensure fixtures are properly anchored, connected to system and effectively vented.

NMS 221318 – DRAINAGE WASTE AND VENT PIPING - PLASTIC

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 The installation of drainage waste and vent piping – plastic.

1.2 REFERENCES

.1 ASTM International Inc.
- .1 ASTM D2235, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- .2 ASTM D2564, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 Canadian Standards Association (CSA International)
- .1 CAN/CSA-Series B1800, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.

.3 Green Seal Environmental Standards (GSES)
- .1 Standard GS-36, Commercial Adhesives.

.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.

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 piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with General Conditions and manufacturer recommendations.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Store at temperatures and conditions recommended by manufacturer.

Part 2 Products

2.1 PIPING AND FITTINGS

.1 For buried DWV piping to:
- .1 CAN/CSA B1800.

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

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 In accordance with Section 23 05 05 – Installation of Pipework.

.2 Install in accordance with National Plumbing Code.

3.3 TESTING

.1 Pressure test buried systems before backfilling.
.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:
- .1 Ensure accessible and that access doors are correctly located.
- .2 Open, cover with linseed oil and re-seal.
- .3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure fixtures are properly anchored, connected to system and effectively vented.

NMS 221500 – GENERAL SERVICE COMPRESSED – AIR SYSTEM

Special Provision

Part 1 General

1.1 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
  .1 ASME Boiler and Pressure Vessel Code Section VIII Pressure Vessels.
    .1 BPVC-VIII B – 2004, BPVC Section VIII – Rules for Construction of Pressure Vessels Division 1.
    .2 BPVC-VIII-2 B – 2004, BPVC Section VIII – Rules for Construction of Pressure Vessels Division 2 - Alternative Rules.
    .3 BPVC-VIII-3 B – 2004, BPVC Section VIII – Rules for Construction of Pressure Vessels Division 3 - Alternative Rules High Press Vessels.
  .2 ASME B16.5-03, Pipe Flanges and Flanged Fittings.
  .3 ASME B16.11-01, Forged Fittings, Socket-Welding and Threaded.

.2 ASTM International (ASTM)
  .1 ASTM A53/A53M-04, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  .2 ASTM A181/A181M-01, Standard Specification for Carbon Steel Forgings for General Purpose Piping.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Indicate:
  .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

Part 2 Products

2.1 MATERIALS

.1 Materials and products in accordance with Section 01 47 15- Sustainable Requirements: Construction.

2.7 PIPING

.1 Piping: to ASTM A53/A53M, schedule 80 seamless black steel.

.2 Fittings:
  .1 NPS2 and smaller: to ASME B16.11, schedule 80 steel, socket welded.
  .2 NPS2 1/2 and larger: to ASME B16.11, schedule 80 steel, butt or socket welded.

.3 Couplings: to ASME B16.11, socket welded or threaded half coupling type.

.4 Unions: 1000 kPa malleable iron with brass-to-iron ground seat.

.5 Dissimilar metal junctions: use dielectric unions.

.6 Flanges:
- .1 NPS2 and smaller: to ASME B16.5, forged steel, raised face and socket welded.
- .2 NPS2 1/2 and larger: to ASME B16.5, forged steel, raised face and slip-on or weld neck.

.7 Joints:
- .1 NPS2 and smaller: socket welded.
- .2 NPS2 1/2 and larger: butt welded.

2.8 BALL VALVES

.1 Three piece design or top entry for ease of in-line maintenance.
- .1 To ASTM A181/A181M, Class 70, carbon steel body screwed ends, carbon steel ball and associated trim suitable for compressed air application.
- .2 To withstand 1034 kPa maximum pressure.

2.9 COUPLERS/CONNECTORS

.1 Industrial interchange series, full-bore.

.2 Maximum inlet pressure: 1700 kPa.

.3 Valve seat: moulded nylon.

.4 Body: zinc plated steel.

.5 Threads: NPT.

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 COMPRESSED AIR PIPING CONNECTIONS AND INSTALLATION

.1 Install shut-off valves at outlets, major branch lines and in locations as indicated.

.3 Install quick-coupler chucks and pressure gauges on drop pipes.

.4 Install unions to permit removal or replacement of equipment.

.5 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.

.6 Grade piping at 1 % slope minimum.

.7 Install compressed air trap and pressure equalizing pipe at moisture collecting points. Drain pipe to nearest floor drain.

.8 Make branch connections from top of main.

.9 Install compressed air trap at bottom of risers and at low points in mains, piped to nearest drain. Distance between drain points to be 30 m maximum.

.10 Provide drain from refrigerated air dryer.

.11 Weld steel piping;
- .1 To ASME code and requirements of authority having jurisdiction.
- .2 Weld concealed and inaccessible piping regardless of size.

3.7 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:
- .1 Testing: pressure test for 4 hours minimum, to 1100 kPa, with outlets closed and with compressor isolated from system. Pressure drop not to exceed 10 kPa.

.2 Manufacturer's Field Services:
- .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.
- .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 Obtain reports within 3 days of review and submit immediately to Consultant.

.4 Verification requirements include:
- .1 Materials and resources.
- .2 Storage and collection of recyclables.
- .3 Construction waste management.
- .4 Resource reuse.
- .5 Recycled content.
- .6 Local/regional materials.
- .7 Certified wood.
- .8 Low-emitting materials.

3.8 CLEANING

.1 Refer to Section 23 08 02- Cleaning and Start-Up of Mechanical Piping System.

.2 Cleaning: blow out piping to clean interior thoroughly of oil and foreign matter.

.3 Check entire installation is approved by authority having jurisdiction.

.4 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 223005 – DOMESTIC WATER HEATERS

Special Provision

Part 1 General

1.1 REFERENCES

.1 Canadian Gas Association (CGA)
- .1 CSA B149.1 00, Natural Gas and Propane Installation Code.
- .2 CSA B149.2 00, Propane Storage and Handling Code.

.2 Canadian Standards Association (CSA International)
- .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
- .2 CAN/CSA B139, Installation Code for Oil Burning Equipment.
- .3 CAN/CSA B140.0 M87(R2001), General Requirements for Oil Burning Equipment.
- .4 CAN/CSA C309 M90(R1998), Performance Requirements for Glass Lined Storage Tanks for Household Hot Water Service.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Indicate:
- .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.4 WARRANTY

.1 For the Work of this Section 22 30 05 – Domestic Water Heaters, the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to number of years specified for each product.

.2 Contractor hereby warrants domestic water heaters in accordance with CCDC2 GC 24, but for number of years specified for each product.

Part 2 Products

2.1 Domestic Hot Water Tank

.1 Domestic Hot Water Tank:
- .1 General: packaged unit to ASME standards, stamped for 1100 kPa WP. Provide CGA certification.
- .2 Capacity: refer to domestic hot water heater schedule on drawing.
- .3 Heater shall have a working pressure of 150 psi and shall be provided with an automatic gas shutoff device and safety shutoff in the event the pilot flame is extinguished; a gas pressure regulator set for the type of gas supplied; an approved draft diverter, and extruded anode rod rigidly supported for cathodic protection. A CSA Certified and ASME Rated T&P Relief Valve shall be furnished and installed by the manufacturer. The tank shall be foam insulated. The outer jacket shall have a

baked enamel finish over a bonderized undercoating. All internal surfaces of the heater exposed to water shall be glasslined with an alkaline borosilicate composition that has been fused-to-steel by firing at a temperature range of 1400° to 1600°F. Water Heater tank shall have a three year limited warranty against corrosion and tank failure due to sediment build-up as outlined in the written warranty.

.4 Trim:
  .1 Self actuated modulating valves with 2 ply thermostatic bellows, copper capillary tubing, separate built in well, tight disc shut off removable composition disc stem with lubricator temperature adjustment setting reference scale, maximum, pressure differential of 28 kPa, temperature range 25-60°C.

.5 Controls:
  .1 Main propane shut off valve.
  .2 Approved gas train including pressure regulator, motorized electric shut off valve, downstream block/test valve, test connection, pressure gauge.
  .3 Thermopilot safety with 100% shut off, adjustable electric high limit control.
  .4 Gas modulating valve adjusted for 100% to 20% input.
  .5 Minimum input valve, on off.
  .6 Flow switch, interlocked with ignition system to prevent operation in event of low flow.

2.2 TRIM AND INSTRUMENTATION

.1 Drain valve: NPS ¾" with hose end.

.2 ASME rated temperature and pressure relief valve sized for full capacity of heater, having discharge terminating over floor drain and visible to operators.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.

.2 Install propane gas fired domestic water heaters in accordance with CSA-B149.2.

NMS 224201 – PLUMBING SPECIALTIES AND ACCESSORIES

Special Provision

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
  .1 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  .2 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA)
  .1 AWWA C700, Cold Water Meters Displacement Type, Bronze Main Case.
  .2 AWWA C701, Cold Water Meters Turbine Type for Customer Service.
  .3 AWWA C702-1, Cold Water Meters Compound Type.

.3 Canadian Standards Association (CSA International)
- .1 CSA B64 Series, Backflow Preventers and Vacuum Breakers.
- .2 CSA B79, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
- .3 CSA B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Plumbing and Drainage Institute (PDI)
- .1 PDI G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
- .2 PDI WH201, Water Hammer Arresters Standard.

.5 National Research Council (NRC)/Institute for Research in Construction
- .1 NRCC 38728, National Plumbing Code of Canada (NPC) complete with Saskatchewan Amendments.

.6 NSF International
- .1 NSF/ANSI Standard 61 – Drinking Water System Components – Health Effects.

1.2 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures, and equipment.
- .2 Indicate dimensions, construction details, and materials for specified items.
- .3 Submit product data sheets to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details, and accessories.

.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.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals, include:
- .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.

Part 2 Products

2.1 FLOOR DRAINS

.1 Floor Drains: to CSA B79.

.2 Floor Drains shall be epoxy coated cast iron body, trap seal primer tapping, flashing clamp device, 6" dia. adjustable to level heavy duty polished nickel bronze strainer and mechanical joint or push-on outlet, and of size indicated on Drawings.

.3 Funnel Floor Drains shall be epoxy coated cast iron body, trap seal primer tapping, flashing clamp device, 6" adjustable to level heavy duty nickel bronze combination strainer and 3" x 9" oval funnel, mechanical joint on push-on outlet and of size indicated on Drawing.

2.2 CLEANOUTS

.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing caulked lead seat or neoprene gasket.

.2 Access Covers:

.1 Wall Access: face or wall type, polished nickel bronze, round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top, cast box with anchor lugs and:

.1 Plugs: bolted bronze with neoprene gasket.

.2 Cover for Unfinished Concrete Floors: nickel bronze, round, gasket, vandal proof screws.

.3 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal proof locking screws.

.4 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal proof locking screws.

2.3 BACK FLOW PREVENTERS

.1 Preventers: to CSA-B64 Series, application as indicated, reduced pressure principle type.

2.4 TRAP SEAL PRIMERS

.1 Brass, with integral vacuum breaker, NPS1/2 solder ends, NPS1/2 drip line connection.

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 data sheets.

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada and authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks, and at locations required code, and as indicated.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Stack base cleanouts: line size to maximum NPS4.

3.4 BACK FLOW PREVENTERS

.1 Install in accordance with CSA B64 Series, where indicated and elsewhere as required by code.

.2 Pipe discharge to terminate over nearest drain [and] [or] service sink.

3.5 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, to approval of engineer.

.3 Install soft copper tubing to floor drain.

3.5 START-UP

.1 General:
- .1 In accordance with Section 01 91 13 Commissioning: Startup and Field Trial Operation, supplemented as specified herein.

.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.
- .4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

3.6 TESTING AND ADJUSTING

.1 Timing:
- .1 After start up deficiencies rectified.
- .2 After certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:
- .1 Pressure at fixtures: +/ 70 kPa.
- .2 Flow rate at fixtures: +/ 20%.

.3 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.

.4 Floor drains:
- .1 Verify operation of trap seal primer.
- .2 Prime, adjust flow rate to suit Site conditions.
- .3 Check operations of flushing features.
- .4 Check security, accessibility, removability of strainer.
- .5 Clean out baskets.

.5 Vacuum breakers, backflow preventers, backwater valves:
- .1 Test tightness, accessibility for O&M of cover and of valve.
- .2 Simulate reverse flow and back pressure conditions to test operation of vacuum breakers, backflow preventers.

.3 Verify visibility of discharge from open ports.

.6 Access doors:
.1 Verify size and location relative to items to be accessed.

.7 Cleanouts:
.1 Verify covers are gas tight, secure, yet readily removable.

NMS 224202 – PLUMBING FIXTURES

Special Provision

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA B45 Series, Plumbing Fixtures.
.2 CAN/CSA B125, Plumbing Fittings.
.3 CAN/CSA B651, Barrier Free Design.

.2 National Research Council (NRC)/Institute for Research in Construction
.1 NRCC 38728, National Plumbing Code of Canada (NPC).

1.2 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Closeout Submittals:
.1 Submit maintenance data in accordance with Section 01 78 00 – Closeout Submittals.
.2 Include:
.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.

Part 2 Products

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

.7 Fixture piping:

.1 Hot and cold water supplies to each fixture:
.1 Flexible supply pipes each with handwheel stop, reducers, escutcheon.
.2 Waste:
.1 Brass P trap with clean out on each fixture not having integral trap.
.2 Chrome plated in all exposed places.

.8 Chair carriers:
.1 Factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.

.9 Acceptable Manufacturers:
.1 Fixtures: Crane, American Standard, Kohler.
.2 Trim: American Standard, Delta Commercial.

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 data sheets.

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada and authority having jurisdiction.

.2 Install in accordance with manufacturer’s instruction and as specified.

.3 Mounting heights:
.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
.2 Wall hung fixtures: as indicated, measured from finished floor.
.3 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651.

3.3 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.

3.4 TESTING AND ADJUSTING

.1 Adjustments:
.1 Adjust water flow rate to design flow rates.
.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.2 Checks:
.1 Aerators: operation, cleanliness.
.2 Vacuum breakers, backflow preventers: operation under all conditions.

.3 Thermostatic controls:
.1 Verify temperature settings, operation of control, limit and safety controls.

NMS DIVISION 23 SPECIFICATIONS

Special Provision

The following Division 23 National Master Specifications are included in this Contract.

NMS 230501 – USE OF HVAC SYSTEMS DURING CONSTRUCTION

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Use of mechanical systems during construction.

1.2 USE OF SYSTEMS

.1 Use of new permanent heat and ventilating systems for supplying temporary heat and ventilation are permitted only under the following conditions:
- .1 Entire system is complete, pressure tested, cleaned, flushed out.
- .2 Building has been closed in, areas to be heated/ventilated are clean and will not thereafter be subjected to dust producing processes.
- .3 There is no possibility of damage.
- .4 Supply ventilation systems are protected by approved filters, inspected daily, changed every two weeks or more frequently as required.
- .5 Return systems have approved filters over openings, inlets, outlets.
- .6 Systems will be:
  - .1 Operated as per manufacturer's recommendations and instructions.
  - .2 Operated by Contractor.
  - .3 Monitored continuously by Contractor.
- .7 Warranties and guarantees are not relaxed.
- .8 Regular preventive and other manufacturers recommended maintenance routines are performed by Contractor at own expense and under supervision of Consultant.
- .9 Refurbish entire system before static completion; clean internally and externally, restore to "as- new" condition, replace filters in air systems.

.2 Exhaust systems are not included in approvals for temporary heating and ventilation.

Part 2 Products

– Not Applicable

Part 3 Execution

– Not Applicable.

NMS 230505 – INSTALLATION OF PIPEWORK

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
  .1 The supply and installation of pipework.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB 1.181, Ready Mixed Organic Zinc Rich Coating.

Part 2 Products

– Not Applicable

Part 3 Execution

3.1 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.2 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, and components.

3.3 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge where indicated separately to above floor drain. Discharge to be visible.

.4 Drain valves: NPS 3/4 ball valve unless indicated otherwise, with hose end male thread, cap and chain.

3.4 AIR VENTS

.1 Install air vents at high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

3.5 DIELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

3.6 PIPEWORK INSTALLATION

.1 Screwed fittings jointed with Teflon tape.

.2 Protect openings against entry of foreign material.

.3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.6 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.7 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.8 Install, except where indicated, to permit separate thermal insulation of each pipe.

.9 Group piping wherever possible and as indicated.

.10 Ream pipes, remove scale and other foreign material before assembly.

.11 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.12 Provide for thermal expansion as indicated.

.13 Valves:

- .1 Install in accessible locations.
- .2 Remove interior parts before soldering.
- .3 Install with stems above horizontal position unless otherwise indicated.
- .4 Valves accessible for maintenance without removing adjacent piping.
- .5 Install globe valves in bypass around control valves.
- .6 Use ball or butterfly valves at branch take offs for isolating purposes except where otherwise specified.
- .7 Install butterfly valves between weld neck flanges to ensure full compression of liner.

3.7 SLEEVES

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at midpoint.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:
- .1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.
- .2 Other floors: Terminate 25 mm above finished floor.
- .3 Before installation, paint exposed exterior surfaces with heavy application of zinc rich paint to CAN/CGSB 1.181.

.6 Sealing:
- .1 Foundation walls and below grade floors: Fire retardant, waterproof non hardening mastic.
- .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
- .3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.
- .4 Ensure no contact between copper pipe or tube and sleeve.

3.8 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.9 PREPARATION FOR FIRESTOPPING

.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 – Firestopping.

.2 Uninsulated unheated pipes not subject to movement: No special preparation.

.3 Uninsulated heated pipes subject to movement: Wrap with non combustible smooth material to permit pipe movement without damaging firestopping material or installation.

.4 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

3.10 FLUSHING OUT OF PIPING SYSTEMS

.1 Before start up, clean interior of piping systems.

.2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Consultant 48 hours minimum prior to performance of pressure tests.

.2 Pipework: Test as specified in relevant sections of Division 23.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of Division 23.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Consultant.

.6 Pay costs for repairs or replacement, retesting, and making good. Consultant to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Consultant.

.8 Preparation for Testing

- .1 Coordinate the time of leak tests with the Owner and Consultant so that tests can be conducted in the presence of the Consultant. Failure to do so will require the retesting of the systems at no cost to the Owner or Consultant.
- .2 All joints including welds shall be left uninsulated and exposed for examination during the test.
- .3 Expansion joints that cannot sustain the reactions due to test pressure shall be provided with temporary restraint, or they may be isolated from testing.
- .4 Equipment that is not subject to the test pressure shall be isolated from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damaging the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.
- .5 If the test pressure is to be maintained for an extended period of time during the leakage inspections and the test fluid may be subject to thermal expansion.

.9 Hydrostatic Testing

- .1 Water at the space ambient temperature shall be used as the test medium.
- .2 Vents shall be provided at high points in the system to release trapped air while filling the system. Drains shall be provided at low points for complete removal of the test liquid.
- .3 The system shall be examined to see that all equipment and parts that cannot withstand the test pressure are properly isolated. Test equipment shall be examined to ensure that it is tight and that low pressure filling lines are disconnected.
- .4 The piping system shall be subjected to a hydrostatic test pressure which is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum test pressure for any vessel, pump, valve of other component in the system under test. A check shall be made to verify that the stress due to pressure at the bottom of vertical runs does not exceed either the 90% of specified minimum yield strength or 1.7 times the SE value as outlined in ASME B31.9.
- .5 Following the application of hydrostatic test pressure for at least 10 minutes, examination shall be made for leakage of the piping, and at all joints and connections. If leaks are found, they shall be eliminated by tightening, repair or replacement, as appropriate, and the hydrostatic test repeated until no leakage is found.

.10 Pay costs for repairs or replacement, retesting, and making good. Consultant to determine whether repair or replacement is appropriate.

.11 Insulate or conceal work only after approval and certification of tests by Consultant.

3.12 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Consultant.

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

NMS 230513 – COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Electrical motors, drives and guards 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 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .1 ASHRAE 90.1, Energy Standard for Buildings Except Low Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).

.2 Electrical Equipment Manufacturers' Association Council (EEMAC).

1.3 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00. Include product characteristics, performance criteria, and limitations.
- .2 Shop Drawings: submit drawings stamped and signed by a professional engineer registered or licensed in the Province of Manitoba.

.3 Quality Control:
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals
.1 Provide maintenance data for motors for incorporation into manual specified in Section 01 78 00.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle in accordance with manufacturers recommendations.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 Products

2.1 GENERAL

.1 Motors: high efficiency, in accordance with local electric utility company standards and to ASHRAE 90.1.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 Motors under 373 W: speed as indicated, continuous duty, built in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.3 Motors 373 W and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C, 3 phase, 208V, unless otherwise indicated.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor reviewed by Engineer for temporary use. Work will only be accepted when specified motor is installed.

2.1 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

.3 For motors under 7.5 kW: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid position of range for specified r/min.

.4 For motors 7.5 kW and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave determined during commissioning.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

.8 Supply one set of spare belts for each set installed in accordance with Section D22.

2.2 DRIVE GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives;
- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
- .3 38 mm dia holes on both shaft centres for insertion of tachometer.
- .4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension.

.5 Guard for flexible coupling:
- .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
- .2 Securely fasten in place.
- .3 Removable for servicing.

.6 Unprotected fan inlets or outlets:
- .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.
- .4 Removable for servicing.

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.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests and submit reports.
- .1 Bump motors to insure proper rotation.
- .2 Confirm amperage and voltage draws for each leg.

.2 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 - 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 Schedule site visits, to review Work.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 The supply and installation of hangers and supports for HVAC piping and equipment.

1.2 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
- .1 ANSI/ASME B31.9, Building Service Piping.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM A125, Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A563, Specification for Carbon and Alloy Steel Nuts.

.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
- .1 MSS SP58, Pipe Hangers and Supports Materials, Design and Manufacture.
- .2 ANSI/MSS SP69, Pipe Hangers and Supports Selection and Application.
- .3 MSS SP89, Pipe Hangers and Supports Fabrication and Installation Practices.

.4 Underwriter's Laboratories of Canada (ULC).

1.3 SYSTEM DESCRIPTION

.1 Design Requirements
- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.9 or MSS SP58.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 Submittal Procedures.

.2 Submit shop drawings and product data for following items:
- .1 Bases, hangers and supports.
- .2 Connections to equipment and structure.
- .3 Structural assemblies.

.3 Closeout Submittals
- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 Closeout Submittals.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.9 and MSS SP58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes
- .1 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 Upper attachment structural: suspension from lower flange of I Beam
- .1 Cold piping NPS 2 maximum: malleable iron C clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
- .2 Hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, and nuts and washers to MSS-SP58 and MSS SP69.

.3 Upper attachment structural: suspension from upper flange of I-Beam
- .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip to MSS SP69.
- .2 Hot piping: malleable iron top of beam jaw-clamp with hooked rod, spring washer, plain washer and nut.

.4 Shop and field fabricated assemblies
- .1 Trapeze hanger assemblies: fabricated from material complying with ASTM A-36.

.5 Hanger rods: threaded rod material to MSS SP58
- .1 Ensure that hanger rods are subject to tensile loading only.
- .2 Provide linkages where lateral or axial movement of pipework is anticipated.

.6 Pipe attachments: material to MSS SP58
- .1 Attachments for steel piping: carbon steel black.
- .2 Attachments for copper piping: copper plated black steel.
- .3 Use insulation shields for hot pipework.
- .4 Oversize pipe hangers and supports.

.7 Adjustable clevis: material to MSS SP69, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
.1 Ensure "U" has hole in bottom for riveting to insulation shields.

2.3 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping
.1 64 kg/m3 density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping
.1 Curved plate 300 mm long, with edges turned up, welded in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

2.4 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel.

2.5 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

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 GENERAL

.1 Hanger components shall not be used for purposes other than for which they were designed. They shall not be used for rigging and erection purposes.

3.3 INSTALLATION

.1 Install in accordance with:
.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:
.1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.

3.4 HANGER SPACING

.1 Plumbing piping: to Saskatchewan Amendments of the National Plumbing Code and the authority having jurisdiction.

.2 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.

.3 Copper piping: up to NPS ½: every 1.5 m.

.4 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

.5 Within 300 mm of each elbow.

.6 Pipework greater than NPS 122: to MSS SP69.

3.5 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

.4 For pipe attachment to steel joints support piping from upper joist chord only.

3.6 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed four degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.7 FINAL ADJUSTMENT

.1 Adjust hangers and supports
- .1 Ensure that rod is vertical under operating conditions.
- .2 Equalize loads.

.2 Adjustable clevis
- .1 Tighten hanger load nut securely to ensure proper hanger performance.
- .2 Tighten upper nut after adjustment.

.3 C clamps
- .1 Follow manufacturer's recommended written instructions and torque values when tightening C clamps to bottom flange of beam.

.4 Beam clamps
- .1 Hammer jaw firmly against underside of beam.

NMS 230553 – MECHANICAL IDENTIFICATION

Special Provision

Part 1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB 1.60, Interior Alkyd Gloss Enamel.
- .2 CAN/CGSB 24.3, Identification of Piping Systems.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
- .1 Equipment: manufacturer's name, model, size, serial number, capacity.
- .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:
- .1 Hazardous: red letters, white background.
- .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
- .1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:
- .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.

.4 Locations:
- .1 Terminal cabinets, control panels: use size #1.
- .2 Equipment in Mechanical Rooms: use size #2.

.5 Identification for PSPC Preventive Maintenance Support System (PMSS):
- .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
- .2 Equipment in Mechanical Room:
  - .1 Main identifier: size #9.
  - .2 Source and Destination identifiers: size #6.
  - .3 Terminal cabinets, control panels: size #5.
- .3 Equipment elsewhere: sizes as appropriate.

2.3 VALVES, CONTROLLERS

.1 3 mm thick plastic laminated, with matte finished tags with letters accurately aligned and machine engraved into core. Red background for normally closed valves and green background for normally open valves.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:
- .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:
- .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:
- .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
- .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
- .3 Use double headed arrows where flow is reversible.

.5 Extent of background colour marking:
- .1 Painted full circumference and length of pipe or insulation.

.6 Colours and Legends:
- .1 Where not listed, obtain direction from Consultant.
- .2 Colours for legends, arrows: to following table:

Background colour:	**Legend, arrows:**
Yellow	BLACK
Brown	BLACK
Green	WHITE
Red	WHITE

- .3 Background colour marking for piping system to match existing.
- .4 Legends for piping systems:

Contents	Background colour marking	Legend
** Add design temperature		
++ Add design temperature and pressure		
Raw water	Green	RAW WATER
River water	Green	RIVER WATER
Sea water	Green	SEA WATER
City water	Green	CITY WATER
Treated water	Green	TREATED WATER
Brine	Green	BRINE
Condenser water supply	Green	COND. WTR. SUPPLY
Condenser water return	Green	COND. WTR. RETURN
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN

Contents	Background colour marking	Legend
High temp HW Htg. supply	Yellow	HTHW HTG. SUPPLY++
High temp HW Htg. return	Yellow	HTHW HTG. RETURN++
Make-up water	Yellow	MAKE-UP WTR
Boiler feed water	Yellow	BLR. FEED WTR
Steam [_____] kPa	Yellow	[_____] kPa STEAM
Steam condensate (gravity)	Yellow	ST.COND.RET (GRAVITY)
Steam condensate (pumped)	Yellow	ST.COND.RET (PUMPED)
Safety valve vent	Yellow	STEAM VENT
Intermittent blow-off	Yellow	INT. BLOW-OFF
Continuous blow-off	Yellow	CONT. BLOW-OFF
Chilled drinking water	Green	CH. DRINK WTR
Drinking water return	Green	CH. DRINK WTR. CIRC
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Waste water	Green	WASTE WATER
Contaminated lab waste	Yellow	CONT. LAB WASTE
Acid waste	Yellow	ACID WASTE (add source)
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
No. [_____] fuel oil suction	Yellow	# [_____] FUEL OIL
No. [___] fuel oil return	Yellow	# [_____] FUEL OIL
Engine exhaust	Yellow	ENGINE EXHAUST
Lubricating oil	Yellow	LUB. OIL
Hydraulic oil	Yellow	HYDRAULIC OIL
Gasoline	Yellow	GASOLINE
Natural gas	to Codes	
Propane	to Codes	
Gas regulator vents	to Codes	
Distilled water	Green	DISTILL. WTR
Demineralized water	Green	DEMIN. WATER
Chlorine	Yellow	CHLORINE
Nitrogen	Yellow	NITROGEN
Oxygen	Yellow	OXYGEN
Compressed air (<700kPa)	Green	COMP. AIR [_____] kPa
Compressed air (>700kPa)	Yellow	COMP. AIR [_____] kPa
Vacuum	Green	VACUUM
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS
Carbon dioxide	Red	CO^2
Instrument air	Green	INSTRUMENT AIR

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.6 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail safe position.

Part 3 Execution

3.1 INSTALLATION

.1 Perform work in accordance with CAN/CGSB 24.3 except as specified otherwise.

.2 Provide ULC and or CSA registration plates as required by respective agency.

3.2 NAMEPLATES

.1 Locations:
  .1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:
  .1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:
  .1 Do not paint, insulate or cover.

3.3 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.
.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.4 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non glare glass where directed by Consultant. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

NMS 230593 – TESTING, ADJUSTING AND BALANCING FOR HVAC

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
.1 The testing, adjusting and balancing for HVAC systems.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
.1 HVAC Applications Handbook, 2011, Chapter 38 – Testing, Adjusting and Balancing.

.2 Associated Air Balance Council (AABC)
.1 AABC National Standards for Total System Balance, 2002.
.2 AABC Test and Balance Procedures.

.3 Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
.1 Manual for the Balancing and Adjustment of Air Distribution Systems.

1.3 SCOPE OF WORK

.1 The mechanical contractor will Contract with an independent testing, adjusting, and balancing (TAB) agency to test, adjust, and balance the HVAC systems.

.2 The Work included in this section consists of furnishing labour, instruments, and tools required in testing, adjusting and balancing the HVAC systems, as described in these specifications or shown on accompanying Drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results.

1.4 QUALIFICATIONS

.1 Agency Qualifications: The TAB Agency shall be a current member of the Associated Air

Balance Council (AABC).

.2 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) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
- .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.

1.5 SUBMITTALS

.1 Qualifications: The TAB agency shall submit a company resume listing personnel and Project experience in air and hydronic system balancing and a copy of the agency's test and balance engineer (TBE) certificate.

.2 Submit names of personnel to perform TAB to Consultant within thirty (30) days of award of Contract.

.3 Procedures and Agenda: The TAB agency shall submit the TAB procedures and agenda proposed to be used.

.4 Sample Forms: The TAB agency shall submit sample forms, which shall include the minimum data required by the AABC National Standards.

1.6 TAB PREPARATION AND COORDINATION

.1 Shop drawings, submittal data, up-to-date revisions, change orders, and other data required for planning, preparation, and execution of the TAB work shall be provided to the TAB agency no later than thirty (30) days prior to the start of TAB work.

.2 System installation and equipment start-up to be complete prior to the TAB agency's being notified to begin.

.3 The building control system shall be complete and operational. The Building Control System contractor shall install all necessary components and software, and make these operational. Assistance shall be provided as required for reprogramming, coordination, and problem resolution.

.4 All test points, balancing devices, identification tags, etc. shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.

.5 Qualified installation or start-up personnel shall be readily available for the operation and adjustment of the systems. Assistance shall be provided as required for coordination and problem resolution.

1.7 REPORTS

.1 Final TAB Report - The TAB agency shall submit the final TAB report for review by the Consultant. All outlets, devices, HVAC equipment, etc., shall be identified, along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" assuring that the Project systems were tested, adjusted and balanced in accordance with the Project specifications and AABC National Standards.

1.8 DEFICIENCIES

.1 Any deficiencies in the installation or performance of a system or component observed by the TAB agency shall be brought to the attention of the Consultant.

.2 The Work necessary to correct items on the deficiency listing shall be performed and verified by the affected Contractor before the TAB agency returns to retest. Unresolved deficiencies shall be noted in the final report.

Part 2 Products

2.1 INSTRUMENTATION

.1 All instruments used for measurements shall be accurate and calibrated. Calibration and maintenance of all instruments shall be in accordance with the requirements of AABC National Standards.

Part 3 Execution

3.1 GENERAL

.1 The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards. Adjustment tolerances shall be ±10% unless otherwise stated.

.2 Equipment settings, including manual valve indicators and similar controls and devices shall be marked to show final settings.

.3 All information necessary to complete a proper TAB project and report shall be per AABC standards unless otherwise noted. The descriptions for Work required, as listed in this section, are a guide to the minimum information needed.

.4 Preconstruction Plan Check and Review

.1 The TAB agency shall review the Project documents and Contractor submittals for their effect on the TAB process and overall performance of the HVAC system. It shall submit recommendations for enhancements or changes to the system within thirty (30) days of document review.

.5 Job Site Inspections

.1 During construction, the TAB agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of two times. (Typically, these are performed when 60% of the total system is installed and again when 90% of the total system is installed, prior to insulation of the piping). The TAB agency shall submit a written report of each inspection.

.6 Verification of HVAC Controls

.1 The TAB agency shall be assisted by the building control systems Contractor in verifying the operation and calibration of all HVAC and temperature control systems. The following tests shall be conducted:

.1 Verify that all control components are installed in accordance with Project requirements and are functional, including all electrical interlocks, and other safety devices.

.2 Verify that all controlling instruments are calibrated and set for design operating conditions.

.7 TAB Report Verification
.1 At the time of final inspection, the TAB agency will be required to recheck, in the presence of the Consultant, specific or random selections of data recorded in the certified report. Points and areas for recheck shall be selected by the Consultant. Measurements and test procedures shall be the same as approved for the initial Work for the certified report. Selections for recheck, specific plus random, will not exceed one day on-site.

NMS 230713 – THERMAL INSULATION FOR DUCTING

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
.1 The supply and installation thermal insulation for ducting.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
.1 ANSI/ASHRAE/IESNA 90.1, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM)
.1 ASTM B209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).
.2 ASTM C335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
.3 ASTM C411, 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 C612, Specification for Mineral Fiber Block and Board 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.

.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (R1999)

.5 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.
.2 CAN/ULC S701, Thermal Insulation Polystyrene, Boards and Pipe Covering.

1.3 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" will mean "not concealed" as defined herein.
.3 Insulation systems insulation material, fasteners, jackets, and other accessories.

1.4 SHOP DRAWINGS

.1 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.5 MANUFACTURERS' INSTRUCTIONS

.1 Installation instructions to include procedures used and installation standards achieved.

1.6 QUALIFICATIONS

.1 Installer: specialist in performing work of this section, and have at least three years successful experience in this size and type of project, qualified to standards of TIAC.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions recommended by manufacturer.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC S102:
- .1 Maximum flame spread rating: 25;
- .2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code C 1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51 GP 52Ma (as scheduled in Part 3 of this section).

2.3 JACKETS

.1 VentureClad 1577CW.

Part 3 Execution

3.1 PRE INSTALLATION REQUIREMENTS

.1 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions and as indicated.

.3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
.1 Hangers, supports to be outside vapour retarder jacket.

.4 Fasteners: At 300 mm o/c in horizontal and vertical directions, minimum two rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: Conform to following table:

Application	TIAC Code	Jacket	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	yes	50
Exhaust and outside air ducts between building envelope and equipment	C-1	yes	50

NMS 230715 – THERMAL INSULATION FOR PIPING

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
.1 Thermal insulation for piping and piping accessories.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
.1 ASHRAE Standard 90.1, Energy Standard for Buildings except Low Rise Residential Buildings.

.2 American Society for Testing and Materials International (ASTM).
.1 ASTM B209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
.2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal 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 C533, Calcium Silicate Block and Pipe Thermal Insulation.
.6 ASTM C547, Mineral Fiber Pipe 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 Manufacturer's Trade Associations
- .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).

.5 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .3 CAN/ULC S702, Thermal Insulation, Mineral Fibre, for Buildings.
- .4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

.1 For purposes of this section
- .1 "CONCEALED" insulated mechanical services in suspended ceilings and non accessible chases and furred in spaces.
- .2 "EXPOSED" will mean "not concealed" as specified.

.2 TIAC
- .1 CRF: Code Rectangular Finish.
- .2 CPF: Code Piping Finish.

1.4 QUALITY ASSURANCE

.1 Qualifications
- .1 Installer: specialist in performing work of this section, and have at least three (3) years successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading.
- .1 Deliver, store and handle in accordance with manufacturer's written instructions.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection.
- .1 Protect from weather, construction traffic.
- .2 Protect against damage.
- .3 Store at temperatures and conditions required by manufacturer.
- .4 Place excess or unused insulation and insulation accessory materials in designated containers.
- .5 Divert unused metal materials from landfill to metal recycling facility.
- .6 Dispose of unused adhesive material at official hazardous material collections site.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC S102.
- .1 Maximum flame spread rating: 25.
- .2 Maximum smoke developed rating: 50.

.2 All insulating material, adhesives and coatings shall be fire retardant type with flame spread and smoke developed rating conforming to the Provincial Building Code, Municipal and CAN/ULC S102 requirements, as may be applicable to the use thereof.

2.2 PIPE INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) in accordance with ASTM C335 and the National Energy Code requirements.

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket:
- .1 Mineral fibre: to CAN/ULC-S702

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket:
- .1 Mineral fibre: to CAN/ULC-S702
- .2 Jacket: to CGSB 51-GP-52Ma

.5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section):
- .1 Mineral fibre: to CAN/ULC-S702
- .2 Jacket: to CGSB 51-GP-52Ma

.6 TIAC Code A-6: flexible unicellular tubular elastomer:
- .1 Insulation: with vapour retarder jacket
- .2 Jacket: to CGSB 51-GP-52Ma

.7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements:
- .1 Insulation: to ASTM C533
- .2 Design to permit periodic removal and re-installation

2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement.
- .1 Hydraulic setting or air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 INDOOR INSULATION JACKETING

.1 Polyvinyl Chloride (PVC):
- .1 One-piece moulded type to CAN/CGSB-51.53 with pre-formed shapes as required.
- .2 Colours: to match adjacent finish paint.
- .3 Minimum service temperatures: -20 degrees C.
- .4 Maximum service temperature: 65 degrees C.
- .5 Moisture vapour transmission: 0.02 perm.
- .6 Thickness: 0.38 mm (15 mil)
- .7 Fastenings:
  - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
- .8 Special requirements:
  - .1 Outdoor: UV rated material at least 0.5 mm thick

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 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

.1 General
- .1 Pipe and Equipment Insulation thickness standards shall not be less than the minimum requirements of National Energy Guide of Canada and AC piping systems and not less than the thickness standards specified for all other piping systems.
- .2 All materials shall be new, undamaged and the best of their respective kind and shall be in conformance with the materials and installation standards of the Thermal Insulation Associates of Canada (TIAC).
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
  - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.
- .6 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.
- .7 Insulate all aboveground vent piping a minimum of 3m within building envelope walls and roofs.

.8 Insulating materials shall not have any corrosive effects on adjoining materials or piping, or support mildew, mold or bacteria. Binders employed in the manufacture of insulating materials shall not exhibit deterioration, degradation, delamination or compressive failure or emit toxic or acrid odours or smoke over the working temperature range of the piping, equipment or ductwork.

.9 Proper wear apparel and safety goggles or face shields shall be employed where loose insulating fibre particles may affect the skin and eyes during the progress of the work. Provide approved respirators and utilize dust collection devices where airborne insulating fibre standards may exceed recommended working levels or where respiratory discomfort may be experienced. Take all precautions as may be necessary during operations to protect all personnel in and near the work areas.

.10 All insulation material, adhesives and coatings shall be retained in original cartons or containers and stored safely until immediately prior to application or use.

.11 Insulation shall not be applied to piping and equipment until such time as the installation and testing of such items has been inspected, verified and accepted by the Consultant.

.12 All surfaces shall be clean and free of oil, dirt and deleterious substances before coverings and insulating adhesives are applied. The Contractor shall be responsible for all cleaning required to bring surfaces to such condition.

.13 It shall be understood that all workmanship shall reflect the best current practices in the trade. Contours on exposed work shall be smooth and continuous. Cemented laps, flaps and bands shall be smoothly and securely cemented down. All surface finishes shall be extended in such manner as to protect all raw edges, ends and surfaces of insulation. Fire resistive adhesives, sealers and mastics shall be liberally used in complete conformity with the requirements of these Specifications and the recommendations of the manufacturer.

.14 All pipe coverings shall be of uniform diameter and shall be neatly and tightly applied in unbroken lengths and with the ends of sections firmly and securely butted together. Wrapping shall be well lapped over at all joints and thoroughly cemented down with adhesive. Where expansion joints are required on insulation, they shall be located and conform to the manufacturer's recommendations. Coverings shall extend through all sleeves or openings in walls, floors, ceilings, and partitions so as to make the insulation continuous except where fire stop or fire safing materials are required. In applying insulation at sleeves or openings, ensure that all sleeves and openings are completely light proof.

.15 Where covering on piping and fittings is terminated, the ends of the covering shall be coated with sealant or terminated neatly with metal or plastic finishing collars on metal jacketed piping, so that no insulating fibers are exposed.

.16 Omit insulation for the following:

- .1 Exposed connections to convectors and connections to heating elements within the enclosure
- .2 Screwed unions on heated piping
- .3 Discharge from safety and relief valves, and drain pipes from valves and vessels subject to occasional hot service only

.17 The vapour barrier shall be continuous over all surfaces and through pipe sleeves on vapour sealed insulation.

.18 Under no circumstances shall materials containing any content of asbestos or materials containing crystalline silica exceeding 1.0% be employed.

.19 Where vessels supplied and installed by the Mechanical Contractor bear an ASME Section VIII stamp require float rings, support rings, studs or anchors for support of the required insulation it shall be this Contractor's responsibility to notify the vessel fabricator, pay for and co-ordinate the placement of the required supports prior to the shipment of the vessel. Field welding on Section VIII stamped vessels is not allowed.

.20 Provide identification on exterior of insulation in accordance with Section 23 05 53.

Application Methods – Pipe, Fittings and Valves

.21 All insulated (hot and cold) piping shall be provided with an integral factory applied jacket conforming to ULC 723, consisting of a smooth glass fiber fabric surface bonded to an aluminized or foil kraft paper laminate adhered to the insulation. Longitudinal and butt joints shall be secured with laps smoothly and continuously, of the same jacket material, self adhering or with a white vapour barrier adhesive. On cold service piping, ensure that vapour barrier integrity around insulation is maintained in strict accordance with the manufacturer's instructions. Water based paints only shall be employed where painting is to be done under another section of the Specifications.

.22 Piping, fittings, valves and flanges, unless otherwise indicated shall be insulated with the same adjoining insulating material and to not less than the same thickness.

.23 Hot Service Piping - with integral jacket shall be held in place by a self-sealing jacket flap and butt strip or by securing non-adhering flap and butt strips with an approved adhesive. Alternately the jacket and butt strips may be secured with staples 3" on centre. Fittings may be insulated with sections of the insulation mitered to fit tightly on piping up to size 2" (unexposed, to view only). Fittings, all sizes, shall be covered with factory molded preformed insulation or tightly placed flexible insulation membrane stapled or wired in place with .062" S.S. wire. Valve bodies and specialties shall be insulated with fitted or mitered blocks fitted neatly to the flange or with tightly placed flexible insulation secured with reinforcing membrane stapled or wired in place with .062" S.S. wire.

.24 Cold Service Piping - with integral vapour barrier jacket shall be held in place by a self-sealing jacket flap and butt strip or by securing non-adhering flap and butt strips with an approved vapour barrier. Alternately the jacket and butt strip may be secured with staples 3" on centre and covered with a heavy brush coat of vapour barrier coating. Fittings may be insulated with sections of the insulation mitered to fit tightly on piping up to size 2" (unexposed to view only). Fittings, all sizes, shall be covered with factory molded preformed insulation or tightly placed flexible insulation secured with reinforcing membrane embedded in an approved vapour barrier coating. Valve bodies and specialties shall be insulated with fitted or mitered insulating segments or with tightly placed flexible insulation secured with reinforcing membrane embedded in an approved vapour barrier coating. Flanges shall be insulated with oversized pipe covering or preformed mitered blocks fitted neatly to the flange or tightly fitted flexible insulation secured with reinforcing membrane embedded in an approved vapour barrier coating. Take care to lap ends and edges of abutting pipe insulation at least 1" inch to ensure physical as well as vapour tight integrity at all abutting pipe, fitting valve and flange insulation. Seal all surface breaks with an approved vapour barrier coating.

.25 All exposed (to view) fittings, valves and flanges shall be finished with preformed P.V.C. covers more than two-piece construction. Joint overlaps P.V.C. to P.V.C. shall be sealed with an approved P.V.C. welding adhesive. On cold service piping seal throat of fittings with an approved vapour barrier adhesive in a width equal to the abutting pipe overlap. Secure covers to pipe jacketing with a compatible solvent-weld adhesive.

.2 Installation of Elastomeric Insulation

.1 Insulation to remain dry. Overlaps to manufacturer's instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

.3 Pipe Insulation Schedules

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1

.1 Securements: SS bands at 300 mm on centre

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: A-3
- .1 Securements: SS bands at 300 mm on centre
- .2 Seals: VR lap seal adhesive, VR lagging adhesive.
- .3 Installation: TIAC Code: 1501-C

.4 TIAC Code: C-2 with vapour retarder jacket
- .1 Insulation securements: manufacturer recommended adhesive or tape
- .2 Seals: lap seal adhesive, lagging adhesive
- .3 Installation: TIAC Code: 1501-C

.5 TIAC Code: A-6
- .1 Insulation securements: manufacturer recommended adhesive or tape
- .2 Seals: lap seal adhesive, lagging adhesive
- .3 Installation: TIAC Code:

.6 TIAC Code: A-2
- .1 Insulation securements: manufacturer recommended adhesive or tape
- .2 Seals: lap seal adhesive, lagging adhesive
- .3 Installation: TIAC Code: 1501-H

.7 Finishes:
- .1 Exposed indoors: PVC jacket
- .2 Exposed in mechanical rooms: PVC jacket
- .3 Concealed, indoors: canvas on valves, fittings. No further finish
- .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation
- .5 Outdoors: water-proof aluminum jacket
- .6 Finish attachments: SS bands, at 150 mm on centre. Seals: wing
- .7 Installation: to appropriate TIAC code CRF/1 through CPF/5

.4 Insulation Application Schedule

Application	Temp degrees C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)				
Run out			to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over
Domestic HWS		A-1	25	25	25	38	38
Domestic CWS		A-3	25	25	25	25	25
Refrigerant hot gas, suction, liquid	5 - 13	A-6	25	25	25	25	25
Refrigerant liquid, hot gas, suction	below 5	A-6	25	25	38	38	38

3.4 INSULATION THERMAL VALUES AND MINIMUM THICKNESSES

.1 All Domestic Water and applicable DWV piping in circulating, recirculating and non-circulating services including piping having electric heating elements along the pipes (i.e. heat tracing, or similar) to maintain temperature shall be insulated in accordance with National Energy Code of Canada for Buildings (2015), as follows:

Piping Location	Insulation Thermal Resistance		Nominal Pipe Diameter, inches (mm)	Minimum Piping Insulation Thickness, mm
	Installed Thermal Resistance, m^2 °C /W	Mean Rating Temperature, **°C**		
Conditioned Space	28.6-25.0	38	Runouts[1] <=2 (51)	25.4
			<=1 (25.4)	
			1¼ - 2 (32-51)	
			2½-4 (64-102	38.1
			>=5 ((127)	
Unconditioned Space (Outdoors)	21.7-20.4	121	Runouts[1] <=2 (51)	38.1
			<=1 (25.4)	63.5
			1¼ - 2 (32-51)	
			2½-4 (64-102	76.2
			>=5 ((127)	88.9

1) Also applies to piping between storage tanks, pumps, etc.
2) The thermal conductivity of piping insulation at the mean rating temperature shall be determined in conformance with ASTM C335/C335M, “Steady-State Heat Transfer Properties of Pipe”.

3.5 CLEANING

.1 Clean all pipe jackets from dust a debris.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment

NMS 230933 – ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

Special Provision

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)
  .1 CSA C22.2-94. 0-M91, Canadian Electrical Code, Part II, General Requirements
  .2 Can/CSA-Z234. 1-89, Canadian Metric Practice Guide

.2 American National Standards Institute (ANSI)
  .1 ANSI/ISAS5.5-1985, Graphic Symbols for Process Displays
  .2 ANSI/EEE260-1978, Letter Symbols for SI and Certain Other Units of Measurements.

1.2 SUMMARY

.1 Section Includes:
  .1 Materials and installation procedures for electric and electronic heating and cooling controls.

1.3 SUBMITTALS

.1 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.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 Submittal Procedures.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

Part 2 Products

2.1 THERMOSTAT GUARDS

.1 Thermostat guards: lockable, clear plastic. Slots for air circulation to thermostat.

2.2 THERMOSTAT (LINE VOLTAGE, HEATING AND COOLING)

.1 Line voltage, wall mounted thermostat, for heating, cooling, heating cooling as dictated by the specified control sequence with:
- .1 Base Full load rating: 16 A at 120 V.
- .2 Base Temperature setting range: 5°C to 30°C.
- .3 Base Thermometer range: 5°C to 30°C.
- .4 Base Markings in 5 degree increments.
- .5 Differential temperature at 1.1°C.
- .6 Provide alternate product or additional components where connected equipment or conditions dictate capacity ranges beyond those indicated above for the base product definitions.
- .7 Lockable Thermostat Guard with slots for air circulation to thermostat.
- .8 ULC/ CSA rated.

2.3 THERMOSTAT (LOW VOLTAGE, HEATING)

.1 Line voltage wall mounted electric heating thermostat with:
- .1 Base Full load rating: 22 A at 120 V.
- .2 Base Temperature setting range: 5°C to 30°C.
- .3 Base Thermometer range: 5°C to 30°C.
- .4 Base Double pole.
- .5 Scale markings: Off 5 10 15 20 25 degrees C.
- .6 Provide alternate product or additional components where connected equipment or conditions dictate capacity ranges beyond those indicated above for the base product definitions.
- .7 Lockable Thermostat Guard with slots for air circulation to thermostat.
- .8 ULC/ CSA rated.

2.4 THERMOSTAT (REMOTE BULB)

.1 Line voltage remote bulb type thermostat with:
- .1 A rating on 120 V.
- .2 3 m copper capillary tube.
- .3 Cast weathertight box.
- .4 ULC/ CSA rated.

2.5 CARBON DIOXIDE SENSOR AND CONTROLLER

.1 Wall mounted carbon dioxide sensor and controller:
- .1 Stand-alone carbon dioxide sensor with 0-10 Vdc analog output.
- .2 Standard of Acceptance: Honeywell C7632A.

2.6 PRESSURE CONTROLLER

.1 Pressure controller for AHU-1:
- .1 The controller shall include fully adjustable analog outputs and hot/common switchable digital outputs from the control board utilizing a PI control loop to control dampers and come complete with duct static pressure pickup probe.
- .2 Controller shall be capable of opening the VAV damper to increase the amount of air bypassed on an increase in duct static pressure.
- .3 Controller shall be capable of closing the VAV damper to reduce the amount of air by-passed on a decrease in duct static pressure.
- .4 Standard of Acceptance: EH Price Model PIC Pressure Controller 25000-310 (Control Sequence number 1550).

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 Install control devices, wiring and conduit in compliance with all requirements outlined in the CEC and the division 26.

.2 Where thermostats are located on outside walls, mount thermostats on brackets or insulated pads 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.

NMS 231123 – Facility Gas Piping

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation for piping, valves and fittings for gas fired equipment.

1.2 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B16.5- 20, Pipe Flanges and Flanged Fittings.
.2 ASME B16.18- [21], Cast Copper Alloy Solder Joint Pressure Fittings.
.3 ASME B16.22- [21], Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
.4 ASME B18.2.1- [12 (R2021)], Square and Hex Bolts and Screws Inch Series.

.2 ASTM International (ASTM)
.1 ASTM A47/A47M- [99 (R2022E1)], Standard Specification for Ferritic Malleable Iron Castings.
.2 ASTM A53/A53M- [22], Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
.3 ASTM B75M- [20], Standard Specification for Seamless Copper Tube [Metric].
.4 ASTM B837- [19], Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems.

.3 CSA Group (CSA)
.1 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel.

.4 CSA Group (CSA)/Canadian Gas Association (CGA)
.1 CAN/CSA B149.1 - 20, Natural Gas and Propane Installation Code Handbook.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Safety Data Sheets (SDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.
.2 Indicate on manufacturers catalogue literature following: valves.

.2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.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.

Part 2 Products

2.1 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.

2.2 JOINTING MATERIAL

.1 Screwed fittings: pulverized lead paste.

.2 Welded fittings: to CSA W47.1.

.3 Flange gaskets: non-metallic flat.

.4 Brazing: to ASTM B837.

2.3 FITTINGS

.1 Steel pipe fittings, screwed, flanged or welded:
- .1 Malleable iron: screwed, banded, Class 150.
- .2 Steel pipe flanges and flanged fittings: to ASME B16.5.
- .3 Welding: butt-welding fittings.
- .4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M.
- .5 Bolts and nuts: to ASME B18.2.1.
- .6 Nipples: schedule 40, to ASTM A53/A53M.

.2 Copper pipe fittings, screwed, flanged or soldered:
- .1 Cast copper fittings: to ASME B16.18.
- .2 Wrought copper fittings: to ASME B16.22.

2.4 VALVES

.1 Provincial Code approved, lubricated plug OR ball type.

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 in accordance with Section CAN/CSA B149.1, 23 05 05 – Installation of Pipework, applicable Provincial Codes, supplemented as specified.

.2 Install drip points:
- .1 At low points in piping system.
- .2 At connections to equipment.

.3 Painting
- .1 As per Section 23 05 53 – Mechanical Identification

3.3 VALVES

.1 Install valves with stems upright or horizontal unless otherwise approved.

.2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

3.4 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:
  .1 Test system in accordance with CAN/CSA B149.1 and requirements of authorities having jurisdiction.

.2 Manufacturer's Field Services:
  .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product[s], and submit written reports, in acceptable format, to verify compliance of work with Contract.
  .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 PV procedures:
  .1 Test performance of components.

1.1 ADJUSTING

.1 Purging: purge after pressure test in accordance with CAN/CSA B149.1.

.2 Pre-Start-Up Inspections:
  .1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.
  .2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.6 CLEANING

.1 Cleaning: Cleaning and Start Up of Mechanical Piping Systems, CAN/CSA B149.1.

.2 Perform cleaning operations in accordance with manufacturer's recommendations.

.3 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 232300 – COPPER TUBING AND FITTINGS REFRIGERANT

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
  .1 Materials and installation for copper tubing and fittings for refrigerant.

.2 Related Sections:
  .1 Section 01 33 00 Submittal Procedures.

.2 Section 01 78 00 Closeout Submittals.
.3 Section 23 05 01 Installation of Pipework.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
.1 ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
.2 ASME B16.24, Cast Copper Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
.3 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
.4 ASME B31.5, Refrigeration Piping and Heat Transfer Components.

.2 American Society for Testing and Materials International (ASTM)
.1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
.2 ASTM B280, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.3 Canadian Standards Association (CSA International)
.1 CSA B52, Mechanical Refrigeration Code.

.4 Environment Canada (EC)
.1 EPS 1/RA/1, Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

.5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
.1 Do construction occupational health and safety in accordance with Health and Safety Requirements.

Part 2 Products

2.1 TUBING

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.
- .1 Pipe (5/8” or smaller): Annealed copper: to ASTM B280, with minimum wall thickness as per CSA B52 and ASME B31.5.
- .2 Pipe (greater than 5/8”): Hard copper: to ASTM B280, type ACR.

2.2 INSULATION

.1 All refrigeration piping (both lines) shall be insulated ½” thick Armaflex or approved equal.

2.3 FITTINGS

.1 Service: design pressure 2070 kPa and temperature 121 degrees C.

.2 Brazed:
- .1 Fittings: wrought copper to ASME B16.22.
- .2 Joints: silver solder, 15% Ag 80% Cu-5%P or copper phosphorous, 95% Cu 5%P and non corrosive flux.

3 Flanged:
- .1 Bronze or brass, to ASME B16.24, Class 150 and Class 300.
- .2 Gaskets: suitable for service.
- .3 Bolts, nuts and washers: to ASTM A307, heavy series.

.4 Flared:
- .1 Bronze or brass, for refrigeration, to ASME B16.26.

2.4 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.5 VALVES

.1 22 mm and under: Class 500, 3.5 Mpa, globe or angle non directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

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 GENERAL

.1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5 Section 23 05 01 - Installation of Pipework.

3.3 BRAZING PROCEDURES

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and bulb.

3.4 PIPING INSTALLATION

.1 General:
- .1 Soft annealed copper tubing: bend without crimping or constriction. Hard drawn copper tubing: do not bend. Minimize use of fittings.

.2 Hot gas lines:
- .1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
- .2 Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.
- .3 Provide inverted deep trap at top of risers.
- .4 Provide double risers for compressors having capacity modulation.
  - .1 Large riser: install traps as specified.
  - .2 Small riser: size for 5.1 m/s at minimum load. Connect upstream of traps on large riser.

3.5 PRESSURE AND LEAK TESTING

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively.

.3 Test Procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

3.6 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:
- .1 Close service valves on factory charged equipment.

.2 Ambient temperatures to be at least 13 degrees C for at least 12 hours before and during dehydration.

.3 Use copper lines of largest practical size to reduce evacuation time.

.4 Use two stage vacuum pump with gas ballast on 2nd stage capable of pulling 5Pa absolute and filled with dehydrated oil.

.5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

.6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:
- .1 Twice to 14 Pa absolute and hold for 4 h.
- .2 Break vacuum with refrigerant to 14 kPa.
- .3 Final to 5 Pa absolute and hold for at least 12 h.
- .4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.
- .5 Submit test results to Consultant.

.7 Charging:
- .1 Charge system through filter drier and charging valve on high side. Low side charging not permitted.
- .2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.
- .3 Re purge charging line if refrigerant container is changed during charging process.

.8 Checks:
- .1 Make checks and measurements as per manufacturer's operation and maintenance instructions.

.9 Manufacturer's Field Services:
- .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its product[s] and submit written reports, in acceptable format, to verify compliance of Work with Contract.
- .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.

3.7 DEMONSTRATION

.1 Instructions:
- .1 Post instructions in frame with glass cover in accordance with Section 01 78 00 Closeout Submittals and CSA B52.

3.8 CLEANING

.1 Perform cleaning operations as in accordance with manufacturer's recommendations.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 233114 – METAL DUCTS – LOW PRESSURE TO 500 PA

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A480/A480M 14b, Standard Specification for General Requirements for Flat Rolled Stainless and Heat Resisting Steel Plate, Sheet and Strip.
- .2 ASTM A635/A635M-13, Standard Specification for Steel, Sheet and Strip, Heavy Thickness Coils, Carbon, Hot Rolled.
- .3 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).

.4 National Fire Protection Association (NFPA).
- .1 NFPA 90A-2012, Standard for the Installation of Air-Conditioning and Ventilating Systems.
- .2 NFPA 90B-2015, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .3 NFPA 96-2014, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- .1 SMACNA HVAC Duct Construction Standards – Metal and Flexible.
- .2 SMACNA HVAC Air Duct Leakage Test Manual.
- .3 IAQ Guideline for Occupied Buildings Under Construction.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:
- .1 Sealants.
- .2 Tape.
- .3 Proprietary Joints.

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:
- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Ontario Regulations.

Part 2 Products

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C
125	Unsealed

.2 Seal classification
- .1 Class C: transverse joints and connections made air tight with sealant or combination thereof. Longitudinal seams unsealed.
- .2 Unsealed seams and joints.

2.2 SEALANT

.1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of 30°C to +93°C.

2.3 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.4 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows.
- .1 Rectangular: Centreline radius: 1.5 times width of duct.
- .2 Round: five piece segmented, Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:
- .1 To 400 mm: with single thickness turning vanes.
- .2 Over 400 mm: with double thickness turning vanes.

.4 Branches:
- .1 Rectangular main and branch: with radius on branch 1.5 times width of duct, 45 degrees entry on branch.
- .2 Round main and branch: enter main duct at 45 degrees with conical connection.
- .3 Provide volume control damper in branch duct near connection to main duct.
- .4 Main duct branches: with splitter damper.

.5 Transitions:
- .1 Diverging: 20 degrees maximum included angle.
- .2 Converging: 30 degrees maximum included angle.

.6 Offsets:
- .1 Full radiused elbows or as indicated.

.7 Obstruction deflectors: maintain full cross sectional area.

2.5 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Firestopping.

.2 Fire stopping material and installation must not distort duct.

2.6 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA.

2.7 HANGERS AND SUPPORTS

.1 Hangers and Supports
- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
- .2 Hanger configuration: to ASHRAE and SMACNA.
- .3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE and SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6

Part 3 Execution

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE, SMACNA and as indicated on drawings.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .1 Insulate strap hangers 100 mm beyond insulated duct, ensure diffuser is fully seated.

.3 Support risers in accordance with ASHRAE and SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with as follows:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6

3.3 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

3.4 LEAKAGE TESTS

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.2 Make trial leakage tests as instructed to demonstrate workmanship.

.3 Complete test before performance insulation or concealment Work.

NMS 233300 – AIR DUCT ACCESSORIES

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation for duct accessories including flexible connections, access doors, vanes, and collars.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- .1 SMACNA HVAC Duct Construction Standards Metal and Flexible.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data
- .1 Submit manufacturer's printed product literature, specifications, and data sheet. Indicate the following:
  - .1 Flexible connections.
  - .2 Duct access doors.
  - .3 Turning vanes.
  - .4 Instrument test ports.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturer's Field Reports: manufacturer's field reports specified.

.7 Closeout submittals: submit maintenance and engineering data for incorporation into O&M manual.

Part 2 Products

2.1 GENERAL

.1 Manufacture in accordance with SMACNA HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 1.3 mm thick with fabric clenched by means of double locked seams.

.2 Material:
- .1 Fire resistant, self-extinguishing, neoprene coated glass fabric, temperature rated at 40°C to 90°C, density of 1.3 kg/m^2.

2.3 ACCESS DOORS IN DUCTS

.1 Non Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene or foam rubber.

.4 Hardware
- .1 Up to 300 x 300 mm: two sash locks complete with safety chain.
- .2 301 to 450 mm: four sash locks complete with safety chain.
- .3 451 to 1000 mm: piano hinge and minimum two sash locks.
- .4 Doors over 1000 mm: piano hinge and two handles operable from both sides.
- .5 Hold open devices.
- .6 300 x 300 mm glass viewing panels.

2.4 TURNING VANES

.1 Factory or shop fabricated single thickness without trailing edge, to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

2.6 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.

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 data sheet.

3.2 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 Length of connection: 100 mm.
- .3 Minimum distance between metal parts when system in operation: 75 mm.
- .4 Install in accordance with recommendations of SMACNA.
- .5 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
  - .1 600 x 600 mm for person size entry.
  - .2 300 x 300 mm for servicing entry.
  - .3 150 x 150 mm for viewing.
  - .4 As indicated.
- .2 Locations
  - .1 Fire and smoke dampers.
  - .2 Control dampers.
  - .3 Devices requiring maintenance.
  - .4 Required by code.
  - .5 Reheat coils.
  - .6 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.
- .4 Locations
  - .1 For traverse readings:
    - .1 Ducted inlets to roof and wall exhausters.
    - .2 Inlets and outlets of other fan systems.
    - .3 Main and sub main ducts.

.4 As indicated.

.2 For temperature readings:
- .1 At outside air intakes.
- .2 In mixed air applications in locations as approved by the Consultant.
- .3 At inlet and outlet of coils.
- .4 Downstream of junctions of two (2) converging air streams of different temperatures.
- .5 As indicated.

.4 Turning vanes
- .1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 233314 – DAMPERS - BALANCING

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA)
- .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

1.3 SUBMITTALS

.1 Product Data
- .1 Submit manufacturer's printed product literature, specifications, and datasheet. Include product characteristics, performance criteria, and limitations.

.2 Quality assurance submittals
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading to manufacturer’s specifications and written instructions.

Part 2 Products

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SPLITTER DAMPERS

.1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.

.2 Control rod with locking device and position indicator.

.3 Rod configuration to prevent end from entering duct.

.4 Pivot: piano hinge.

.5 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 nylon or bronze end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 MULTI BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness, and construction to recommendations of SMACNA.

.3 Maximum blade height: 100 mm.

.4 Bearings: pin in bronze bushings or self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

.7 Maximum leakage: 5% at 100 Pa.

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 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locate balancing dampers in each branch duct for supply systems.

.3 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.4 Dampers: vibration free.

.5 Ensure damper operators are observable and accessible.

.6 Corrections and adjustments conducted by the Consultant.

3.3 FIELD QUALITY CONTROL

.1 Tests:
  .1 Tests to demonstrate that system is functioning as specified.

3.4 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 233315 – DAMPERS - OPERATING

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
  .1 Operating dampers for mechanical forced air ventilation and air conditioning systems.

1.2 SUBMITTALS

.1 Product Data
  .1 Submit in accordance with Section 01 33 00 – Submittal Procedures
  .2 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, and limitations.
  .3 Indicate the following:
    .1 Performance data.

.2 Quality assurance submittals
  .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  .2 Instructions: submit manufacturer's installation instructions.

.3 Closeout Submittals
  .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.3 QUALITY ASSURANCE

.1 Certificates
  .1 Catalogue or published ratings those obtained from tests carried out by manufacturer

or those ordered by manufacturer from independent testing agency.

Part 2 Products

2.1 MULTI LEAF DAMPERS

.1 Extruded aluminum (6063T5) damper frame shall not be less than 2.03 mm (0.080") in thickness. Damper frame to be 101.6 mm (4") deep.

.2 Blades to be extruded aluminum (6063T5) profiles, internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.

.3 Blade and frame seals shall be of extruded silicone and be secured in an integral slot within the aluminum extrusions.

.4 Bearings are to be composed of a Celcon inner bearing fixed to an 11.1 mm (7/16") aluminum hexagon blade pin, rotating within a polycarbonate outer bearing inserted in the frame, resulting in no metal-to-metal or metal-to-plastic contact.

.5 Linkage hardware shall be installed in the frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip.

.6 Dampers are to be designed for operation in temperatures ranging between -40°C (-40°F) and 85°C (185°F).

.7 Dampers shall be parallel blade action.

.8 Leakage shall not exceed 15.2 l/s/m² (3 cfm/ft²) against 250Pa (1” w.g). differential static pressure.

.9 Leakage shall not exceed 25 l/s/m² (4.9 cfm/ft²) against 1kPa (4" w.g) differential static pressure at -40°C (-40°F).

.10 Pressure drop of a fully open 1220 mm x 1220 mm (48" x 48") damper shall not exceed 7Pa (0.03" w.g) at 5.08m/s (1000 fpm).

.11 Dampers shall be made to size required without blanking off free area.

.12 Dampers shall be "Flanged to Duct".

.13 Acceptable Material: Alumavent, Tamco, Ventex.

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 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.

NMS 233316 – DAMPERS – FIRE AND SMOKE

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Fire and smoke dampers, and fire stop flaps.

1.2 REFERENCES

.1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)
- .1 ANSI/NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

.2 Underwriters Laboratories of Canada (ULC)
- .1 CAN4 S112, Fire Test of Fire Damper Assemblies.
- .2 CAN4 S112.2, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.
- .3 ULC S505, Fusible Links for Fire Protection Service.

1.3 SUBMITTALS

.1 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.
- .2 Indicate the following:
  - .1 Fire dampers.
  - .2 Smoke dampers.
  - .3 Fire stop flaps.
  - .4 Operators.
  - .5 Fusible links.
  - .6 Design details of break away joints.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 Submittal Procedures.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

.3 Closeout Submittals:
- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.4 MAINTENANCE

.1 Extra Materials:
  .1 Provide maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.
  .2 Provide following: Six (6) fusible links of each type.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
  .1 Deliver, store and handle in accordance with the manufacturer recommendations.
  .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 Products

2.1 FIRE DAMPERS

.1 Fire dampers: arrangement Type B, listed and bear label of ULC, meet requirements of provincial fire authority and authorities having jurisdiction. Fire damper assemblies fire tested in accordance with CAN4 S112.

.2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
  .1 Fire dampers: 1-1/2 hour fire rated unless otherwise indicated.
  .2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.

.3 Top hinged: offset single damper, round or square; multi blade hinged or interlocking type; sized to maintain full duct cross section, as indicated.

.4 Fusible link actuated, weighted to close and lock in closed position when released or having negator spring closing operator for multi leaf type or roll door type in horizontal position with vertical air flow.

.5 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.

.6 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.

.7 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.

.8 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition of floor slab depth or thickness.

.9 Unless otherwise indicated, the installation details given in SMACNA Install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

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 Install in accordance with ANSI/NFPA 90A and in accordance with conditions of ULC listing.

.2 Maintain integrity of fire separation.

.3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.

.4 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.

.5 Co-ordinate with installer of firestopping.

.6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.

.7 Install break away joints of approved design on each side of fire separation.

3.3 FIELD QUALITY CONTROL

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 233400 – HVAC FANS

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Fans, motors, accessories and hardware for commercial use.

1.2 REFERENCES

.1 Air Conditioning and Mechanical Contractors (AMCA)
- .1 AMCA Publication 99, Standards Handbook.
- .2 AMCA 300, Reverberant Room Method for Sound Testing of Fans.
- .3 AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
- .1 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB 1.181, Ready-Mixed Organic Zinc-Rich Coating.

1.3 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: flow rate, total static pressure, W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
- .3 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.
- .4 Sound ratings: comply with AMCA 301, tested to AMCA 300. Supply unit with AMCA certified sound rating seal.
- .5 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210. Supply unit with AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

1.4 SUBMITTALS

.1 Shop Drawings
- .1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Provide
- .1 Fan performance curves showing point of operation, kW and efficiency.
- .2 Sound rating data at point of operation.

.3 Indicate
- .1 Motors, sheaves, bearings, shaft details.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Closeout Submittals
- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.5 MAINTENANCE

.1 Extra Materials
- .1 Provide maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.
  - .1 Spare parts to include:
    - .1 Matched sets of belts.
- .2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
  - .1 Bearings and seals.
  - .2 Addresses of suppliers.
  - .3 List of specialized tools necessary for adjusting, repairing or replacing.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 Products

2.1 FANS GENERAL

.1 Motors
- .1 In accordance with Section 23 05 13 – Common Motors Requirements for HVAC Equipment supplemented as specified herein.
- .2 For use with variable speed controllers.
- .3 Size: as indicated.

.2 Accessories and hardware: matched sets of V belt drives, adjustable motor bases, belt guards, coupling guards fan inlet safety screens as indicated and as specified in Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

.3 Factory primed before assembly in colour standard to manufacturer.

.4 Scroll casing drains: as indicated.

.5 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

.6 Acceptable Manufacturers: Carnes, Greenheck, Loren Cook, Soler & Palau, Twin City.

2.2 CENTRIFUGAL FANS

.1 Fan wheels
- .1 Welded aluminum construction.
- .2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.
- .3 Backward inclined blades, as indicated.

.2 Bearings: flange mounted grease lubricated ball or roller self-aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 100,000 hours.

.3 Housings
- .1 Volute with inlet cones: fabricated steel for wheels 300 mm or greater, aluminum, for smaller wheels, braced, and with welded supports.
- .2 For horizontally and vertically split housings provide flanges on each section for bolting together, with gaskets of non-oxidizing non-flammable material.
- .3 Provide bolted airtight access doors with handles.

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 FAN INSTALLATION

.1 Install fans as indicated. Where fan control is not indicated, provide local switch adjacent to room light switch for on/off control of fan.

.2 Provide sheaves and belts required for final air balance.

.3 Bearings and extension tubes to be easily accessible.

.4 Access doors and access panels to be easily accessible.

3.3 ANCHOR BOLTS AND TEMPLATES

.1 Size anchor bolts to withstand seismic acceleration and velocity forces.

NMS 233713 – DIFFUSERS, REGISTERS AND GRILLES

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 Supply, return and exhaust grilles and registers, and diffusers and linear grilles, for commercial use.

1.2 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.

1.3 SUBMITTALS

.1 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.
- .2 Indicate following:
  - .1 Capacity
  - .2 Throw and terminal velocity
  - .3 Noise criteria
  - .4 Pressure drop
  - .5 Neck velocity.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.5 MAINTENANCE

.1 Extra Materials

.1 Include:
.1 Keys for volume control adjustment.
.2 Keys for air flow pattern adjustment.

Part 2 Products

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity.

.2 Frames
.1 Full perimeter gaskets.
.2 Plaster frames where set into plaster or gypsum board.
.3 Concealed fasteners.

.3 Concealed manual volume control damper operators.

.4 Colour: as indicated.

2.2 MANUFACTURED UNITS

.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

.2 Acceptable Manufacturers: Nailor, Price, Titus, Tuttle & Bailey.

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 Install in accordance with manufacturer’s instructions.

.2 Install with stainless steel screws in countersunk holes where fastenings are visible.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 00 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 233720 – LOUVRES, INTAKES AND VENTS

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
.1 Mechanical louvers; intakes; vents; and reinforcement and bracing for air vents, and

intakes.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/ National Fire Protection Association (NFPA)
- .1 ANSI/NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.2 American Society for Testing and Materials International (ASTM).
- .1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.4 Society of Automotive Engineers (SAE).

1.3 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.

1.4 SUBMITTALS

.1 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.
- .2 Indicate following:
  - .1 Pressure drop.
  - .2 Face area.
  - .3 Free area.

Part 2 Products

2.1 FIXED LOUVRES - ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063 T5.

.3 Blade: minimum 3 mm thick with reinforcing bosses and maximum blade length of 1500 mm.

.4 Frame, head, sill and jamb: 100 mm deep one piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.

.5 Mullions: at 1500 mm maximum centres.

.6 Fastenings: stainless steel SAE 194 8F with SAE 194 SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.7 Screen: 12 mm mesh, 2 mm diameter wire aluminum bird screen on inside face of louvres in formed U frame.

.8 Finish: anodized. Colour: to Contract Administrator's approval.

.9 Acceptable Manufacturers: Greenheck, Price, Ruskin, Ventex.

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 In accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace as indicated.

.3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

3.3 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 235100 – BREECHING, CHIMNEYS AND STACKS

Special Provision

Part 1 General

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

.2 Underwriters' Laboratories of Canada (ULC).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

.1 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
- .2 Indicate following:
  - .1 Methods of sealing sections.
  - .2 Methods of expansion.
  - .3 Details of thimbles.
  - .4 Bases/Foundations.
  - .5 Supports.
  - .6 Guy details.
  - .7 Rain caps.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 -

Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Closeout Submittals

.1 Submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with applicable Provincial regulations.

.2 Certificates:

.1 Catalogued or published ratings: obtained from tests carried out by independent testing agency or manufacturer signifying adherence to codes and standards.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials in accordance with General Conditions.

Part 2 Products

2.1 BREECHINGS

.1 Shop fabricated 3.5 mm thick galvanized steel with sweep bends from domestic hot water and furnace outlet to chimney as indicated.

2.2 FUELS: PRESSURE CHIMNEY AND BREECHING

.1 ULC labelled.

.2 Sectional, prefabricated, double wall with air space or mineral wool insulation with mated fittings and couplings.

.1 Liner: type 304 stainless steel.
.2 Shell: type 304 stainless steel.
.3 Outer seals between sections: to suit application.
.4 Inner seals between sections: to suit application.

2.3 TYPE B GAS VENT

.1 ULC labelled, atmospheric gas vent only.

.2 Sectional, prefabricated, double wall with 13 mm air space. Aluminum inner wall. Galvanized steel outer wall. Mated fittings and couplings.

2.3 STEEL CHIMNEY REFRACTORY LINED

.1 Material:

.1 Prefabricated sections with 90 mm thick high temperature impervious insulating refractory lining, centrifugally spun into 3.5 mm thick circular casing.

.2 Construction:
.1 Prefabricated sections, welded on site or at factory. Use high temperature insulating cement at joints in refractory lining.

.3 Welding:
.1 To full thickness; grind welds smooth.

.4 Supports:
.1 Welded gussets, cleats and bolts for installation on concrete base.
.2 Chimney self supporting.

.5 Breeching entry:
.1 Tee section with 150 mm minimum refractory lined projection.

.6 Access door: in bottom section.

.7 Drain connection: at base of stack.

.8 Dimensions: as indicated.

2.4 ACCESSORIES

.1 Cleanouts: bolted, gasketted type, full size of breeching, as indicated.

.2 Barometric dampers: 70% of full size of breeching area.

.3 Hangers and supports: in accordance with recommendations of Sheet Metal and Air Conditioning Contractors National Association Inc. (SMACNA).

.4 Rain cap.

.5 Expansion sleeves with heat resistant caulking, held in place as indicated.

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 - GENERAL

.1 Follow manufacturer's and SMACNA installation recommendations for shop fabricated components.

.2 Suspend breeching at 1.5 m centres and at each joint.

.3 Support chimneys at bottom, roof and intermediate levels as indicated.

.4 Install thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney. Pack annular space with heat resistant caulking.

.5 Install flashings on chimneys penetrating roofs, as indicated.

.6 Install rain caps and cleanouts, as indicated.

3.3 INSTALLATION - REFRACTORY LINED STEEL CHIMNEY

.1 Grind welds smooth to form appearance of single tube.

.2 Seal insulating refractory at top of stack.

.3 Pack annular space around breeching at entry tee with heat resistant caulking.

.4 Run drain line from drain connection to nearest floor drain.

.5 On completion, paint one coat of rust inhibitive primer and two coats of heat resisting paint of colour, make and quality approved by Consultant.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 237200 – AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

Special Provision

Part 1 General

1.1 SUMMARY

.1 Section Includes:
  .1 Materials, components and installation for heat reclaim devices.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  .1 ASHRAE 84, Method of Testing Air to Air Heat Exchangers (ANSI approved).

1.3 SUBMITTALS

.1 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.

.2 Shop Drawings:
  .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.
  .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Closeout Submittals:
  .1 Provide operation and maintenance data for incorporation into manual specified in

Section 01 78 00 – Closeout Submittals.

.5 Certificates:
- .1 Catalogued or published ratings: obtained from tests carried out by manufacturer or those ordered from independent testing agency signifying adherence to codes and standards in force.
- .2 Provide confirmation of testing.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with manufacturer's written instructions and Common Product Requirements.

1.5 MAINTENANCE

.1 Extra Materials:
- .1 Provide maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.

.2 Furnish list of individual manufacturer's recommended spare parts for equipment include:
- .1 Bearings and seals.
- .2 Addresses of suppliers.
- .3 List of specialized tools necessary for adjusting, repairing or replacing.

Part 2 Products

2.1 GENERAL

.1 Comply with ASHRAE 84.

2.2 AIR TO AIR DUAL CORE EXCHANGER

.1 Casing: 0.8 mm thick galvanized steel.

.2 Heat transfer surfaces: corrugated aluminum, edge sealed and bonded to casing.

.3 Cross contamination: not to exceed ASHRAE 62 acceptable cross leakage rate.

.4 Removable access panels.

.5 Performance characteristics: refer to equipment schedules.

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 Install in accordance with manufacturers recommendations.

.2 Support independently of adjacent ductwork with flexible connections.

.3 Install access doors in accordance with Section 23 33 00 – Air Duct Accessories for access to dampers, and fans.

3.3 FIELD QUALITY CONTROL

.1 Tests:
  .1 Perform tests in accordance with Section 26 05 01 – Common Work Results - Electrical.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

NMS 237400 – PACKAGED OUTDOOR HVAC EQUIPMENT

Special Provision

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Conform to the General Provisions of Section 21 05 01.

.2 Provide complete control system c/w all wiring, dampers, thermostats, sensors, etc. as described herein.

1.2 REFERENCE STANDARDS

.1 American Gas Association (AGA)

.2 American National Standards Institute/Air-Conditioning, Heating and Refrigeration Institute (ANSI/AHRI)
  .1 ANSI/AHRI 210/240, Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
  .2 ANSI/AHRI 270, Sound Rating of Outdoor Unitary Equipment.

.3 CSA Group (CSA)
  .1 CSA B52, Mechanical Refrigeration Code.
  .2 CSA C22.1, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

.4 National Fire Protection Association (NFPA)
  .1 NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

.5 Underwriters Laboratories (UL)
  .1 UL 1995, Standard for Heating and Cooling 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 outdoor HVAC equipment 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, Canada.
.2 Drawings to indicate project layout and dimensions; indicate:
.1 Equipment, piping, and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware, and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections.
.2 Piping, valves, fitting shipped loose showing final location in assembly.
.3 Control equipment shipped loose, showing final location in assembly.
.4 Complete internal panel pneumatic tube piping and wiring and external panel pneumatic tube piping and wiring, both as schematics and as actually assembled.
.5 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads.
.6 Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices of ancillaries, accessories, controllers.
.7 Pump and fan performance curves.
.8 Details of vibration isolation.
.9 Estimate of sound levels to be expected across individual octave bands in dB referred to A rating.
.10 Type of refrigerant used.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.6 Manufacturer's Field Reports:
.1 Submit manufacturer's field reports specified.

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 outdoor HVAC equipment for incorporation into manual.
.1 Indicate: brief description of unit, indexed, with details of function, operation, control, and service for components.
.2 Provide for units, manufacturer's name, type, year, number of units, and capacity.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect outdoor HVAC equipment from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse by manufacturer of packaging materials as specified in Waste Reduction Work plan and Construction Waste Management Plan

1.6 WARRANTY

.1 For Work of this Section 23 74 00 - Packaged Outdoor HVAC Equipment, 12 months warranty period is extended to 60 months.

.2 Contractor hereby warrants that packaged rooftop HAVC units and refrigeration compressors will function and operate in accordance with CCDC 2 GC 24, but for 60 months.

Part 2 Products

2.1 PACKAGED GROUND HVAC UNITS

.1 Ground mounted, the units shall be convertible airflow. The operating range shall be between 115°F and 0°F in cooling as standard from the factory for units with microprocessor controls.

.2 Operating range for units with electromechanical controls shall be between 115°F and 40°F.

.3 Cooling performance shall be rated in accordance with ARI testing procedures.

.4 All units shall be factory assembled, internally wired, fully charged with R-410A, and 100 percent run tested to check cooling operation, fan and blower rotation, and control sequence before leaving the factory.

.5 Wiring internal to the unit shall be colored and numbered for simplified identification.

.6 Units shall be UL listed and labeled, classified in accordance for Central Cooling Air Conditioners.

2.2 CABINET

.1 Unit casing shall be constructed of zinc coated, heavy gauge, and galvanized steel.

.2 Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B117.

.3 Cabinet construction shall allow for all maintenance on one side of the unit. Service panels shall have lifting handles and be removed and reinstalled by removing two fasteners while providing a water and air tight seal.

.4 All exposed vertical panels and top covers in the indoor air section shall be insulated with a cleanable foil-faced, fire-retardant permanent, odorless glass fiber material.

.5 The base of the unit shall be insulated with 1/8 inch, foil-faced, closed-cell insulation. All insulation edges shall be either captured or sealed.

.6 The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised 1 1/8 inch high down flow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up.

.7 The base of the unit shall have provisions for forklift and crane lifting, with forklift capabilities on three sides of the unit.

.8 The base of the unit shall have provisions for forklift and crane lifting, with forklift capabilities on three sides of the unit.

.9 The top cover shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and enhances water removal from unit top.

2.3 FANS

.1 Indoor Fan shall be plenum fan design and shall include a backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor. All plenum fan designs will have a variable speed adjustment potentiometer located in the control box.

.2 .Outdoor fan shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position. The fan motor shall be permanently lubricated.

.3 All motors shall be thermally protected.

2.4 AIR FILTERS

.1 To meet NFPA 90A, air filter requirements.

.2 Shall consist of factory installed, low velocity, 2” pleated media filters.

.3 Filters shall be standard, commercially available sizes.

2.5 ELECTRIC HEATERS

.1 The heating section shall have a progressive tubular heat exchanger design using stainless steel burners and corrosion resistant steel throughout. An induced draft combustion blower shall be used to pull the combustion products through the firing tubes. The heater shall use a direct spark ignition (DSI) system. On initial call for heat, the combustion blower shall purge the heat exchanger for 20 seconds before ignition after three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat/zone sensor.

.2 Controls:

.1 The electronic programmable sensor is Auto or Manual changeover with seven day programming. Auto or Manual selection of Fan Auto, Fan On. Programmable sensor has System Off, Auto, Heat, Cool, and Service /LCD indicators as standard. Night setback sensor has up to four programs per day which can be individually configured to occupied or unoccupied

2.6 HEAT EXCHANGERS AND BURNERS

.1 The heating section shall have a progressive tubular heat exchanger design using stainless steel burners and corrosion resistant steel throughout. An induced draft combustion blower shall be used to pull the combustion products through the firing tubes. The heater shall use a direct spark ignition (DSI) system. On initial call for heat, the combustion blower shall purge the heat exchanger for 20 seconds before ignition after three unsuccessful ignition attempts, the entire heating system shall be locked out until manually reset at the thermostat/zone sensor.

2.7 REFRIGERATION

.1 Conform to CSA B52 and UL 1995 requirements.

.2 Compressor/Condenser Section:
- .1 All units shall have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps.
- .2 Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage.
- .3 Internal overloads shall be provided with the scroll compressors.
- .4 Unit to be complete with two stage compressors.

.3 Evaporator and Condenser Coils:
- .1 Rated to ANSI/AHRI 210/240.
- .2 Internally finned, 5/16" copper tubes mechanically bonded to a configured aluminum plate fin shall be standard.
- .3 Coils shall be leak tested at the factory to ensure the pressure integrity. The evaporator coil and condenser coil shall be leak tested to 600 psig. The assembled unit shall be leak tested to 465 psig.
- .4 A plastic, dual-sloped, removable and reversible condensate drain pan with through-the-base condensate drain is standard.
- .5 Thermostatic expansion valve, with adjustable super heat and external equalizer.

2.8 CONTROLS

.1 In addition to combustion safety controls, provide smoke sensors in return to NFPA standards, low limit on supply and freeze protection on coils.

.2 Economizer: This accessory shall be available with barometric relief. The assembly includes fully modulating 0-100 percent motor and dampers, minimum position setting, preset linkage, wiring harness with plug, spring return actuator and differential enthalpy control.

.3 The barometric relief shall provide a pressure operated damper that shall be gravity closing and shall prohibit entrance of outside air during the equipment off cycle.

.4 The economizer arrives in the shipping position and shall be moved to the operating position by the installing contractor

.5 Freeze protection control: wired in cold deck control circuit to guard against coil frosting and low air flow, with shut off by differential pressure switch or low temperature.

2.9 PROGRAMMABLE ZONE TEMPERATURE SENSOR

.1 The electronic programmable sensor is Auto or Manual changeover with seven day programming. Auto or Manual selection of Fan Auto, Fan On. Programmable sensor has System Off, Auto, Heat, Cool, and Service /LCD indicators as standard. Night setback sensor

has up to four programs per day which can be individually configured to occupied or unoccupied

2.10 CAPACITY

.1 As indicated on the drawings

Part 3 Execution

3.1 PACKAGED GROUND HVAC UNITS

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for outdoor HVAC equipment installation in accordance with manufacturer's written instructions.

.2 Install unit in accordance to manufacturer’s installation instructions.

.3 Division 26 to provide power to units.

.4 All duct connections shall be made utilizing canvas connections as specified under Section 23 31 14.

.5 Refer to Controls Section 23 09 33 for the work performed by that section.

.6 Upon completion of the installation the manufacturer to furnish the services of a technician to start up air handling units and perform tests over their full operating range, in conjunction with the requirements of the Commissioning Authority

3.2 DEMONSTRATION

.1 Training: in accordance with Section 01 91 13 - General Commissioning Requirements: Training of O&M Personnel, supplemented as specified.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Perform cleaning operations in accordance with manufacturer's recommendations.

NMS 238123.01 – SINGLE SPLIT AIR CONDITIONING

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute/American Society of Heating, Refrigeration and Air-Conditioning Engineers (ANSI/ASHRAE)
  .1 ANSI/ASHRAE 52.2, Method of Testing General Ventilation Air-Cleaning Devices for

Removal Efficiency by Particulate Size.

.2 ASTM International (ASTM)
.1 ASTM C547, Specification for Mineral Fiber Pipe Insulation.

.3 CSA Group (CSA)
.1 CSA B52, Mechanical Refrigeration Code.
.2 CAN/CSA-C656, Performance Standard for Single Package Central Air-Conditioners and Heat Pumps.

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 air conditioning components and accessories 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 Manitoba, Canada.
.2 Indicate on drawings:
.1 Major components and accessories including sound power levels of units.
.2 Type of refrigerant used.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate major components and accessories including sound power levels of units.

.3 Type of refrigerant used, R-410A.

1.4 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for air conditioning components 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.

.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 air conditioning components from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

1.6 WARRANTY

.1 Provide 5 year warranty including material and labour on compressors.

Part 2 Products

2.1 INDOOR UNIT

.1 Refer to schedule.

2.2 OUTDOOR UNIT

.1 Refer to schedule.

2.3 ACCEPTABLE MANUFACTURERS

.1 LG

.2 Daikin

.3 Samsung

Part 3 Execution

3.1 GENERAL

.1 Install as indicated, to manufacturer's recommendations, and in accordance with EPS 1/RA/2.

.2 Manufacturer to certify installation.

.3 Run drain line from cooling coil condensate drain pan to terminate over nearest floor drain.

3.2 EQUIPMENT PREPARATION

.1 Provide services of manufacturer's field engineer to set and adjust equipment for operation as specified.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

NMS DIVISION 26 SPECIFICATIONS

Special Provision

The following Division 26 National Master Specifications are included in this Contract.

NMS 260500 – COMMON WORK RESULTS - ELECTRICAL

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group
- .1 CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
- .2 CAN/CSA-C22.3 No.1-10, Overhead Systems.
- .3 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.

1.2 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data: Submit manufacturer's instructions, printed product literature and data sheets for all electrical equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit for review single line electrical diagrams and locate the approved Single Line Diagrams in glazed frames as below:
- .1 Electrical distribution system in main electrical room.
- .2 Electrical power generation and distribution systems in power plant rooms.

.3 Shop drawings:
- .1 Submit drawings for all equipment for review by engineer.
- .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 drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 Submit one copy of drawings and product data to Contract Administrator.
- .6 If changes are required, notify the Contract Administrator of these changes before

they are made.

.4 Certificates:
- .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
- .2 Submit test results of installed electrical systems and instrumentation.
- .3 Permits and fees: in accordance with General Conditions of contract.
- .4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
- .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Contract Administrator.

.5 Manufacturer's Field Reports: submit to Contract Administrator manufacturer's written report, within five days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for all electrical equipment for incorporation into manual.

.2 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.3 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. Safety precautions.
- .3 Procedures to be followed in event of equipment failure.
- .4 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.4 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.5 Post instructions where directed.

.6 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.7 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

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 indoors, off ground, in dry location and in accordance with

manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect all electrical equipment from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new

.4 Material Delivery Schedule: provide Contract Administrator with schedule within 2 weeks after award of Contract.

.5 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

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.

2.2 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with their respective specification section requirements.

.2 Material and Equipment to be CSA certified. Where CSA certified material and equipment are 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 specified in mechanical sections as shown on mechanical drawings.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction or inspection authorities or Owner’s Representative and Contract Administrator.

.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 and labels as follows:
- .1 Nameplates: Limacoid 3 mm matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
- .2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 × 50 mm	1 line	3 mm high letters
Size 2	12 × 70 mm	1 line	5 mm high letters
Size 3	12 × 70 mm	2 lines	3 mm high letters
Size 4	20 × 90 mm	1 line	8 mm high letters
Size 5	20 × 90 mm	2 lines	5 mm high letters
Size 6	25 × 100 mm	1 line	12 mm high letters
Size 7	25 × 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 Owner's Representative and Contract Administrator prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, 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 5 m 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 light gray to EEMAC 2Y-1.
- .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1 or 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 for installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Contract Administrator.
- .2 Inform Contract Administrator 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 Contract Administrator.

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 and No. 7 except where specified otherwise.

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: plastic, 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.

3.4 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, where possible

3.5 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. Install electrical equipment at following heights unless indicated otherwise:
- .1 Local switches: 1400 mm.
- .2 Wall receptacles:
  - .1 General: 450 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 data/computer outlets: 450 mm or as indicated.

.5 Wall mounted telephone and interphone outlets: 1500 mm.

.6 Fire alarm stations: 1120 mm.

.7 Fire alarm bells: 2100 mm.

.8 Television outlets: 1500 mm.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

.1 The scope of the work under this item shall include all devices and equipment supplied and installed under this contract including contractor purchased equipment and equipment pre-purchased by the Owner or supplied by others as part of the work.

.2 The Contractor shall gather all equipment and cable data and hire a testing firm to perform the short circuit, protective device co-ordination and Arc flash studies including all breakers, generator protection and utility interface requirements. All studies shall be reviewed and stamped by a professional engineer in the Province of Ontario.

.3 The testing firm hired by the contractor shall evaluate the adequacy of all equipment including but not limited to power circuit breakers, load interrupter switches, molded case breakers, automatic transfer switches and fuses. Any areas or inadequacies in the equipment shall be reported to the Contract Administrator.

.4 The protective device co-ordination study shall be performed by the contractor to select the final fuse sizing, protective relay characteristics and settings. The object of the study is to obtain optimum protective and co-ordination performance for these devices. The phase and ground overcurrent protection, protective relay settings, and utility interface protections shall

be included.

.5 Complete study to be reviewed and approved by the Owner, Contract Administrator and ESA prior to settings being applied to the equipment.

3.7 FIELD QUALITY CONTROL

.1 The scope of the work under this item shall include all devices and equipment supplied and installed under this contract including contractor purchased equipment and equipment pre-purchased by the Owner or supplied by others.

.2 The Contractor shall engage the services of a recognized independent testing firm for the purposes of protective device testing and inspections. The testing firm shall be experienced with this type of project and selection is subject to the approval of the Contract Administrator. A final report signed by the testing technician shall be submitted indicating test methods, test equipment used, test results and final settings for all relays.

.3 Where electronic relays are programmed, the final electronic settings files shall be submitted as part of the O&M Manual.

.4 The testing agency shall perform visual and mechanical testing of all equipment to ensure that the equipment has been installed per the manufacturer's specifications, the meagering and high-potential testing of cables and equipment, any adjustments to the equipment in the field application of the final relay settings and testing of all relays during commissioning.

.5 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 - 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.

.6 Testing shall include all contractor purchased equipment, Owner Pre-purchased equipment, or equipment supplied by others as part of this work:
- .1 Power generation and distribution systems 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 system and 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.
  - .4 Check potential difference between ground and neutral. Potential difference between ground and neutral shall not exceed 2V.

.7 The testing firm shall maintain written records of all tests, calibrations and settings and upon completion of the project, assemble and certify final test reports. Submit digital copies of all

test reports to the Contract Administrator.

.8 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

.9 Carry out tests in presence of Owner's Representative or Contract Administrator.

.10 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.11 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 – 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 Schedule site visits, to review Work, as directed in Part 1 – Quality Assurance.

3.8 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

NMS 260520 – WIRE AND BOX CONNECTORS – (0-1000V)

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA)
- .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)

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper alloy sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper or copper alloy 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 or bar.
- .2 Clamp for stranded round copper conductors or bar.
- .3 Stud clamp bolts.
- .4 Bolts for copper conductors or bar.
- .5 Sized for conductors or bars as indicated.

.4 Clamps or connectors for armoured cable, and flexible conduit, as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:
- .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
- .2 Install fixture type connectors and tighten. Replace insulating cap.
- .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

NMS 260521 – WIRE AND BOX CABLES – (0-1000V)

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

.1 CSA C22.2 No .0.3-01 R2005, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131-M89 (R2007), Type TECK 90 Cable.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600V or 1000V insulation of chemically cross linked thermosetting polyethylene material rated RW90 or RWU90.

.3 Use RW90 for building installations in above ground applications.

.4 Use RWU90 for grade slab in embedded conduits systems or for underground installations.

.5 Neutral supported cable: 3 phase insulated conductors of aluminium and one neutral conductor of aluminium steel reinforced, size as indicated. Insulation: Type NSF 2 flame retardant rated 600 V.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size and number as indicated.

.3 Insulation:
- .1 Chemically cross linked thermosetting polyethylene rated type RW90, 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking galvanized steel.

.6 Overall covering: polyvinyl chloride material.

.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 300 mm centers.
- .3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:
- .1 Watertight, approved for TECK cable.
- .2 Explosion proof for hazardous locations, approved for TECK cable.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from galvanized steel strip.

2.4 CONTROL CABLES

.1 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type polyethylene insulation with shielding of metallized tapes over each pair and over all conductors and overall covering of PVC jackets interlocked armour of flat galvanized steel. Cables shall be tray rated

.2 600 V type: stranded annealed copper conductors, sizes as indicated with cross linked polyethylene type RW90 (x link).

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 26 05 34.

3.2 INSTALLATION OF TECK CABLE 0-1000 V

.1 Group cables wherever possible on channels.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 – 1000 V.

3.3 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

3.4 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit or cable trays as indicated

.2 Ground control cable shield at one end only.

3.5 HOT SURFACES

.1 Where exposed to hot surfaces, maintain 1-5/8” clearance from hot surfaces and provide thermal break between support steel and conduit, cables, etc.

NMS 260528 – GROUNDING SECONDARY

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE):
  .1 ANSI/IEEE 837-2002, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International).

.3 CAN/CSA Z32-2009, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Contract Administrator.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required 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: copper clad steel 20 mm dia. by 3 m long.

.4 Plate electrodes: copper, surface area 0.2 m2, 1.6 mm thick.

.5 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.6 Insulated grounding conductors: green.

.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 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 or 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 one 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 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.13 Ground secondary service pedestals.

3.2 MAINTENANCE HOLES

.1 Install conveniently located grounding stud, electrode, size 4/0 stranded copper conductor in each maintenance hole.

.2 Install ground rod in each manhole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made.

3.3 ELECTRODES

.1 Make ground connections to continuously conductive underground water pipe on street side of water meter.

.2 Install water meter shunt.

.3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.

.4 Install rod, plate electrodes and make grounding connections.

.5 Bond separate, multiple electrodes together.

.6 Use size 4/0 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.

3.4 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary 600 V system.

3.5 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.

3.6 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room.

.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.7 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:

- .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
- .2 Sound, fire alarm, intercommunication systems as indicated.

3.8 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 Contract Administrator and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

NMS 260529 – HANGERS AND SUPPORTS

Special Provision

Part 1 General

1.1 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction Demolition Waste Management and Disposal.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal bonding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted on walls and ceilings.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to solid masonry with lead anchors or nylon shields.

.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 malleable iron 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 dia. threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia. threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 2.5 m on centre spacing.

.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 Contract Administrator.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

NMS 260531 – SPLITTERS, JUNCTION, PULL BOXES, AND CABINETS

Special Provision

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets for review.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position. NEMA 12 indoors, NEMA 3R outdoors, and NEMA 4X in hazardous areas.

.2 Main and branch lugs or connection bars to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Junction and pull shall be of size as indicated on the drawing. NEMA 12 indoors, NEMA 3R outdoors or NEMA 4X (SS) in process areas.

.2 Welded construction with screw on flat covers for surface mounting.

.3 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.3 CABINETS

.1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting. NEMA 12 indoors, NEMA 3R outdoors or NEMA 4X (SS) in process areas.

.2 Type T: sheet steel cabinet, with hinged door, latch, lock, two keys, containing sheet steel backboard for surface mounting. NEMA 12 indoors, NEMA 3R outdoors or NEMA 4X (SS) in process areas.

.3 Cabinets and enclosures located in process areas or outdoors shall be stainless steel. NEMA 12 indoors, NEMA 3R outdoors or NEMA 4X (SS) in process areas.

Part 3 Execution

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the 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.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Install size 2 identification labels indicating system name and/or voltage and phase.

NMS 260532 – OUTLET BOXES, CONDUITS BOXES AND FITTINGS

Special Provision

Part 1 General

1.1 REFERENCES

.1 Canadian Electrical Code (latest edition).

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

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 for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Provide weatherproof covers in process areas and outdoors. Covers to be extra deep to facilitate closure of cover with cord plugged in.

.5 Blank cover plates for boxes without wiring devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

.7 Stainless steel or PVC boxes and fittings in process areas or outdoors.

2.2 OUTLET BOXES

.1 Stainless steel or PVC 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.

.2 Stainless steel or PVC utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster tile 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 brass brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex single receptacles. Minimum depth: 28 mm for receptacles; 73 mm for communication equipment.

.2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 12 mm and 19 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

.1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle. Use non-metallic boxes in corrosive areas.

.2 Explosion proof boxes in hazardous areas as required by the Canadian Electrical Code.

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 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

.5 Stainless steel or PVC in process areas or outdoors.

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. Reducing washers are not allowed.

NMS 260533.01 – SURFACE AND LIGHTING FIXTURE RACEWAYS

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)
  .1 CAN/CSA-C22.2 No. 62-93 (R2003), Surface Raceway Systems.

Part 2 Products

2.1 SURFACE RACEWAY SYSTEM (WIRING PULLED IN)

.1 One piece steel, free of sharp edges to CAN/CSA-C22.2 No. 62.

.2 Corners, pull boxes, elbows, tees, two piece assembly to facilitate site wiring.

.3 Finish: grey enamel.

.4 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

2.2 SURFACE RACEWAY SYSTEM (WIRING LAID IN)

.1 Two piece steel assembly CAN/CSA-C22.2 No. 62.
.1 Finish: grey enamel.

.2 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

2.3 SURFACE FLOOR RACEWAY SYSTEM

.1 Two piece steel assembly manufactured for floor lay-in type raceway to CAN/CSA-C22.2 No. 62.

.2 Finish: grey enamel.

2.4 CHANNEL RACEWAY

.1 Channel type raceway: to CAN/CSA-C22.2 No. 62, steel, solid.

2.5 PLASTIC RACEWAY

.1 Plastic raceway: to CAN/CSA-C22.2 No. 62, rigid extruded polyvinyl chloride or reinforced thermosetting plastic with slots on either side of raceway for exit of wiring.

.2 Channel: with solid snap-on cover throughout entire length.

2.6 LIGHTING FIXTURE RACEWAY

.1 LED fixture support system using channel type raceway with snap-on cover.

.2 Channel: minimum 1.6 mm thick.

.3 Clamp hangers with threaded rod, rod hangers, or chain.

2.7 FITTINGS

.1 Elbows, tees, supports, connectors couplings and fittings: to CAN/CSA-C22.2 No. 62.

Part 3 Execution

3.1 INSTALLATION

.1 Install raceway systems as indicated and in accordance with manufacturer's instructions.

.2 Install supports, elbows, tees, connectors, fittings, bushings, adaptors as required.

.3 Keep number of elbows, offsets and connections to minimum.

.4 Use wiring with mechanical protection in channel raceways.

.5 Install barriers in raceways for different services where required by code.

.6 Install wiring after installation of raceway system is complete.

NMS 260534 – CONDUITS, CONDUIT FASTENINGS, AND CONDUIT FITTINGS

Special Provision

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA):
- .1 CAN/CSA C22.2 No. 18-98, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
- .2 CSA C22.2 No. 45-M1981, Rigid Metal Conduit.
- .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985, Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3, Flexible Non-metallic Tubing.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel or aluminum in process areas threaded at both ends.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with water tight couplings. Set screw couplings and connectors are not allowed.

.3 Rigid PVC conduit: to CSA C22.2 No. 211.2. Use Schedule 40 for corrosive areas, duct banks, reinforce concrete and direct buried installation.

.4 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

.5 Flexible PVC conduit: to CAN/CSA C22.2 No. 227.3.

2.2 CONDUIT FASTENINGS

.1 One hole stainless steel or PVC straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5 m oc.

.4 Threaded rods, 6 mm dia. to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit, non-painted.

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

.4 Use explosion proof flexible connection for connection to explosion proof devices.

.5 Install conduit sealing fittings in hazardous areas. Fill with compound.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 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.

.3 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.

.4 Use rigid PVC in corrosive areas.

.5 Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.

.6 Use rigid PVC conduit underground.

.7 Use flexible metal conduit for connection to motors in dry areas.

.8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations. Use liquid tight fittings.

.9 Where exposed to hot surfaces, maintain 1-5/8” clearance from hot surfaces and provide thermal break between support steel and conduit.

.10 Use explosion proof flexible connection for connection to explosion proof motors.

.11 Install conduit sealing fittings in hazardous areas. Fill with compound.

.12 Minimum conduit size for lighting and power circuits: 21 mm.

.13 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.14 Mechanically bend steel conduit over 21 mm dia.

.15 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.16 All conduit threads to be sealed. Conduits entering on top of enclosures in process areas shall utilize O-rings.

.17 Install fish cord in empty conduits.

.18 Run 2 - 27 mm spare conduits up to ceiling space and 2 - 27 mm spare conduits down to ceiling space from each flush panel. 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 type box.

.19 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.20 Dry conduits out before installing wire.

3.2 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.

3.3 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.

3.4 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel. Install in centre one third of slab. Confirm with structural engineer that the depth of concrete is appropriate for conduits.

.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. Use cold mastic between sleeve and conduit.

.5 Do not place conduits is slabs in which slab thickness is less than 4 times conduit diameter.

.6 Encase conduits completely in concrete. Confirm minimum cover with structural engineer.

.7 Organize conduits in slab to minimize cross overs.

3.5 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

3.6 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC accepted) with heavy coat of bituminous paint.

NMS 260543.01 – INSTALLATION OF CABLES IN TRENCHES AND IN DUCTS

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results For Electrical.

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA)

.2 Insulated Cable Engineers Association, Inc. (ICEA)

Part 2 Products

2.1 CABLE PROTECTION

.1 38 × 140 mm planks pressure treated with clear, coloured, or copper naphthenate or 5%

pentachlorophenol solution, water repellent preservative.

2.2 MARKERS

.1 Coloured plastic tape (150 mm wide) suitable for marking and detecting buried underground cables. Low density polyethylene tape with stainless steel wires labeled “Caution Electrical Cable Below”.

Part 3 Execution

3.1 DIRECT BURIAL OF CABLES

.1 After sand bed is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.

.2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.

.3 Make termination and splice only as indicated leaving 0.6 m of surplus cable in each direction.
- .1 Make splices and terminations in accordance with manufacturer's instructions using approved splicing kits.

.4 Underground cable splices not acceptable.

.5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

.6 Cable separation:
- .1 Maintain 75 mm minimum separation between cables of different circuits.
- .2 Maintain 300 mm horizontal separation between low and high voltage cables.
- .3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.
- .4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.
- .5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.
- .6 Install treated planks on lower cables 0.6 m in each direction at crossings.

.7 After sand protective cover is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run as indicated.

3.2 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.
- .1 Do not pull spliced cables inside ducts.

.2 Install multiple cables in duct simultaneously.

.3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.4 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.

.5 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead

covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.6 After installation of cables, seal duct ends with duct sealing compound.

3.3 MARKERS

.1 Mark cable every 150 m along cable duct runs and changes in direction.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 mega ohms.

.5 Pre-acceptance tests.
- .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000V megger on each phase conductor.
- .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests
- .1 Ensure that terminations and accessory equipment are disconnected.
- .2 Ground shields, ground wires, metallic armour and conductors not under test.
- .3 High Potential (Hipot) Testing.
  - .1 Conduct hipot testing at 100% of original factory test voltage in accordance with ICEA recommendations.
- .4 Leakage Current Testing.
  - .1 Raise voltage in steps from zero to maximum values as specified by ICEA for type of cable being tested.
  - .2 Hold maximum voltage for specified time period by ICEA manufacturer.
  - .3 Record leakage current at each step.

.7 Provide Contract Administrator with list of test results showing location at which each test was made, circuit tested and result of each test. Include results in commissioning manual.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.5 PROTECTION

.1 Repair damage to adjacent materials caused by cables installation.

NMS 260573 – SHORT CIRCUIT, PROTECTIVE SYSTEM COORDINATION & ARC FLASH STUDY

Special Provision

Part 1 General

1.1 DESCRIPTION

.1 Provide a coordination/protective study, short circuit, and arc flash incident energy analysis per IEEE Std 1584-2018 and to the requirements of CSA Z462:21 on the electrical distribution system of all equipment specified herein and submit for review.

.2 Include the following:
- .1 600V cable thermal damage curves.
- .2 600V circuit breaker overcurrent, overload, ground fault devices, and zone interlocking.
- .3 347/600V and 120/208V panelboards, MCCs, Switchboards, and switchgear, and connecting feeder cables.
- .4 600V transformer damage curves, magnetizing currents for all transformers 150kVA and larger.
- .5 Locked rotor currents, acceleration times and damage curves for motors 75kW and larger.
- .6 Any additional data necessary for successful completion of the coordination and short circuit study.

.3 Data shall clearly state the operating time in cycles of each breaker and indicate whether the time current curves for relays are inclusive of breaker trippings time or otherwise.

.4 Prepare a summation chart showing all ratings and settings with easy reference to the appropriate curve.

.5 Symmetrical and asymmetrical fault current calculations shall be submitted to verify the correct choice of the protective elements of the system.

.6 Prepare a systems single line diagram on which the resultant short circuit values, device numbers and equipment ratings are shown.

.7 Include a list of recommended settings for each relay.

1.2 QUALIFICATIONS

.1 This study shall be provided by the supplier of the motor control center or the main electrical distribution equipment.

.2 This study shall be performed by and bear the stamp of a Professional Engineer registered in the Province of Ontario.

1.3 SUBMITTALS

.1 Submit the complete study for review prior to carrying out calibration and verification.

.2 Submit typed results of coordination and short circuit study in maintenance manuals.

PART 2 PRODUCTS

2.1 TRIPPING DEVICES AND CABLES

.1 Relay style, CT ratios and fuse/breaker, and cables sizes have been selected on a preliminary basis for design purposes. Final selection shall be based on the results of this study and shall be included at no extra cost.

PART 3EXECUTION

3.1 DATA

.1 Provide the main switchboard/MCC and/or the distribution Equipment supplier with all relevant data for equipment not provided by that supplier.

.2 Provide Arc Flash Hazard Level labels for all electrical equipment.

NMS 260923.01 – METERING AND SWITCHBOARD INSTRUMENTS

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 Materials, components, cabinets, instruments and installation for metering and switchboard Instruments.

1.2 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.3 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)
  .1 ANSI C39.1-1981, Requirements, Electrical Analog Indicating Instruments.

.2 CSA Group (CSA)
  .1 CAN3-C17-M84 (R2008), Alternating - Current Electricity Metering.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data
  .1 Submit manufacturer's instructions, printed product literature and data sheets for metering and switchboard instruments and include product characteristics, performance criteria, physical size, finish and limitations.
  .2 Include meter, instrument, outline dimensions, panel drilling dimensions and installation cutout template.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused wiring materials from landfill to metal recycling facility as approved by Contract Administrator.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 METER

.1 Include digital metering system (DMS) (3 total) with remote accessibility via web interface (if necessary provide CT's/PT's). PM5500 or approved equal
- .1 Provide 1 unit to monitor utility power (mount on MDS as per drawing).
- .2 Provide 1 unit to monitor generator power (mount on MDS as per drawing).
- .3 Provide 1 unit at each system to monitor Heat Trace system power (mount to door of heat trace enclosure. Reference Div 238314).

.2 Display the following quantities (but not limited to):
- .1 3ph voltages
- .2 Power
- .3 Demand
- .4 Energy
- .5 Frequency
- .6 Power factor.

2.2 METER SOCKET

.1 Weatherproof meter socket to suit meter with automatic current transformer shorting devices when metre removed.

2.3 METER CABINET

.1 Sheet steel CSA enclosure NEMA 12 indoors or stainless steel Nema 3R/NEMA 4X in process areas or outdoors with meter backplate, to accommodate meters, test terminal block and associated equipment, factory installed and wired.

2.4 TEST TERMINAL BLOCKS

.1 Test terminal blocks: Where the customer or authorities require sampling data.

2.5 INDICATING INSTRUMENTS

.1 Digital indicating instruments: 1% accuracy, switchboard mounting:
- .1 Current: true RMS range as indicated.
- .2 Voltage: true RMS range as indicated.
- .3 Watt: range as indicated.
- .4 Vars: range as indicated.
- .5 Frequency: range as indicated.
- .6 Power factor: range as indicated.
- .7 Ethernet communications.

.2 ION 7550 as indicated or equal.

2.6 SHOP INSTALLATION

.1 Install customer metering as shown on drawings.

.2 Ensure adequate spacing between current transformers installed on each phase.

.3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources, electrical supplies.

Part 3 Execution

3.1 METERING INSTALLATION

.1 Install meters and instruments in location free from vibration and shock.

.2 Make connections in accordance with diagrams.

.3 If applicable, ensure power factor corrective equipment connected on load side of meter.

.4 Connect meter and instrument transformer cabinets to ground.

3.2 FIELD QUALITY CONTROL

.1 Conduct tests in accordance with Section 26 05 00 - Common Work Results - Electrical and in accordance with manufacturer's recommendations.

.2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.

.3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.

.4 Perform tests to obtain correct calibration.

.5 Do not dismantle meters and instruments.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by metering and switchboard instrument installation.

NMS 261216.01 – DRY TYPE TRANSFORMER UP TO 600V PRIMARY

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and components for dry type transformers up to 600 V primary, equipment identification and transformer installation.

1.2 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results For Electrical.

1.3 REFERENCES

.1 CSA Group (CSA)
- .1 CAN/CSA-C22.2 No.47-M90 (R2007), Air-Cooled Transformers (Dry Type).
- .2 CSA C9-02 (R2007), Dry-Type Transformers.
- .3 CAN/CSA-C802.2-06, Minimum Efficiency Values for Dry Type Transformers.

.2 National Electrical Manufacturers Association (NEMA)

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused wiring materials from landfill to metal recycling facility as approved by Contract Administrator.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 DESIGN DESCRIPTION

.1 Use transformers of one manufacturer throughout project and in accordance with CAN/CSA-C22.2 and No.47 CSA-C9.

.2 Meets NEMA TP1 and CSA C802.2 efficiencies.

.3 Design:
- .1 Type: ANN.
- .2 1 phase units and 3 phase units, kVA as indicated, V input as indicated, V output as indicated, 60 Hz.
- .3 Voltage taps: ± 2 ½% above and below neutral.
- .4 Insulation: Class H, 220 degrees C temperature rise.
- .5 Windings: 2, copper.
- .6 Basic Impulse Level (BIL): standard.
- .7 Hipot: standard.
- .8 Average sound level: standard.
- .9 Impedance at 170 degrees C: standard.
- .10 Enclosure: NEMA CSA, removable metal front panel.
- .11 Mounting: wall or floor.
- .12 Finish: in accordance with Section 26 05 00 - Common Work Results for Electrical.

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: Unit ID plus kVA rating plus primary and secondary voltage.

Part 3 Execution

3.1 INSTALLATION

.1 Mount dry type transformers up to 75 kVA on wall brackets above distribution panels.

.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 Ensure clearances around electrical equipment meet current CEC requirements.

.10 Make conduit entry into bottom 1/3 of transformer enclosure.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by dry type transformers installation.

NMS 262300 – LOW VOLTAGE SWITCHGEAR

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)
- .1 CSA C22.2 No.31-10, Switchgear Assemblies.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
- .1 EEMAC G8-3.3-89, Metal Enclosed Interrupter Switchgear Assemblies.

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 low voltage switchgear and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit shop drawings for review by contract administrator.
.2 Indicate on drawings:
.1 Floor anchoring method and foundation template.
.2 Dimensioned cable entry and exit locations.
.3 Dimensioned position and size of bus.
.4 Overall length, height and depth of complete switchgear.
.5 Dimensioned layout of internal and front panel mounted components.

.4 Certificates:
.1 Submit certified factory test results.

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 low voltage switchgear and components for incorporation into manual.

1.4 EXTRA STOCK MATERIALS

.1 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Include:
.1 3 fuses for each type above 600 A.
.2 6 fuses for each type up to and including 600 A.

Part 2 Products

2.1 MATERIALS

.1 Switchgear assembly: to CSA C22.2 No.31.

2.2 RATING

.1 Secondary switchgear: indoor, 600/347V, 400A, 3 phase, 4 wire, 60 Hz, minimum short circuit capacity 18 kA (rms symmetrical).

2.3 ENCLOSURE

.1 Main incoming section to contain:
.1 Moulded case circuit breaker sized as indicated.
.2 Digital metering system to Section 26 09 23.01 - Metering and Switchboard Instruments.
.3 Provision for electrical power supply authority metering.

.2 Distribution sections to contain:
.1 Moulded case circuit breaker sized as indicated.
.2 Copper bus, from main section to distribution sections.

.3 Blanked off spaces with bus stabs and hardware for mounting future units.

.4 Metal enclosed, free standing, floor mounted, dead front, indoor, CSA Enclosure 1 cubicle unit.

.5 Ventilating louvres: vermin, insect proof.

.6 Access from front.

.7 Steel channel sills for base mounting in single length common to multi-cubicle switchboard.

.8 Provision for future extension on both sides.

.9 Include manually operated breaker lifting device mounted on the top of the switch gear.
- .1 Where air circuit breakers are mounted in multiple cubicles, lifting device to travel on rail on top of switch board.

.10 Receptacle: 120 V, single phase, 60 Hz, duplex, U-ground. For overall panel, provide 2 outlets.

2.4 BUSBARS

.1 Three phase and 100% rated bare busbars, continuous current rating 400 A self-cooled, extending full width of cubicle, suitably supported on insulators.

.2 Main connections between bus and major switching components to have continuous current rating to match major switching components.

.3 Busbars and main connections: 99.30 % minimum conductivity copper.

.4 Allow for extension of bus on both sides of unit without need for further drilling or preparation in field.

.5 Tin plated joints, secured with non-corrosive bolts and Belleville washers.

.6 Identify phases of busbars by suitable marking.

.7 Busbar connectors, when switchboard shipped in more than one section.

2.5 GROUNDING

.1 Copper ground bus not smaller than 50 mm x 6 mm extending full width of multi-cubicle switchboard and situated at bottom.

.2 Lugs at each end for size 4/0 AWG grounding cable.

2.12 POWER SUPPLY AUTHORITY METERING

.1 Separate compartment and metal raceway for exclusive use of power supply authority metering.

.2 Arrange with authority having jurisdiction for supply of mounting accessories and wiring for metering as follows:
- .1 Potential transformers.
- .2 Current transformers.
- .3 Watthour meter.
- .4 Demand metre with kWh register.

.5 Ammeter.
.6 Voltmeter.
.7 Ammeter phase selector switch.
.8 Voltmeter phase selector switch.

2.13 FINISHES

.1 Apply finishes in accordance with Section 26 05 00 - Common Work Results for Electrical.
.1 Cubicle exteriors gray.
.2 Cubicle interiors white.

2.14 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Nameplates:
.1 White plate, black letters, size 7.
.2 Complete switchgear labelled: voltage, system configuration and main bus ampacity.
.3 Main cubicle labelled: "Main Switch".
.4 Distribution units labelled: "Feeder No.1 ", "Feeder No.2 ".

2.15 SOURCE QUALITY CONTROL

.1 Contract Administrator to witness final factory tests.

.2 Notify Contract Administrator in writing 5 days minimum in advance that switchgear assembly is ready for testing.

Part 3 Execution

3.1 INSTALLATION

.1 Locate switchgear assembly as indicated and bolt to floor.

.2 Connect main secondary power supply to main breaker.

.3 Connect load side of breakers in distribution cubicles to distribution feeders.

.4 Check factory made connections for mechanical security and electrical continuity.

.5 Run one grounding conductor 4/0 AWG bare copper in 25 mm conduit from ground bus to ground.

.6 Check trip unit settings against co-ordination study to ensure proper working and protection of components.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by low voltage switchgear installation.

NMS 262401 – SERVICE EQUIPMENT

Special Provision

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 service equipment and include product characteristics, performance criteria, physical size, finish and limitations.

Part 2 Products

2.1 EQUIPMENT

.1 Fused disconnect switch: in accordance with Section 26 28 23 - Disconnect Switches - Fused and Non-Fused, rating as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install service equipment.

.2 Connect to incoming service.

.3 Connect to outgoing load circuits.

.4 Install ground fault equipment.

.5 Make grounding connections in accordance with Section 26 05 28 - Grounding - Secondary.

.6 Make provision for power supply authority's metering.

NMS 262402 – SERVICE ENTRANCE BOARD

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group
- .1 CSA C22.2 No.31-10, Switchgear Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:
- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide:
- .1 3 extra fuses for each type above 600 A.
- .2 6 extra fuses for each type up to and including 600 A.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

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 service entrance board from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SERVICE ENTRANCE BOARD

.1 Service Entrance Board: to CSA C22.2 No.31.

.2 Rating: 600/347 V, 3 phase, 4 wire, 400 A, short circuit current 18 kA (rms symmetrical).

.3 Cubicles: wall-mounted, dead front, size as indicated.

.4 Barrier metering section from adjoining Sections.

.5 Provision for installation of power supply authority metering in barriered Section.

.6 Owners metering.

.7 Distribution section.

.8 Hinged access panels with captive knurled thumb screws.

.9 Bus bars and main connections: 99.3% copper.

.10 Bus from load terminals of main breaker to main lugs of distribution section.

.11 Cable from load terminals of main breaker to metering section and cable from metering section to lugs of distribution section.

.12 Identify phases with colour coding.

2.2 MOULDED CASE CIRCUIT BREAKERS

.1 As per Section 26 28 21 Moulded Case Circuit Breakers.

2.3 FUSIBLE DISCONNECTS AND FUSES

.1 As per Section 26 28 23 Disconnect Switches - Fused and Non-Fused.

2.4 GROUNDING

.1 Copper ground bus extending full width of cubicles and located at bottom.

.2 Lugs at each end for size 4/0 AWG grounding cable.

2.5 POWER SUPPLY AUTHORITY METERING

.1 Separate compartment and metal raceway for exclusive use of power supply authority metering.

.2 Mounting accessories and wiring for metering supplied by power supply authority:
- .1 Potential transformers.
- .2 Current transformers.
- .3 Watthour meter.
- .4 Demand metre with kWh register.

2.6 FINISHES

.1 Apply finishes in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .1 Service entrance board exterior: gray.

2.7 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Nameplates:
- .1 White plate, black letters, size 7.
- .2 Complete board labelled: "600 V."
- .3 Main disconnect labelled: "Main Breaker Switch ".
- .4 Branch disconnects labelled: "Feeder No. 1 ", "Feeder No. 2 ", "Feeder No. 3 ", as indicated.

2.8 SOURCE QUALITY CONTROL

.1 Contract Administrator to witness final factory tests.

.2 Notify Contract Administrator in writing 5 days in advance that service entrance board is ready for testing.

Part 3 Execution

3.1 INSTALLATION

.1 Locate service entrance board and fasten to wall.

.2 Connect main secondary service to line terminals of main breaker.

.3 Connect load terminals of distribution breakers to feeders.

.4 Check factory made connections for mechanical security and electrical continuity.

.5 Run one grounding conductor 4/0 AWG bare copper in 1" conduit from ground bus to building ground.

.6 Check trip unit settings against co-ordination study to ensure proper working and protection of components.

NMS 264717 – PANELBOARDS BREAKER TYPE

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

.1 Section 01 33 00 Submittal Procedures.

.2 Section 26 05 00 – Common Work Results – Electrical.

.3 Section 26 28 21 Moulded Case Circuit Breakers.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings in accordance with Section 01 33 00 Submittal Procedures.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity, and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one (1) 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.

.2 600 V panelboards: bus and breakers rated for 18kA (symmetrical) interrupting capacity or as indicated on the drawings.

.3 250 V panelboards: bus and breakers rated for 10kA (symmetrical) interrupting capacity or as indicated on the drawings.

.4 Panelboard width to be less than 230 mm.

.5 Integral TVSS.

.6 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.

.7 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated on plans.

.8 Two (2) keys for each panelboard and key panelboards alike.

.9 Copper bus with neutral of same ampere rating as mains.

.10 Mains: suitable for bolt on breakers.

.11 Trim with concealed front bolts and hinges.

.12 Trim and door finish: baked grey enamel.

.13 Panelboards to be surface mounted with enclosure rated NEMA 1 with drip-hood or as indicated on the drawings.

.14 Service entrance rated panelboard shall be rated as such.

.15 Approved manufacture: Eaton, Siemens, Schneider Electric or equal.

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Lock on devices for fire alarm clock outlet, emergency lights, 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 – 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.

Part 3 Execution

3.1 INSTALLATION

.1 Mount panelboards in MCC, surface mount to walls, or as indicated on the plans.

.2 Connect loads to circuits.

.3 Connect neutral conductors to common neutral bus with respective neutral identified.

.4 Measure load current on each phase and adjust phase loading for a balanced system.

NMS 262716 – ELECTRICAL CABINETS AND ENCLOSURES

Special Provision

Part 1 General

1.1 REFERENCES

.1 The Munsell System of Colour Notation.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction Demolition Waste Management and Disposal.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIALS

.1 All enclosures shall be NEMA 12 indoors or stainless steel NEMA 3R/NEMA 4X in process areas or outdoors.

.2 Enclosure constructed with 2.7 mm thick minimum steel, with weather and corrosion resistant finish, Munsell Notation 7.5GY3.5/1.5, size as indicated.

.3 Entire enclosure capable of withstanding maximum impact force of 86 MN/m2 area without rupture of material.

.4 Removable enclosure panels with formed edges, galvanized steel external fasteners removable only from inside enclosure.

.5 Enclosure equipped with hot dipped galvanized mounting rails 1 m adjustable horizontally and vertically to enable mounting of equipment at any location within housing:
- .1 Rails: 14 mm holes and 50 x 14 mm slots on 100 mm centres for horizontal adjustment.
- .2 Holes in side panel flanges in 60 mm increments for vertical adjustment.

.6 Cover: tamperproof, bolt-on, domed to shed water.

.7 Door: minimum 1 m wide, hinged, 3 point latching, with padlocking means.

.8 Ventilation panel constructed to allow air circulation yet preventing entry of foreign objects, wild life, vermin.

.9 Door interlocks: as required.

.10 Enclosure construction such as to allow any configuration of single or ganged enclosures.

.11 Enclosure capable of being shipped in knocked-down condition.

Part 3 Execution

3.1 INSTALLATION

.1 Assemble enclosure in accordance with manufacturer's instructions.

.2 Mount equipment in enclosure.

NMS 262726 – WIRING DEVICES

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results for Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.2 No.42 10 (R2015), General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CSA C22.2 No.42.1-13, Cover Plates for Flush Mounted Wiring Devices (Bi national standard, with UL 514D).
- .3 CSA C22.2 No.55 15, Special Use Switches.
- .4 CSA C22.2 No.111 10 (R2015), General Use Snap Switches (Bi national standard, with UL 20).

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Submittal Procedures.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction Waste Management and Disposal Work plan.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Contract Administrator.

Part 2 Products

2.1 SWITCHES

.1 15 or 20 A, 120 V, single pole, double pole, three-way, four-way switches to: C22.2 NO. 55-15 and C22.2 NO. 111-10 (R2015).

.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.

.4 Switches of one manufacturer throughout project.

.5 Explosion proof switches where required.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5 20 R, 125 V, 15 A, U ground, to: C22.2 NO. 42-10 (R2015) with following features:
- .1 white urea moulded housing or as indicated.
- .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 riveted grounding contacts.

.2 Single receptacles CSA type 5 20 R, 125 V, 15 A, U ground with following features:
- .1 white urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Four back wired entrances, two side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No.42.1-13.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Type 302 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush mounted outlet box.

.5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

Part 3 Execution

3.1 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 in accordance with Section 26 05 00 – Common Work Results – Electrical as indicated.

.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 in accordance with Section 26 05 00 – Common Work Results – Electrical as indicated.
- .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Cover plates:
- .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .2 Install suitable common cover plates where wiring devices are grouped.
- .3 Do not use cover plates meant for flush outlet boxes on surface mounted boxes.

NMS 262821– MOLDED CASES CIRCUIT BREAKERS

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 Materials for moulded-case circuit breakers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 Submittal Procedures.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).
  .1 CSA-C22.2 No. 5, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 Submittal Procedures.

.2 Include time current characteristic curves for breakers with ampacity of 90 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case 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 Celsius ambient.

.3 Common trip breakers: with single handle for multi pole applications.

.4 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 three (3) to eight (8) times current rating.

.5 Circuit breakers to have minimum symmetrical rms interrupting capacity rating matching panel board or switchboard containing breaker or as indicated.

2.2 THERMAL MAGNETIC BREAKERS

.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

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 SOLID STATE TRIP BREAKERS

.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 long time, short time, instantaneous tripping for phase and ground fault short circuit protection.

2.5 OPTIONS

.1 Provide enclosures for individual circuit breakers rated for the proper area (Weatherproof, hazardous rated, or as indicated on the drawings).

.2 If the circuit breaker is the main service device, it must be service entrance rated.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

.2 Set adjustable trip settings according to coordination study.

NMS 262822– GROUND FAULT CIRCUIT INTERRUPTERS – CLASS A

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)
- .1 CAN/CSA C22.2 No.144-M91 (R2006), Ground Fault Circuit Interrupters.

.2 National Electrical Manufacturers Association (NEMA)
- .1 NEMA PG 2.2-1999 (R2009), Application Guide for Ground Fault Protection Devices for Equipment.

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 ground fault circuit interrupters and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings for review by contract administrator.

.4 Test and Evaluation Reports: submit test report for field testing of ground fault equipment to Contract Administrator and certificate that system as installed meets criteria specified.

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 ground fault circuit interrupters for incorporation into manual.

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 indoors, off ground, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect ground fault circuit interrupters from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA C22.2 No.144.

.2 Components comprising ground fault protective system to be of same manufacturer.

2.2 GROUND FAULT PROTECTOR UNIT

.1 Self-contained with 15/20 A, 120 V circuit interrupter and duplex receptacle complete with:
.1 Solid state ground sensing device.
.2 Facility for testing and reset.
.3 CSA Enclosure 1, flush mounted with painted face plate.

Part 3 Execution

3.1 INSTALLATION

.1 Do not ground neutral on load side of ground fault relay.

.2 Pass phase conductors including neutral through zero sequence transformers.

.3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical

.2 Demonstrate simulated ground fault tests.

NMS 262823 – DISCONNECT SWITCHES – FUSED AND NON-FUSED

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results For Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International):
  .1 CAN/CSA C22.2 No.4-04), Enclosed Switches.
  .2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.4 SUBMITTALS

.1 Submit product data for all disconnect switches for review.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction Demolition Waste Management and Disposal.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Fusible and Non-fusible, horsepower rated disconnect switch in CSA enclosures, size as indicated

.2 Enclosure NEMA 1 or NEMA 12 indoor, NEMA3R, NEMA 4X outdoor, to CAN/CSA C22.2, size as indicated.

.3 Provision for padlocking in off switch position by three locks.

.4 Mechanically interlocked door to prevent opening when handle in ON position.

.5 Quick-make, quick-break action.

.6 ON-OFF switch position indication on switch enclosure cover.

.7 Provide auxiliary contacts were required. Refer to schematics.

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 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

NMS 262901 – CONTACTORS

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)
- .1 CSA C22.2 No.14-10, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)
- .1 NEMA ICS 2-2000 (R2005), Controllers, Contactors and Overload Relays Rated 600 V.

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 contactors 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 contactors for incorporation into manual.

.3 Include operating information required for start-up, synchronizing and shut-down of generating units.

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 Store and protect contactors from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CONTACTORS

.1 Contactors: to CSA C22.2 No.14.

.2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.

.3 Breaker combination contactor as indicated.

.4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.

.5 Mount in NEMA Enclosure NEMA 12 unless otherwise indicated.

.6 Include following options in cover:
- .1 Green indicating lamp.
- .2 Stop-Start pushbutton.
- .3 Hand-Off-Auto selector switch.
- .4 On-Off selector switch.

.7 Control transformer: in accordance with Section 26 29 03 - Control Devices, factory wired and installed in contactor enclosure.

2.2 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Size 4 nameplate indicating as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install contactors and connect power wires and auxiliary control devices.

.2 Identify contactors with nameplates or labels indicating panel and circuit number.

.3 Test contactors in accordance with 26 05 00 - Common Work Results for Electrical.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by contactor installation.

NMS 262903 – CONTROL DEVICES

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for industrial control devices including pushbutton stations, control and relay panels.

1.2 RELATED SECTIONS

.1 Section 01 33 00 Submittal Procedures.

.2 Section 26 05 00 - Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.14, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)
.1 NEMA ICS 1, Industrial Control and Systems: General Requirements.

1.4 SHOP DRAWINGS

.1 Submit Shop Drawings in accordance with Section 01 33 00 Submittal Procedures.

.2 Include schematic, wiring, interconnection diagrams.

1.5 QUALITY ASSURANCE

.1 Submit to Contract Administrator copy of test results.

Part 2 Products

2.1 AC CONTROL RELAYS

.1 Control Relays: to CSA C22.2 No.14.

.2 Fixed contact plug in type: general purpose heavy duty with two (2) poles. Coil rating: 120 V. Contact rating: 240V, minimum 15A@120V.

2.2 RELAY ACCESSORIES

.1 Standard contact cartridges: normally open convertible to normally closed in field.

2.3 OILTIGHT LIMIT SWITCHES

.1 Snap action type: roller, rod, fork, lever, top, side, push, wobble stick actuator, CSA type 4 enclosure. Contact rating 240VAC, minimum 15A@120V.

2.4 SOLID STATE TIMING RELAYS

.1 Construction: AC operated electronic timing relay with solid state timing circuit to operate output contact.

.2 Operation: on delay or off delay.

.3 Potentiometer: self contained to provide time interval adjustment.

.4 Supply voltage: 120 V, AC, 60 Hz.

.5 Temperature range: minus 20 to 60 degrees Celsius.

.6 Output contact rating: maximum voltage 300 V AC or DC. Current: 2A

.7 Timing ranges: field adjustable, 0 to 30 minutes or as shown on the drawings.

2.5 OPERATOR CONTROL STATIONS

.1 Enclosure: CSA Type 4, or rated for the applicable hazardous, weather, wet/damp or other areas. Surface mounting:

2.6 PUSHBUTTONS

.1 Illuminated, Heavy duty Oil and water tight. Operator extend type, as indicated. Black, with 2 NO and 2 NC contacts rated at 10 A, AC, labels as indicated. Stop pushbuttons coloured red. Start pushbuttons coloured green. Rated for the applicable hazardous, weather, wet/damp or other areas.

2.7 EMERGENCY STOP PUSHBUTTONS

.1 Illuminated, Heavy duty oil and water tight. Mushroom head, 2-position, Push-Pull operator, Red, with 2 NO and 2 NC contacts rated at 10 A, AC/DC, labels as indicated. Rated for the applicable hazardous, weather, wet/damp or other areas.

2.8 SELECTOR SWITCHES

.1 Maintained 2 or 3 position labelled as indicated heavy duty oil and water tight, operators wing lever contact arrangement as indicated, rated 120 V, 10A, AC. Rated for the applicable hazardous, weather, wet/damp or other areas.

2.9 INDICATING LIGHTS

.1 Heavy duty Oil and water tight, full voltage, LED type, push to test, lens colour: as indicated, supply voltage: 120 V, lamp voltage: 120 V, labels as indicated. Rated for the applicable hazardous, weather, wet/damp or other areas.

2.10 CONTROL AND RELAY PANELS

.1 CSA Type 12 sheet steel enclosure with hinged pad lockable access door, accommodating relays timers, labels, as indicated, factory installed and wired to identified terminals.

.2 Finished panel must have CSA approval.

2.11 CONTROL CIRCUIT TRANSFORMERS

.1 Single phase, dry type.

.2 Primary: 600, 208, or 240V, 60 Hz AC.

.3 Secondary: 120V, or 24V AC.

.4 Rating: 150 VA, or larger as required.

.5 Secondary fuse: ampacity as required.

.6 Close voltage regulation as required by magnet coils and solenoid valves.

2.12 THERMOSTAT LINE VOLTAGE

.1 Wall mounted, for exhaust fan or heating control.

.2 Full load rating: 8A at 120 V.

.3 Temperature setting range: 0 to 30 degrees Celsius.

.4 Thermometer Range: 0 to 30 degrees Celsius.

.5 Markings in 5 degree increments.

.6 Differential temperature fixed at 1 degree Celsius.

Part 3 Execution

3.1 INSTALLATION

.1 Install pushbutton stations, control and relay panels, control devices and interconnect.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.

.3 Upon completion of sectional test, undertake group testing.

.4 Check out complete system for operational sequencing.

NMS 265000 – LIGHTING

Special Provision

Part 1 General

1.1 REFERENCES

.1 CSA Standards
- .1 CAN/CSA-C22.2 No. 250, Light Emitting Diode (LED) Equipment for Lighting Applications.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Works for Electrical.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with Submittal Procedure for Shop Drawings, Product Data and Samples.

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Contract Administrator.

.3 Photometric data to include: spacing criterion.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 LUMINAIRES

.1 Refer to Fixture Schedule and drawings.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Final installation shall be co-ordinated to avoid interference with piping, equipment and other materials.

3.2 WIRING

.1 Connect luminaires to lighting circuits:
.1 Through rigid conduit for luminaire designs.

3.3 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.

NMS 265212.12–EMERGENCY LIGHTING

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)
.1 CSA C22.2 No.141-10, Emergency Lighting Equipment.

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 emergency lighting 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 emergency lighting 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

.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 Store and protect emergency lighting from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

1.5 WARRANTY

.1 For batteries in this Section 26 52 12.12 - 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: 120 V, AC.

.3 Output voltage: 12 V 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 and remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED, 4 W.

.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: grey.

.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 Bracket.
- .8 Cord and plug connection for AC.
- .9 RFI suppressors.

2.2 WIRING OF REMOTE HEADS

.1 Conduit: type in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Conductors: type in accordance with manufacturer's recommendations.

Part 3 Execution

3.1 INSTALLATION

.1 Install unit equipment and remote mounted fixtures.

.2 Direct heads.

.3 Connect exit lights to unit equipment.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by emergency lighting installation.

NMS 265300 – EXIT SIGNS

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group
- .1 CSA C22.2 No.141-15, Emergency Lighting Equipment.
- .2 CSA C860-11(R2016), Performance of Internally-Lighted Exit Signs.

.2 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.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Submit product data in accordance with Section 01 33 00 – Submittals Procedures.
- .2 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

Part 2 Products

2.1 STANDARD UNITS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860.

.2 Housing: Aluminum frame.

.3 Face and back plates: cast aluminum or extruded aluminum.

.4 Lamps: LED.

.5 Letters: Pictogram.

.6 Third lamp socket for emergency lamp lighting circuit. Third lamp: 6 V dc.

.7 Supply voltage: 120 V, ac.

.8 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit.

.9 Cabinet: finish: white.

.10 Single or Double face.

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.

NMS DIVISION 27 SPECIFICATIONS

Special Provision

The following Division 27 National Master Specifications are included in this Contract.

NMS 270528 – PATHWAYS FOR COMMUNICATION SYSTEMS

Special Provision

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 communication raceway systems and include product characteristics, performance criteria, physical size, finish and limitations.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Empty telecommunications raceways system consists of outlet boxes, cover plates, distribution cabinets, conduits, cable trays, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.

.2 Cable tray distribution system.

2.2 MATERIAL

.1 Conduits: RPVC type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Underground cable ducts: RPVC type

.3 Junction boxes, cabinets type T, or E: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.4 Outlet boxes Stainless steel, or PVC type, conduit boxes 102 mm square size, and fittings: in accordance with Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.

.5 Fish wire: polypropylene type.

Part 3 Execution

3.1 INSTALLATION

.1 Install empty raceway system, including overhead distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable

tray, service poles, miscellaneous and positioning material to constitute complete system.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by pathways for communications systems installation.

NMS 271005 – STRUCTURED CABLING FOR COMMUNICATION SYSTEMS

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)
- .1 CSA-C22.2 No. 214-02 (R2006), Communications Cables (Bi-National standard with UL 444).
- .2 CSA-C22.2 No. 232-M1988 (R2004), Optical Fiber Cables.

.2 Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA)
- .1 TIA/EIA-568-B.1-(2001), Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
- .2 TIA/EIA-568-B.2-(2001), Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.
- .3 TIA/EIA-568-B.3-(2000), Optical Fiber Cabling Components Standard.
- .4 TIA/EIA-606-A-(2002), Administration Standard for the Commercial Telecommunications Infrastructure.
- .5 TIA TSB-140-2004, Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
- .6 TIA-598-C-(2005), Optical Fiber Cable Colour Coding.

1.2 DEFINITIONS

.1 Refer to TIA/EIA-598-C, Annex A for definitions of terms: optical-fiber interconnect, distribution, and breakout cables.

1.3 SYSTEM DESCRIPTION

.1 Structured telecommunications wiring system consist of unshielded-twisted-pair and optical fibre cables, terminations, connectors, cross-connection hardware and related equipment installed inside building for occupant's telecommunications systems, including voice (telephone), data, and image.

.2 Installed in physical star configuration with separate horizontal and backbone sub-systems.
- .1 Horizontal cables link work areas to telecommunications room located on same floor.
- .2 Telecommunications rooms linked to main terminal/equipment room (MT/ER) by backbone cables.
- .3 MT/ER also linked to Entrance Room by backbone cables.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products

2.1 FOUR-PAIR 100 W BALANCED TWISTED PAIR CABLE

.1 Four-pair, 100 ohm balanced unshielded-twisted-pair (UTP) cable, flame test classification FT6 or MPP or CMP to: CSA-C22.2 No. 214, Augmented Category 6a (Cat 6a) to: TIA/EIA-568-B.2.

2.2 WORK AREA UTP 4-PAIR MODULAR JACK

.1 Eight-position modular jack ("RJ-45"), type Category 6a:
- .1 Mounted in compatible single gang faceplate, flush entry, 1 jack positions per faceplate.

2.3 TERMINATION AND CROSS-CONNECTION HARDWARE FOR UTP

.1 IDC Terminal strips, 25 pair, for terminating 4 pair 100 W balanced twisted pair cables and supporting cross-connections using jumper wires or compatible plug-ended patch cords: Category 6a to: TIA/EIA-568-B.2.

.2 Patch panel, 2 rack units high, 48 ports:
- .1 Each port equipped with factory installed "RJ-45" jacks, type Category 6a to: TIA/EIA-568-B.2.
- .2 Horizontal cable-management unit for every 48 ports.

.3 Consolidation point, terminates 12 UTP horizontal cables from telecommunications room on IDC terminations. Cables extending to work areas terminate on Category 6a to: TIA/EIA-568-B.2.

2.4 UTP CROSS-CONNECT WIRE

.1 Category 6a, 4 pairs to: TIA/EIA-568-B.2.

2.5 UTP PATCH CORDS

.1 3 metres long, with factory-installed male plug at one end to mate with "RJ-45" jack and with factory-installed male plug at other end to mate with Category 6a, 4 pairs to: TIA/EIA-568-B.2.

2.6 UTP EQUIPMENT CABLE

.1 4 pair "pigtail", 3 metres long, with factory-installed male plug on one end to mate with "RJ-45" jack and other end equipped with factory-installed male plug to mate with "RJ-45" jack: Category 6a to: TIA/EIA-568-B.2.

2.7 UTP WORK AREA CORDS

.1 3 metres long, each end equipped with "RJ-45" plug Category 6a to: TIA/EIA-568-B.2.

Part 3 Execution

3.1 INSTALLATION OF TERMINATION AND CROSS-CONNECT HARDWARE

.1 Install termination and cross-connect hardware in rack as indicated and according to manufacturers' instructions. Identify and label as indicated to: TIA/EIA-606-A.

.2 Install consolidation points, as indicated according to manufacturer's instructions. Identify and label as indicated to: TIA/EIA-606-A.

3.2 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

.1 Install horizontal cables as indicated in conduits, perimeter raceways, or cable trays from telecommunication rooms to individual work-area jacks. Identify and label as indicated to: TIA/EIA-606-A.

.2 Support horizontal cables at intervals not exceeding 2 metres.
- .1 Where raceways are used to distribute cables to each zone, provide supplementary "J" hooks to support cables at intervals not exceeding 2 metres.

.3 Install horizontal cables from consolidation point to individual work-area jacks.
- .1 Provide supplementary "J" hooks to support cables at intervals not exceeding 2 metres.
- .2 Identify and label as indicated to: TIA/EIA-606-A.

.4 Terminate horizontal cables in telecommunications room and at individual work-area jacks.

.5 Identify and label as indicated to: TIA/EIA-606-A.

.6 Coil spare cables and store in ceiling space in zone.

.7 Harness slack cable in cabinets, racks, and wall-mounted termination and cross-connection hardware.

3.3 INSTALLATION OF BACKBONE CABLES

.1 Install backbone cables from each telecommunications room to main terminal/equipment room (MT/ER) as indicated and according to manufacturers' instructions.
- .1 Identify and label as indicated to: TIA/EIA-606-A.

.2 Install backbone cables from MT/ER to carrier demarcation point in Communications Room as indicated and according to manufacturer's instructions.
- .1 Identify and label as indicated to: TIA/EIA-606-A.

3.4 INSTALLATION OF EQUIPMENT CABLES

.1 Install equipment cables from equipment terminal strips as indicated.
- .1 Identify and label as indicated to: TIA/EIA-606-A.

3.5 IMPLEMENT CROSS-CONNECTIONS

.1 Implement cross-connections using jumper wires as specified.

3.6 FIELD QUALITY CONTROL

.1 Test horizontal UTP cables as specified below and correct deficiencies provide record of

results as electronic record on flash disk.

.1 Perform tests for Permanent Link on installed cables, including spares:
  .1 Category 6a using certified level III tester to: TIA/EIA-568-B.2.

.2 Perform tests for Channel on 20 % of cross-connected data horizontal cabling installed from each telecommunications room, including shortest and longest drops from each telecommunications room: should more than 5 % of tested cables fail, test remaining cross-connected data cables.
  .2 Category 6a using certified level III tester to: TIA/EIA-568-B.2.

.2 Test backbone UTP cables as specified below and correct deficiencies: provide record of results as electronic record on flash disk.

.1 Perform tests for Permanent Link on 4-pair cables:
  .2 Category 6a using certified level III tester to: TIA/EIA-568-B.2.

.2 Perform Wire Map tests on multi-pair UTP cables to: TIA/EIA-568-B.1.

.3 Test Optical-fiber strands for attenuation to: TIA/EIA-568-[B.1] and correct deficiencies: provide record of results as electronic record on flash disk.

.1 Test horizontal links need at only one wavelength (850 nm or 1300 nm) and in one direction.
  .1 Attenuation to be less than 2.0 dB, unless consolidation point is used.
  .2 If consolidation point is used, attenuation test result to be less than 2.75 dB when testing between horizontal cross-connect and telecommunications outlet/connector.

.2 Test backbone links in both directions. Backbone links:
  .1 Test multi-mode fibre at both applicable wavelengths (850 nm and 1300 nm).
  .2 Test single-mode fibre at both applicable wavelengths (1550 nm and 1310 m).

.3 Maximum attenuation: Cable attenuation + Connector loss + Splice loss.
  .1 Multi-mode-fiber attenuation coefficients:
    .1 3.5 db/km @ 850 nm; and
    .2 1.5 db km @ 1300 nm
  .2 Single-mode fibre attenuation coefficients at both 1310 nm and 1550 nm:
    .1 1.0 db/km for inside plant cable; and
    .2 0.5 db/km for outside plant cables.
  .3 Maximum connector insertion loss: 0.75 db per pair and maximum splice insertion loss: 0.3 db.

.4 Perform additional Tier 2 tests using optical time domain reflectometer (OTDR) on backbone fibre pairs to: TSB-140.
  .1 Correct deficiencies.
  .2 Provide record of results as described in SUBMITTALS.

.5 Provide record of results as electronic record on flash disk to: TIA/TSB-140.

NMS 273100 – VOICE COMMUNICATIONS SWITCHING AND ROUTING EQUIPMENT

Special Provision

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)
  .1 CSA C83-96 (R2016), Communication and Power Line Hardware.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Co-ordination with telephone and telecommunication authorities:
- .1 Co-ordinate with telephone authority to ensure availability of service.
- .2 Co-ordinate with other telecommunication provider for tenant-provided telecommunication systems and other entrance 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 voice communications equipment 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 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 in dry location, off ground, indoors, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect voice communications equipment from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESCRIPTION

.1 Incoming telephone service facilities from property line to main terminal, in underground duct.

2.2 MATERIALS

.1 Grounding: in accordance with Section 26 05 28 - Grounding - Secondary.

.2 Telecommunications raceway system: in accordance with Section 27 05 28 - Pathways for Communications Systems.

.3 Communication line hardware to CSA C83.

Part 3 Execution

3.1 INSTALLATION

.1 Install telephone service facilities.

.2 Install 19 mm thick plywood backboard in each telecommunication room in accordance with Section 06 10 53 - Miscellaneous Rough Carpentry.

.3 Install grounding facilities and make connections.

.4 Connect owners conduits to those of telephone company or telecommunication provider.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by voice communications switching and routing equipment installation.

NMS DIVISION 28 SPECIFICATIONS

Special Provision

The following Division 28 National Master Specifications are included in this Contract.

NMS 281000 – ACCESS CONTROL

Special Provision

Part 1 General

1.1 RELATED SECTIONS

.1 Section 08 11 13 – Hollow Metal Doors and Frames.

.2 Section 08 11 16 - Aluminum Doors, Frames and Screens.

.3 Section 08 71 00 -Door Hardware.

.4 Section 26: Electrical Power Supply.

.5 Section 27: Communications

1.2 REFERENCES

.1 Ontario Building Code (OBC).

.2 Electrical devices to be ULC approved and installation in accordance with Canadian Electrical Code.

1.3 WORK INCLUDED

.1 This contractor shall procure, install and commission a completely integrated and ready to operate access control.

.2 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing and putting into proper operation complete systems as shown, as specified and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation, certified and warranted by the supplier.

1.4 SUBMITTALS

.1 Submit product data and obtain Contract Administrators approval prior to development of the Contractor's shop drawings. Shop drawing submittal shall include all drawings detailed herein. Separate submittals shall not be acceptable unless authorized by the Contract Administrator.

.2 System Description and Analysis: Complete system descriptions, analyses, and calculations used in sizing the equipment required by the specifications. Descriptions and calculations shall show how the equipment will operate as a new stand alone system to meet the performance of this specification. The submittal shall include the following at minimum:

.1 Product Data Submittals:
Submit catalog cut sheets, technical data sheets, manufacturer specifications and/or diagrams necessary to illustrate a product, material or system for the work. Product data literature is required on all items of material and equipment and should be clearly marked; identifying specific items proposed with a reference to the specification requirement for which the item is being submitted.

.2 Product data shall include adequate descriptive literature and catalog cut sheets required for the Contract Administrator to ascertain that the proposed equipment and materials comply with specification requirements.

.3 Submit shop drawings in accordance with General Contract Requirements and Section 01 33 00 - Submittal Procedures. Shop drawings shall include the following at minimum:

.1 System block diagrams.
.2 System riser diagrams.
.3 Point-to-point color-coded wiring diagrams.
.4 Floor plans detailing device locations.
.5 Equipment room layouts to scale.
.6 Door Rough-in Details. Contract drawing door details shall be utilized and modified for site-specific conditions based on field survey by the Contractor. Details in AutoCAD will be provided for use by the Contractor.
.7 Installation of SACS equipment in consoles, cabinets and racks, including wiring diagrams and rack elevations.
.8 Installation of SACS equipment located in the communications rooms, including wiring diagrams and rack elevations.
.9 Surge protection device installation details.
.10 Sequence of operations for each security door and gate type.
.11 Details of interconnection to fiber optic backbone system.
.12 Details of interconnection to security local area network (LAN).
.13 Prepare using AutoCAD.

.4 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

.5 Warranty Information: All materials relating to warranties.

.6 Manufacturer's training certifications of service personnel.

.7 Manuals:

.1 Provide complete sets of manuals and other information necessary for the operation and maintenance of the system in accordance with Division 1 requirements.
.2 Manuals: Manuals shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and nearest service representatives for each item of equipment for each system.
.3 The manuals shall have a table of contents and tab sheets.
.4 Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix.
.5 The final copies delivered after completion testing shall include all modifications made during installation, checkout, and testing.
.6 Design Manual: Design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included for all system operating modes. Submit design manual with product data submittal.
.7 Operator's Manual: The operator's manual shall describe all equipment furnished, including general hardware operations, description, and specifications.
.8 Software Manual: The software manual shall describe the functions of all software, and shall include all other information necessary to enable proper loading, testing, and operation, including:
    .1 Description of required sequences.
    .2 Description of complete GUI functionality including but not limited to the following:
        .1 Icon sequence of operation.
        .2 Graphical hierarchical map operation.
        .3 VSS interoperability.
.9 List of all software licenses.
.10 Maintenance and Service: The maintenance manual shall describe maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components. Manufacturer's repair manuals shall include the SACS equipment physical layout and schematics to the component and device level.
.11 Operation and maintenance manuals shall be fully corrected to include review comments prior to final submission to the Contract Administrator.

1.5 TRAINING

.1 System Overview: Conduct an on-site system overview for the Owner and end users (separate from the systems testing) of the access control system to instruct the users on the scope and operations of the systems.

.2 Provide on-site training by a qualified, factory-trained instructor for designated maintenance technicians and operations personnel on the operation and maintenance of the system(s). If trained personnel from the factory are required for training, they shall be provided onsite by the Contractor at no additional cost to the Owner.

.3 Provide the following training upon completion of final testing and acceptance of the systems:
    .1 Demonstrate operation of system during system overview tour. Demonstrate the system in all modes of operation.
    .2 Provide a minimum of 8 hours of system maintenance training and system customization updates to designated Owner personnel. The Owner will provide information on how they want the intrusion alarm system and access control systems customized. Classes shall accommodate up to five students at one time. Provide multiple classes at two different times to accommodate the Owners ability to maintain ongoing maintenance support of the Owners facilities.
    .3 Maintenance training shall cover all technical training required for maintenance,

preventative maintenance and system adds, moves and changes including detailed instructions on system software modifications.

.4 Provide a minimum of 8 hours of operator training to the Owner's Communications Center operators. Classes shall accommodate up to five students at one time. Provide two separate courses to accommodate separate operator shifts.

.5 Provide minimum of 8 hours of operator training to the Owner's security personnel. Number of classes and class dates and times shall be coordinated with the Owner. Provide multiple classes at different times to accommodate the Owner's ability to maintain ongoing support of the Owner's security operations.

.6 Provide course syllabus for all training courses in advance of each course, with outline of topics, time allotted for each topic, targeted audience, and training objectives. Submit training manuals to Owner for review and approval a minimum of 21 working days in advance of scheduled training. Training shall not commence until training syllabus has been approved.

1.6 QUALITY ASSURANCE

.1 The equipment manufacturers shall have been in business manufacturing similar products for at least 10 years.

.2 Equipment shall be installed by qualified individuals having at least 5 years of experience installing and maintaining similar equipment. The qualified individuals shall have installed at least three systems of similar type and size within the past 5 years. Submit evidence of successful installation, owner training and maintenance for a minimum of the previous five years. Provide listing of projects with verifiable references with names and telephone numbers.

.3 Personnel:

.1 Service personnel shall be qualified to accomplish all work promptly and satisfactorily.

.2 Service personnel shall have attended the manufacturer's training school(s) for equipment being serviced. Provide certificates of completion or other documentation showing manufacturers' certification.

.3 Notify the Contract Administrator in writing of the name of the designated service representative and of any change in personnel.

1.7 WARRANTY, MAINTENANCE, AND SERVICE

.1 The warranty, maintenance, and service period shall commence in accordance with the General Conditions and shall not be a function of material delivery dates.

Part 2 Products

2.1 PRODUCTS

.1 Access control systems.

.2 The access control systems shall include:

.1 Punch pad access control devices at all exterior man doors of the Vehicle Maintenance Garage, Administrative Space and Auxiliary Storage Building. All punch pads shall heavy duty commercial grade rated for exterior exposure. (**No card readers, punch pad access control only**)

.2 Include all items required to achieve these access control requirements including but

not limited to punch pads, door contacts, electric strikes, interior request to exit detectors etc.

.3 Remaining door hardware: as specified under Section 08.

Part 3 Execution

3.1 INSTALLATION

.1 Scope of work shall include owner customization and training for these systems.

NMS DIVISION 31 SPECIFICATIONS

Special Provision

The following Division 31 National Master Specifications are included in this Contract.

NMS 312301 - EXCAVATION FOR STRUCTURES

Special Provision

OPSS.PROV 902 shall apply except as extended or amended elsewhere in the contract documents.

NMS 312302 - BACKFILL AND COMPACTION FOR STRUCTURES

Special Provision

OPSS.PROV 902 shall apply except as extended or amended elsewhere in the contract documents.

NMS 312303 - COMPACTION CONTROL AND TESTING

Special Provision

OPSS.PROV 501 shall apply for compaction control and testing except as amended or extended elsewhere in the contract documents.

NMS 313219.01 - GEOTEXTILES

Special Provision

Part 1 General - Geotextiles

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
  .1 ASTM D4751-20, Standard Test Method for Determining Apparent Opening Size of a Geotextile.

.2 Ontario Provincial Standard Specifications (OPSS)
  .1 OPSS.PROV 1860 (Nov 2019), Material Specification for Geotextiles.

1.3 SUBMITTALS

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit to Engineer copies of mill test data and certificate at least 4 weeks prior to start of Work, and in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with the General Conditions.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products - Geotextiles

2.1 MATERIAL

.1 Geotextile: Class I non-woven synthetic fibre fabric, supplied in rolls, as per OPSS.PROV 1860.

.2 Hydraulic properties:
  .1 Apparent opening size (AOS): to ASTM D4751, 212 micrometres.

Part 3 Execution - Geotextiles

3.1 INSTALLATION

.1 Place geotextile material in orientation, manner and locations indicated and retain in position.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Overlap each successive strip of geotextile 600 mm over previously laid strip.

.4 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.5 Replace damaged or deteriorated geotextile to approval of Engineer.

3.2 CLEANING

.1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

3.3 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

NMS DIVISION 33 SPECIFICATIONS

Special Provision

The following Division 33 National Master Specifications are included in this Contract.

NMS 331600 – FIRE WATER STORAGE TANKS

Special Provision

Part 1 General

1.1 SECTION INCLUDES

.1 Underground Water Tanks:
- .1 Tank installations in the following locations:
  - .1 United States.
  - .2 Canada.

.2 For the following applications:
- .1 Fire Protection Standby Water Storage.

1.2 RELATED SECTIONS

.1 N/A

1.3 REFERENCES

.1 Underground Water Tanks in the United States and Canada:
- .1 American Concrete Institute (ACI) standard ACI 318, Building Code Requirements for Structural Concrete.
- .2 ANSI/AWWA D120 - Thermosetting Fiberglass-Reinforced Plastic Tanks.
- .3 NFPA 22: Standard for Water Tanks for Private Fire Protection.
- .4 NFPA 1142: Standard for Water Supplies for Suburban and Rural Fire Fighting.
- .5 Tank manufacturer shall be recognized as a manufacturer of tanks listed to the ANSI/CAN/UL/ULC 1316:2018 Underwriters Laboratories (UL) Standard for Fiber Reinforced Underground Tanks for Flammable and Combustible Liquids.
- .6 National Fire Code of Canada.

1.4 SUBMITTALS

.1 Submit under provisions of Section 01300 - Administrative Requirements.
.2 Product Data: Submit manufacturer's data sheets on each product to be used, including, but not limited to, the following:
  .1 Preparation instructions and recommendations.
  .2 Storage and handling requirements and recommendations.
  .3 Installation manual and operating guidelines.

.3 Shop Drawings: Tank manufacturer shall submit the following for review and approval prior to fabrication of the tanks:
  .1 Detailed shop drawings of each tank, complete with all accessories supplied by the manufacturer and all components of the overall fire water storage system.
  .2 Detailed shipping, handling, and installation instructions.

1.5 QUALITY ASSURANCE

.1 Tank installations in the United States and Canada:
  .1 Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of federal, state, provincial and local authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 General: Comply with tank manufacturer's Installation and Operating Guidelines recommendations for delivery, storage, and tank handling.

1.7 WARRANTY

.1 Warranty: Provide manufacturer's standard limited warranty.

Part 2 PRODUCTS

2.1 MANUFACTURERS:

.1 Tank installations in the United States and Canada:
  .1 Acceptable Manufacturer: Xerxes Corporation, which is located at: 7901 Xerxes Avenue S, Suite 201, Minneapolis, MN 55431. Telephone: 952-887-1890. Email: watersales@mattr.com. Web: www.xerxes.com.

.2 Substitutions: Contract Administrator approved equal.

2.2 UNDERGROUND WATER TANKS

.1 Tank Design - Fiberglass reinforced plastic (FRP) tanks:
  .1 The tank size, fittings and accessories shall be as shown on the drawings.
  .2 Tank shall be manufactured with structural ribs which are fabricated as an integral part of the tank wall.
  .3 Tank shall be manufactured with a laminate consisting of resin and glass fiber reinforcement only. No sand/silica fillers or resin extenders shall be used.
  .4 Tank shall be vented to atmospheric pressure.
  .5 Tank shall be capable of handling liquids with specific gravity up to 1.1.
  .6 Tank shall be compatible with liquids identified in the manufacturer's standard limited warranty.

.2 Loading Conditions - Tank shall meet the following design criteria:
- .1 Internal Load - Tank shall be designed to withstand a 5-psig (35 kPa) air-pressure test with a 5:1 safety factor.
- .2 Surface Loads - Tank shall be designed to withstand surface H-20 and HS-20 axle loads when properly installed according to manufacturer's current Installation Manual and Operating Guidelines.
- .3 External Hydrostatic and Earth Pressure - Tank shall be designed for 7 feet (2.1 m) of overburden over the top of the tank, the hole fully flooded, and a safety factor of 5:1 against general buckling.

.3 Fire Protection Standby Water Storage Applications:
- .1 Governing Standards, as applicable:
  - .1 ANSI/AWWA D120 - Thermosetting Fiberglass-Reinforced Plastic Tanks.
  - .2 American Concrete Institute (ACI) standard ACI 318, Building Code Requirements for Structural Concrete.
  - .3 NFPA 22: Standard for Water Tanks for Private Fire Protection.
  - .4 NFPA 1142: Standard for Water Supplies for Suburban and Rural Fire Fighting.
  - .5 Tank manufacturer shall be recognized as a manufacturer of tanks listed to the ANSI/CAN/UL/ULC 1316:2018 Underwriters Laboratories (UL) Standard for Fiber Reinforced Underground Tanks for Flammable and Combustible Liquids.
  - .6 National Fire Code of Canada
- .2 Tank Design: Single-Wall vessel as specified and shown on the Drawings.
- .3 Tank Accessories - Fire Protection Standby Water Storage Applications:
  - .1 Tank Anchoring
    - .1 Anchor straps shall be as supplied by tank manufacturer and designed for a maximum load of 25,000 lbs. (11340 kg).
    - .2 Galvanized turnbuckles shall be supplied by the tank manufacturer.
    - .3 Prefabricated concrete anchors shall be supplied by the tank manufacturer, designed to the CSA A23.3 standard, manufactured with 4,000 psi concrete and shall have adjustable anchor points.
  - .2 Access Openings:
    - .1 All access openings shall have a diameter of 30 inches, complete with riser, lid, access ladder and necessary hardware.
  - .3 Attached Access Risers:
    - .1 Attached access risers shall be PVC or FRP as supplied by tank manufacturer.
    - .2 Attached access risers shall be 30 inches in diameter.
    - .3 Access risers shall be attached to access openings during installation utilizing adhesive or FRP bonding kits as supplied by the tank manufacturer.
  - .4 Piping and Fittings:
    - .1 Tank shall be equipped with factory-installed threaded fittings, or pipe stubs.
    - .2 PVC piping shall at a minimum meet the requirements of ANSI Schedule 40.
    - .3 All flanged nozzles shall be flanged and flat-faced, and conform to Class 150 bolting patterns as specified in ANSI/ASME/ B16.5.

.4 Carbon steel and stainless-steel NPT fittings shall withstand a minimum of 150 foot-pounds (203 NM) of torque and 1,000 foot-pounds (1356 NM) of bending, both with a 2:1 safety factor.

.5 Manway Openings:
- .1 The standard manway shall be flanged, 22 inches (559 mm) I.D. and complete with gaskets, bolts, and cover.
- .2 Manway openings shall be designed to withstand 5-psig (35 kPa) test pressure with a 5:1 safety factor.

.6 Ladders:
- .1 Ladders shall be the standard FRP ladder as supplied by tank manufacturer.

.7 Pump Platforms:
- .1 FRP pump platforms shall be supplied by tank manufacturer.

.8 Internal Piping
- .1 All internal piping shall be supplied by tank manufacturer.
- .2 All FRP nozzles for fire pump supply shall have an anti-vortex plate factory installed.

.9 Suction/Fill tubes:
- .1 Vertical draft/fill tubes shall be a minimum of PVC SCH 40 or FRP.
- .2 Vertical draft /fill tubes shall be factory installed.
- .3 Vertical draft /fill tubes shall terminate 4 inches (102 mm) above the bottom of tank.
- .4 Vertical draft tubes shall have anti-vortex plate factory installed.

Part 3 EXECUTION

3.1 TESTING

.1 Tank shall be tested according to the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.

.2 The fire water storage system shall be leakage tested and commissioned in accordance with the Division 1 specifications.

3.2 INSTALLATION

.1 Tank shall be installed in strict accordance with the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.

NMS 333400 – SANITARY UTILITY SEWAGE FORCEMAIN AND SEWER

Special Provision

Part 1 General - Sanitary Forcemain and Gravity Sewer

1.1 RELATED SECTIONS

.1 Section 013300 - Submittal Procedures.

.2 Section 033000 - Cast-in-Place Concrete.

1.2 MEASUREMENT PROCEDURES

.1 Measure supply and installation of sewage force main including excavating and backfilling, granular bedding and in metres of each type and size of pipe installed. Measurement will be made of actual length in place, through valves and fittings, after work has been completed.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
- .1 ASTM D698-12e2, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort ((12,400 ft-lbf/ft3) (600kN-m/m3)).
- .2 ASTM D2466-17, Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40.

.2 Canadian Standards Association (CSA International)
- .1 CSA B137 Series-17, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
  - .1 CSA B137.3-17, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.

.3 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act, 1999 (CEPA)

.4 Ontario Provincial Standard Drawings (OPSD)
- .1 OPSD 802.010 (Nov 2014), Flexible Pipe, Embedment and Backfill, Earth Excavation.
- .2 OPSD 802.013 (Nov 2014), Flexible Pipe, Embedment and Backfill, Rock Excavation.
- .3 OPSD 1103.010 (Nov 2018), Concrete Thrust Blocks for Tees, Plugs, And Horizontal Bends.
- .4 OPSD 1103.020 (Nov 2018), Concrete Thrust Blocks for Vertical Bends.
- .5 OPSD 1103.021 (Nov 2018), Dimension Tables for Concrete Thrust Blocks for Vertical Bends.

.5 Ontario Provincial Standard Specifications (OPSS)
- .1 OPSS.PROV 1010 (Apr 2013), Material Specification for Aggregates-Base, Subbase, Select Subgrade, and Backfill Material.

.6 Transport Canada (TC)
- .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with the General Conditions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

.5 Divert unused metal materials from landfill to metal recycling facility.

.6 Divert unused concrete materials from landfill to local quarry.

.7 Divert unused aggregate materials from landfill to quarry for reuse.

.8 Place materials defined as hazardous or toxic in designated containers.

.9 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.10 Fold up metal banding, flatten and place in designated area for recycling.

1.5 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services.

.2 Submit schedule of expected interruptions and adhere to schedule approved by Engineer.

.3 Notify Engineer and building manager a minimum of 24 h in advance of interruption in service.

Part 2 Products – Sanitary Forcemain and Gravity Sewer

2.1 MATERIALS

.1 Polyvinyl chloride (PVC) pipe: to CSA-B137.3.
- .1 Acceptable material: PVC.
- .2 SDR: 26
- .3 Pressure Class: Series 160 (160 psi).
- .4 Gasket bell end.
- .5 Pipe joints: bell and spigot with rubber gaskets to pipe manufacturers specifications.

2.2 PIPE BEDDING AND SURROUND MATERIALS

.1 Granular material to OPSS.PROV 1010 – Granular A.

.2 Shallow sewers to be provided with Extruded Polystyrene Insulation (Styrofoam S.M.). 50mm of insulation required for every 600mm of cover deficiency.

2.3 BACKFILL MATERIAL

.1 Native soil matching exposed trench walls.

Part 3 Execution – Sanitary Forcemain and Gravity Sewer

3.1 PREPARATION

.1 Pipes and fittings to be clean and dry.

3.2 TRENCHING

.1 Do trenching Work, in accordance with OPSS.PROV 401.

3.3 GRANULAR BEDDING

.1 Place granular bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% standard proctor maximum dry density (SPMDD) to ASTM D698. (98% if within 1m of subgrade of a paved surface)

.6 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material.

3.4 INSTALLATION

.1 Install as per OPSD 802.010 or 802.013, as applicable.

.2 Lay pipes in accordance with manufacturer's recommendations.

.3 Join pipes in accordance with manufacturer's recommendations.

.4 Avoid damage to machined ends of pipes in handling and moving pipe.

.5 Maintain grade and alignment of pipes.

.6 Align pipes carefully before jointing.

.7 Do not exceed maximum joint deflection recommended by pipe manufacturer.

.8 Support pipe firmly over entire length, except for clearance necessary at couplings. Do not use blocks to support pipe.

.9 Keep pipe and pipe joints free from foreign material.

.10 Avoid bumping gasket and knocking it out of position or contaminating with dirt or other foreign material. Remove disturbed gaskets clean, lubricate and replace before jointing is attempted.

.11 Support pipes using hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.12 Apply sufficient pressure in making joint to ensure that joint is complete to manufacturer's recommendations.

.13 Apply restraint to pipe to ensure that joints when completed are held in place, by tamping bedding material under and alongside pipe.

.14 When stoppage of Work occurs, block pipe as directed by Engineer to prevent creep during downtime.

3.5 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Engineer has inspected pipe joints, surround and cover pipes as indicated.

.3 Hand place surround material in uniform layers simultaneously on each side of pipe not exceeding 150 mm compacted thickness as indicated. Do not dump material within 1.0 m of pipe.

.4 Compact each layer from pipe invert to mid height of pipe to at least 95% SPMDD to ASTM D698. (98% if within 1 m of subgrade of a paved surface)

.5 Compact each layer from mid height of pipe to underside of backfill to at least 95% SPMDD to ASTM D698.

3.6 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

NMS 333600 – SEPTIC AND PUMP TANKS

Special Provision

Part 1 General – Tanks

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 03 30 00 - Cast-in-Place Concrete.

1.2 MEASUREMENT PROCEDURES

.1 Measurement will be based on units of precast septic and pump tanks supplied and installed, including stripping, excavating, bedding, backfilling and all appurtenances.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
- .1 ASTM D698-12e2, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3(600 kN-m/m3)).

.2 Canadian Standards Association, (CSA International)
- .1 CAN/CSA-A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .2 CAN/CSA-A23.4-16, Precast Concrete - Materials and Construction.
- .3 CAN/CSA-B66-21, Prefabricated Septic Tanks and Sewage Holding Tanks.

.3 Ontario Provincial Standard Specifications (OPSS)

.1 OPSS.PROV 1010 (Apr 2013), Material Specification for Aggregates-Base, Subbase, Select Subgrade, and Backfill Material.

.4 Ontario Building Code (OBC)
.1 2012 Ontario Building Code, Part 8.

1.4 DESIGN REQUIREMENTS

.1 Design precast concrete tanks in accordance with CAN/CSA-B66, and to carry handling stresses and indicated service loads.

.2 Tanks to have minimum total working capacity as indicated on drawing.

.3 All tanks shall be designed to resist buoyant uplift considering ground water at grade, tanks empty and neglecting friction between the tank walls and surrounding backfill material. Minimum factor of safety against buoyant uplift shall be 1.25.

.4 All tanks shall be completely watertight. See requirements for leakage testing the tanks prir to backfilling.

1.5 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings to indicate:
.1 Design calculations for items designed by manufacturer.
.2 Tables and bending diagrams of reinforcing steel.
.3 Camber.
.4 Formwork.
.5 Finishing schedules.
.6 Methods of handling and erection.
.7 Storage facilities.
.8 Openings, sleeves, inserts and related reinforcement.

.3 Each drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with the General Conditions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused concrete materials from landfill to local quarry.

.5 Divert unused aggregate materials from landfill to quarry for reuse.

Part 2 Products – Tanks

2.1 CONCRETE MIXES AND MATERIALS

.1 Concrete mixes and materials: to CAN/CSA-B66 and CAN/CSA-A23.1/A23.2.

.2 Concrete shall meet the performance requirements of the A-1 concrete mix with air entrainment in accordance with CSA A23.1

2.2 MANUFACTURE

.1 Manufacture units in accordance with CAN/CSA-A23.4, except where specified otherwise.

2.3 FINISHES

.1 Finish tanks to commercial grade to CAN/CSA-A23.4.

2.4 ACCESS

.1 Provide access holes to surface to facilitate cleaning and inspection with risers and covers as indicated.

2.5 TANK BEDDING AND SURROUND MATERIAL

.1 Granular material to OPSS.PROV 1010 – Granular A.

2.6 BACKFILL MATERIAL

.1 Native soils matching excavation.

Part 3 Execution – Tanks

3.1 INSTALLATION

.1 Do excavation in accordance with Section 31 23 01 – Excavation for Structures.

.2 Place 200mm of compacted Granular ‘A’ Base compacted to 98% SPD minimum.
.1 Place bedding and surround material in unfrozen condition.

.3 Make inlet and outlet joints of septic tank watertight, using appropriately sized Link-Seal modular wall seals.
.1 Install Link-Seals in accordance with manufacturers recommendations.

.4 Install effluent filter, baffles, pumps, rails, floats, and all other appurtenances as indicated.

.5 Ensure that the tanks are not covered by soil or leaching bed fill having a depth greater than the maximum burial depth that the tank is designed to withstand.

3.2 TESTING

.1 Conduct leakage test on septic tank in presence of Engineer before backfilling. Seam in tank is to be exposed for duration of test. Fill tank to invert of outlet pipe and allow to stand for 48 hours. Contractor to confirm allowable leakage after 24 hours. Engineer will confirm allowable leakage after 48 hours provided allowable leakage is met after 24 hours.
.1 Allowable leakage is zero.

If tank leakage occurs the Contractor shall correct all leakage deficiencies in a manner reviewed and approved by the Contract Administrator at no additional cost to the contract.

.2 Conduct pump draw down test. Contractor to ensure the demand dose of 246.0L per pump

cycle is provided.

.3 Test Floats to ensure high water alarm triggers visual and audible alarms, and the pump on/off floats operate as indicated.

3.3 BACKFILLING

.1 Place backfill material in unfrozen condition.

NMS 333633 – UTILITY DRAINAGE FIELD

Special Provision

Part 1 General - Drainage Field

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 31 32 19.01 – Geotextiles.

.3 Section 33 36 00 – Utility Septic Tanks.

1.2 MEASUREMENT PROCEDURES

.1 Measure septic tank sewage disposal field in number of disposal fields supplied and installed including stripping, excavating, bedding, and backfilling.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM C136-19, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .2 ASTM C117-17, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.

.3 Canadian Standards Association (CSA International)
- .1 CSA B1800-18, Plastic Non-pressure Pipe Compendium - B1800 Series. (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).
  - .1 CSA B182.2-18, PVC Sewer Pipe and Fittings (PSM Type).

.4 Ontario Building Code (OBC)
- .1 2012 Ontario Building Code, Part 8.

1.4 SUBMITTALS

.1 Submit in accordance with Section 013300 - Submittal Procedures.

.2 Submit to Engineer grain size distribution analysis of sand material at least 4 weeks prior to beginning Work.

.3 Submit to Engineer copy of certification or licence of approved installers.

1.5 QUALITY ASSURANCE

.1 Use licenced installers who comply with local authority having jurisdiction.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with General Conditions.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused concrete materials from landfill to local quarry.

.5 Divert unused aggregate materials from landfill to quarry for reuse.

.6 Divert unused geotextiles from landfill to plastic recycling facility for disposal.

Part 2 Products - Drainage Field

2.1 GRANULAR MATERIALS

.1 Granular material to following requirements:
- .1 Stone layer to conform to OBC 8.7.3.3.
- .2 Filter Sand to meet the grading requirements of OBC 8.7.5.3(3)
- .3 Imported Sand to have a percolation time of 6-10 min/cm.
- .4 Stone material to be washed and free of fine material.

2.2 GEOTEXTILE COVER

.1 Geotextile cover: to Section 31 32 19.01 – Geotextiles.
- .1 UV resistant polyolefin fabric.
- .2 As indicated.

2.3 PIPE FOR DISPOSAL FIELDS

.1 Straight PVC pipe and fittings to CAN/CSA-B182.2. Perforated or unperforated as indicated in drawing.

Part 3 Execution - Drainage Field

3.1 FILTER BED DISPOSAL FIELD INSTALLATION

.1 Excavate to lines and depths as indicated.

.2 Scarify subgrade soils at a right angle to the direction of lateral sewage flow in the leaching bed prior to importing fill or installing distribution pipe stone layer.

.3 Place filter sand material to depths and dimensions as indicated in maximum 300 mm thick lifts.

.4 Obtain Engineer's approval to operate construction equipment across disposal field.
.1 Only track mounted equipment shall be operated across scarified base.

.5 Place minimum 150 mm of stone material on top of the Filter Sand, as indicated.

.6 Install header between the two stone layers. Installation to be water-tight construction. Solvent weld all joints at connection to force main. Insulate as indicated.

.7 Header: set level as indicated.

.8 Place distribution pipe on top of stone and connect each distribution pipe to header.

.9 Cover with an additional 150 mm of stone material on top totalling a thickness of 300 mm.

.10 Place the permeable geotextile over stone as indicated.

.11 Maintain pipe elevations within 5 mm of inverts indicated.

.12 Do not backfill filter bed until pipe grade and alignment have been approved by Engineer and authority having jurisdiction.

.13 Backfill filter bed with material as indicated. Material to be approved by Engineer.

.14 Grade areas surrounding disposal field as indicated, to provide for diversion of surface run off waters.

PAYMENT ADJUSTMENT FOR CHANGES IN THE MINISTRY OF TRANSPORTATION'S PERFORMANCE GRADED ASPHALT CEMENT (PGAC) PRICE INDEX FOR GRANULAR SEALER TYPE I and TYPE II

Special Provision No. BITU0031

A payment adjustment shall be applied based on changes to the ministry's performance graded asphalt cement (PGAC) price index unless, the Contract Administrator is notified in writing of the choice to opt out within 5 Business Days of receiving a completed MTO form PH-CC-700, Permission to Start Work. Once opted out of payment adjustments based on the PGAC price index, opting back in shall not be permitted.

The PGAC price index shall be published monthly in the Owner’s Contract Bulletin. The PGAC price index shall be used to calculate the amount of the payment adjustment per tonne of PGAC accepted into the Work. No PGAC price index payment adjustment shall be applied to the PGAC used in repair work.

The PGAC price index is based on the price, excluding taxes, Freight on Board (FOB) the depots in the Toronto area, of PGAC grade PG 58-28 or equivalent. One index shall be used to establish and calculate the payment adjustment for all grades.

A payment adjustment per tonne of PGAC shall be established for each month in which application of granular sealer occurs when the PGAC price index for the month differs by more than 5% from the PGAC price index for the month prior to tender closing. When the price index differential is less than 5%, there shall be no payment adjustment established for that month. Payment adjustments due to changes in the PGAC price index are independent of any other payment adjustments made to the granular sealer tender items.

The payment adjustment for the month shall be calculated from the following formulas:

I_P	**PGAC Payment Adjustment for Granular Sealer, PA_{GS}**
$I_P > 1.05\ I_T$	$PA_{GS} = (I_P - 1.05\ I_T) \times GS_{AC}$
$I_P < 0.95\ I_T$	$PA_{GS} = (0.95\ I_T - I_P) \times GS_{AC}$

Note: If $I_P > 1.05\ I_T$ the Contractor shall receive a compensation; however, if $I_P < 0.95\ I_T$ the Owner shall receive a rebate.

Where:

PA_{GS} = Payment adjustment for PGAC in granular sealer, in dollars.

I_T = PGAC price index for the month prior to tender closing, in dollars/tonne.

I_P = PGAC price index for the month in which application of granular sealer occurs, in dollars/tonne.

GS_{AC} = Quantity of PGAC in granular sealer, in tonne.

GS_{AC} shall be calculated as follow:

When unit of measurement for the granular sealer tender item by mass in kilograms:

$$GS_{AC} = \frac{\left(\frac{AC_{GS}}{100}\right) x\, Q_{GS}}{1000}$$

When unit of measurement for the granular sealer tender item in square metres:

$$GS_{AC} = \frac{\left(\frac{AC_{GS}}{100}\right) x\, AR_{GS}\, x\, Q_{GS}}{1000}$$

Where:

AC_{GS} = Percentage of PGAC in granular sealer, which is determined based on percentage of residue by distillation test according to OPSS 1103, in percent.

AR_{GS} = The application rate of granular sealer as specified in OPSS 305, in kg/m².

Q_{GS} = The quantity of granular sealer accepted into the Work during the month for which the payment adjustment was calculated, in kilograms or in square metres.

The payment adjustment per tonne applies to the quantity of PGAC in granular sealer accepted into the Work during the month for which it is established. The quantity of PGAC includes all grades of PGAC supplied with and without polymer modifiers.

For each month in which a payment adjustment has been established, the quantity is calculated using the granular sealer quantity accepted into the Work and its corresponding PGAC content in the granular sealer.

For progress payment purposes, payment adjustments are made on the monthly progress payment certificate for the months in which application of granular sealer occurs.

PAYMENT ADJUSTMENT FOR CHANGES IN THE MINISTRY OF TRANSPORTATION'S PERFORMANCE GRADED ASPHALT CEMENT (PGAC) PRICE INDEX FOR TACK COAT

Special Provision No. BITU0032

A payment adjustment shall be applied based on changes to the ministry's performance graded asphalt cement (PGAC) price index unless the Contract Administrator is notified in writing of the choice to opt out within 5 Business Days of receiving a completed MTO form PH-CC-700, Permission to Start Work. Once opted out of payment adjustments based on the PGAC price index, opting back in shall not be permitted.

The PGAC price index shall be published monthly in the Owner's Contract Bulletin. The PGAC price index shall be used to calculate the amount of the payment adjustment per tonne of PGAC accepted into the Work. No PGAC price index payment adjustment shall be applied to the PGAC used in paving repair work.

The PGAC price index is based on the price, excluding taxes, Freight on Board (FOB) the depots in the Toronto area, of PGAC grade PG 58-28 or equivalent. One index shall be used to establish and calculate the payment adjustment for all grades.

A payment adjustment per tonne of PGAC in tack coat shall be established for each month in which application of tack coat occurs when the PGAC price index for the month differs by more than 5% from the PGAC price index for the month prior to tender closing. When the price index differential is less than 5%, there shall be no payment adjustment established for that month. Payment adjustments due to changes in the PGAC price index are independent of any other payment adjustments made to the tack coat tender items.

The payment adjustment for tack coat for the month shall be calculated from the following formulas:

I_P	**PGAC Payment Adjustment for Tack Coat,** PA_{TC}
$I_P > 1.05\ I_T$	$PA_{TC} = (I_P - 1.05\ I_T) \times TC_{AC}$
$I_P < 0.95\ I_T$	$PA_{TC} = (0.95\ I_{TO} - I_P) \times TC_{AC}$

Note: If $I_P > 1.05\ I_T$ the Contractor shall receive a compensation; however, if $I_P < 0.95\ I_T$ the Owner shall receive a rebate.

Where:

PA_{TC} = Payment adjustment for PGAC in tack coat, in dollars.

I_T = PGAC price index for the month prior to tender closing, in dollars/tonne.

I_P = PGAC price index for the month in which application of tack coat occurs, in dollars/tonne.

TC_{AC} = Quantity of PGAC in tack coat, in tonnes.

TC_{AC}, shall be calculated as follows:

$$TC_{AC} = \frac{\left(\frac{AC_{TC}}{100}\right) x\ AR_{TC}\ x\ Q_{TC}}{1000}$$

Where:

AC_{TC} = Percentage of PGAC in tack coat, which is determined based on percentage of residue by distillation test according to OPSS 308, in percent.

AR_{TC} = Application rate of tack coat as specified in OPSS 308, in kg/m².

Q_{TC} = Quantity of tack coat accepted into the Work during the month for which the payment adjustment was calculated, in square metres.

The payment adjustment per tonne applies to the quantity of PGAC in the tack coat accepted into the Work during the month for which it is established.

For each month in which a payment adjustment has been established, the quantity is calculated using the tack coat quantity accepted into the Work and its corresponding PGAC content in the tack coat.

For progress payment purposes, payment adjustments are made on the monthly progress payment certificate for the months in which application of tack coat occurs.

AMENDMENT TO OPSS 100, April 2023, MTO GENERAL CONDITIONS OF CONTRACT

Special Provision No. 100F28 May 2023

Additional Contractor's Insurance Requirements

GC 6.0 INSURANCE, PROTECTION, AND DAMAGE

GC 6.03 Contractor's Insurance

GC 6.03.01 General

Clause GC 6.03.01 of OPSS 100 is amended by the addition of the following paragraphs:

.02 The Contractor shall provide the Owner with proof of insurance required by these MTO General Conditions of Contract in the form of valid certificates of insurance acceptable to the Owner that references the Contract and confirms the required coverage, on or before the commencement of this Contract, and any renewal replacements on or before the expiry of any such insurance.

.03 The Contractor shall submit annually on the anniversary of the execution of the Agreement to the Owner the proof of the continuation of the insurance as described in these MTO General Conditions of Contract or elsewhere in the Contract Documents in the form of valid certificates of insurance acceptable to the Owner that references the Contract and confirms the required coverage.

.04 If the Contractor decides not to employ Subcontractors for operations requiring the use of explosives for blasting, pile driving or caisson work, or removal or weakening of support of property building or land, the certificate of insurance shall include the appropriate endorsements.

.05 "Claims Made" insurance policies shall not be permitted.

GC 6.03.02 Commercial General Liability Insurance

Clause GC 6.03.02 of OPSS 100 is amended by deleting paragraphs .02, .03, .04 and .05 in their entirety.

GC 6.03.03 Builder's Risk Insurance

.01 All risks builder's risk insurance, including collapse, shall be in the joint names of the Contractor, the Owner and the Contract Administrator, in the amount equal to the Contract price. This insurance shall be in a form acceptable to the Owner.

AMENDMENT TO OPSS 100, APRIL 2023, MTO GENERAL CONDITIONS OF CONTRACT

Special Provision No. 100F68 May 2023

Condition of the Working Area, and Maintaining Roadways and Detours

GC 7.0 CONTRACTOR'S RESPONSIBILITIES AND CONTROL OF WORK

GC 7.07 Condition of the Working Area

Subsection GC 7.07 of OPSS 100 is amended by the addition of the following:

.04 Materials or Equipment shall not be stored adjacent to the edge of lanes carrying traffic within:

a) 7 m, on roadways with a posted speed equal to or greater than 70 km/h, or within

b) 4 m, on roadways with a posted speed of less than 70 km/h.

Upon permission from the Contract Administrator, the distances specified above may be reduced to a minimum of 2.5 m in medians only, and 4 m in all other areas.

.05 The Contractor shall at no additional cost to the Owner, remove any vehicle, equipment, or material which, in the opinion of the Contract Administrator, constitutes a traffic hazard or obstruction to maintenance operations.

GC 7.08 Maintaining Roadways and Detours

Subsection GC 7.08 of OPSS 100 is amended by the addition of the following:

.08 The Contractor shall schedule the Work so that there will be no open excavation adjacent to a lane carrying traffic overnight and/or on non-Working Days, except where a traffic barrier designed to restrain errant vehicles is located between the traffic and the excavation.

Open excavations adjacent to the edge of lanes carrying traffic within:

a) 7 m, on roadways with a posted speed equal to or greater than 70 km/h, or within

b) 4 m, on roadways with a posted speed of less than 70 km/h,

shall be backfilled and compacted as specified to provide a continuous surface from the travelled way, prior to closing down operations each Day.

AMENDMENT TO OPSS 100, April 2023, MTO GENERAL CONDITIONS OF CONTRACT

Special Provision No. 100F71 May 2023

Use of Contract Management System (CMS) for Administering the Contract

GC 1.0 INTERPRETATION

GC 1.07 Definitions

Subsection GC 1.07 of OPSS 100 is amended by the addition of the following definition:

Contract Management System (CMS) means a solution that provides a digital means to record, collect, transmit and store Contract data.

GC 1.09 Interpretation of Certain Words

Subsection GC 1.09 of OPSS 100 is amended by the addition of the following:

.03 Any reference in the Contract Documents to “Owner Standard Form” or “PH-CC” or “MTO Form” shall be deemed to mean the digital equivalent of that form within CMS where such exists.

.04 The verbs: “write”, “notify”, “submit”, “issue”, “provide”, “execute”, “report”, “give”, “furnish”, “return”, “apply” and their variations, and other words referring to a communication from the Contractor to the Contract Administrator, or from the Contract Administrator to the Contractor, shall mean “[verb] using CMS” (e.g., “submitted using CMS”, “notify using CMS”).

GC 3.0 ADMINISTRATION OF THE CONTRACT

Section GC 3.0 of OPSS 100 is amended by the addition of the following subsection:

GC 3.16 Use of CMS

.01 CMS shall be used to administer Contract data. After Contract award, submissions shall only be accepted by the Owner through CMS.

.02 CMS is mandatory to complete the digital records with all necessary data. It is not acceptable to attach a scanned copy of the paper version, where a digital record in CMS is available.

.03 A subscription is only required for Contractor’s representative(s) creating or editing records. The Owner will provide the Contractor with up to a maximum of three annual subscriptions for the duration of the Contract, at no cost to the Contractor.

.04 The Owner will provide subscription information to the Contractor, at the time of Contract award.

.05 The Contractor shall:

a) Accept the CMS (Kahua) terms of service agreement, upon Contract award;

b) Submit to the Owner, within 7 Business Days of Contract award, the names and contact information of the Contractor’s representative(s) to receive a subscription;

c) Identify any restrictions for access to Contract information for any Contractor representatives. Permissions for Contractor representatives are assigned on an individual Contract basis;

d) Ensure that all Contractor representatives' subscriptions are in place;

e) Notify the Contract Administrator of any requests to add, delete, or replace any Contractor representatives during the duration of the Contract;

f) Ensure a subscription is maintained for at least one Contractor representative until the receipt of the Release of Warranty Certificate;

g) Ensure that internet access is continuously available to all Contractor representatives; and

h) Record all activities daily using CMS.

.06 A document signed and sealed by one or more Engineer(s), Ontario Land Surveyor(s), Professional Geoscientist(s), or other professional licensed according to federal or provincial legislation shall be submitted using CMS. In addition to the CMS submission, the original signed and sealed copy shall be submitted within 5 Business Days to the Contract Administrator.

.07 Digital submission of records shall be deemed the legal equivalent of an original signed paper document.

OCCUPATIONAL HEALTH AND SAFETY ACT COMPLIANCE

Special Provision No. 101F21 November 2014

List of Designated Substances

In accordance with the *Occupational Health and Safety Act, R.S.O. 1990, c. 0.1*, the Contractor is advised of the presence of the following Designated Substance(s):

Substance	Location
Arsenic	None Identified
Asbestos on Construction Projects and in Buildings and Repair Operations (O. Reg. 278/05)	None Identified
Lead	None Identified
Silica	Groundwater results for the Phase II Environmental Site Assessment indicate Silica is present onsite.
Benzene	Samples obtained for the Phase II Environmental Site Assessment indicate a naturally occurring benzene source located approximately 30m south of the proposed Auxiliary Storage Building.
Vinyl Chloride, Coke Oven Emissions, Ethylene Oxide, Acrylonitrile and Isocyanates	None Identified
Mercury	None Identified

AMENDMENT TO OPSS 313, APRIL 2021

Special Provision No. 103F03 October 2021

313.07 CONSTRUCTION

313.07.07 Placing Hot Mix Asphalt

313.07.07.02 Paving

313.07.07.02.02 Paving in Echelon

Clause 313.07.07.02.02 of OPSS 313 is amended by deleting the first paragraph in its entirety and replacing it with the following:

For the purpose of laying levelling, binder and surface courses as required under this Contract, paving in echelon shall not be used for the whole contract.

AMENDMENT TO OPSS 501, NOVEMBER 2014

Special Provision No. 105S22M

501.07 CONSTRUCTION

501.07.02 Restricted Zones

Subsection 501.07.02 of OPSS.PROV 501 is amended by removal of section 501.07.02 (a) and replacement with the following Subsection:

Abutments, Retaining Walls and Building Foundation Walls

An area within a plane extending from the base of the face of the wall where it contacts the footing upwards at a slope of 1H:1.5V to a maximum distance of 2.5m from the wall.

501.07.04.01 General

Subsection 501.07.04.01 of OPSS.PROV 501 is amended by the following addition of the following paragraphs:

Compaction testing for engineered fill under building foundations, granular materials under building slabs on grade or adjacent to building foundations and granular materials for pavement subbase in the parking lot area of the Maintenance Patrol Yard shall be undertaken in accordance with Method A and according to the field compaction requirements specified in Table 2.

501.07.04.02 Compaction Requirements

501.07.04.02.01 General

Subsection 501.07.04.02.01 of OPSS.PROV 501 is amended by the following addition of the following paragraphs:

Method A

The Maximum Dry Density shall be determined using LS-706.

Earth and granular materials which satisfy the Contract Document requirements shall be placed and compacted to achieve the maximum dry densities provided in Table 2. Materials shall be placed in horizontal lifts, for full width of excavation and simultaneously on all sides of structures as outlined elsewhere in the Contract.

501.07.04.02.05 Lot Testing

Subsection 501.07.04.02.05 of OPSS.PROV 501 is amended by the following addition of the following paragraphs:

Lot testing shall be used for compaction control and testing of engineered fill under building foundations, granular materials under building slabs on grade or adjacent to building foundations of the Maintenance Patrol Yard. Table 1, Part V shall be used to establish the compaction lot size for these elements. For the situations described in Table 2, the lot size shall be limited to a plan area 3m in width and 10m in length. A minimum of 2 field density and moisture content tests shall be carried out at random location within each lot. The granular and earth material for the pavement base and subbase shall have a maximum lot size of 400m2 and a minimum of 4 field density and moisture content tests shall be carried out at random locations within each lot.

501.07.04.02.07 Acceptance

Subsection 501.07.04.02.07 of OPSS.PROV 501 is amended by the following addition of the following paragraphs:

For the situations described in Table 2, acceptance or rejection of a QC lot for compaction shall be based on 2 or more random field density and moisture content tests taken within the lot. For a lot to be acceptable, all tests shall be at least 100% of the target density established for granular materials. Otherwise, the QC lot shall be rejected for compaction.

501.08.02.03 Compaction

Subsection 501.08.02.03 of OPSS.PROV 501 is amended by the following addition of the following paragraphs:

For the situations described in Table 2, compaction QA shall consist of taking 2 or more random field density and moisture content measurements of each compacted lot and the subsequent determination of percent target density.

Table 2: Maximum Lift Thicknesses and Compaction Requirements

Location	Material	Maximum Lift Thickness	Maximum Dry Density
Engineered Fill below foundations, below slabs on grade or pavement subbase in parking lot areas	Granular A	150 mm	100%
	Granular B	300mm	100%
Adjacent to concrete walls or foundations	Granular B	300 mm	98%
Below Floor Slabs	Granular A	150mm	100%
	Granular B	300 mm	98%

USE OF AIR COOLED IRON BLAST FURNACE SLAG AS GRANULAR MATERIAL

Special Provision No. 110F10 September 2001

SCOPE

This special provision covers the requirements for the use of air cooled iron blast furnace slag as granular material in road construction.

DEFINITIONS

Slag: means air cooled iron blast furnace slag.

CONSTRUCTION

General Operational Constraints

For those applications permitted in this special provision, it is the Contractor's responsibility to notify the District Manager of the local District Office of the Ministry of the Environment (MOE), of the locations where slag will be utilized.

The Contractor shall prepare a contingency plan that specifically addresses management by the Contractor, during construction, of any odour and leachate which may be generated by the slag material. The plan shall include but not be limited to the following:

a. a strategy for containment, cleanup and disposal of leachate to ensure a quick and comprehensive response to any escape of leachate from the construction site;

b. a strategy for communicating with MOE and other regulatory authorities in the event of any escape of leachate;

c. a strategy to identify the project specific causes of leachate problems as well as a commitment to developing short and long term corrections; and

d. a strategy for dealing with public complaints about odour problems which may occur.

Restrictions On the Use of Slag

a. Slag is prohibited for any application below top of subgrade.

b. Slag may be applied above subgrade with the following exceptions:

Slag shall not be used in this project.

c. During construction, water shall not be directed, through means such as channelized flow or dewatering effluent, to areas where slag has been placed.

d. When placing slag, the Contractor shall ensure that the material is graded and placed in a manner which ensures free drainage and prevents ponding on, within or against the material.

SUBMISSION AND DESIGN REQUIREMENTS

Notification of Sites Intended to be Used for the Placement of Slag

Three weeks prior to receipt of the slag material at the job site, a completed Notification of Intended Placement of Slag Form, included in this special provision, shall be submitted to the attention of the District Manager of the appropriate local District Office of the Ministry of the Environment. The notification shall include a copy of this special provision and a copy of the contingency plan required by this special provision.

Three weeks prior to receipt of the slag material on the job site, copies of the completed Notification of Intended Placement of Slag Form and the Contractor's contingency plan for the use of slag material shall be supplied to the Contract Administrator, and to the Manager/Supervisor of the MTO Regional Environmental Office/Unit.

Notification of Intended Placement of Air Cooled Iron Blast Furnace Slag Form

Highway: _____ MTO Contract No. _____

Location of Contract: _____

Contractor: _____ Telephone: _____

Construction Administrator: _____

The following describes the Contractor's intended locations for placement of slag on the noted MTO Contract currently under construction. By signing this form the noted Contractor acknowledges to the Ministry of the Environment that all locations proposed to be used by the Contractor for the placement of slag meet the requirements of the special provision attached.

_____

1. Source of Slag

The material source is as follows:

Name and address of the commercial source;

_____
_____
_____
_____

2. Site Description

The site description includes the following:

An identification of the location of the work project including a map reference;

_____
_____
_____
_____
_____

3. Location for Placement of Slag

Attach descriptions (including station numbers) detailing the following:

a) use and location of the slag, including a detailed plan of the material placement site (and typical cross section if necessary); and

b) quantities/volume of material to be placed at the location specified.

Dated this _____ day of _____ 2___

_____
Contractor's Signature

_____
Name of Construction Company

AMENDMENT TO OPSS 1151, APRIL 2021

Special Provision No. 111F06 October 2021

1151.04 DESIGN AND SUBMISSION REQUIREMENTS

1151.04.01 Design Requirements

1151.04.01.01 General

Clause 1151.04.01.01 of OPSS 1151 is amended by the addition of the following:

For HMA in this Contract, the mix properties, the compaction effort, and the aggregate properties specified in the Contract Documents shall conform to the requirements for the traffic category specified in Table A. The use of a mix designed with a traffic category different than specified in Table A shall not be permitted.

The asphalt cement (AC) added to the hot mix types shall be performance graded asphalt cement (PGAC) as specified in Table A. For bidding purposes only, the percentage by mass of asphalt cement, AC_{BID} contained in the various HMA mix types shall be as specified in Table A.

OPSS 1151 is amended with the addition of the following Table:

TABLE A
HMA Mix Design Criteria

HMA Type	Location in Contract	Traffic Category	PGAC Grade	AC_{BID} % (Note 1)
Superpave 12.5	Surface	C	58-28	5.2
Superpave 19	Binder	C	58-28	4.8

Notes:
1. For SMA Mix Types a minimum AC Content is specified in Table 5 based on combined aggregate bulk relative density.

TEMPORARY ROADWAY CLOSURES

Special Provision No. 199F01 August 2019

1.0 HOLIDAY / SPECIAL EVENT RESTRICTIONS

Closures for mobilization of equipment and materials and construction operations shall not be permitted on the holidays / special events specified below; and when applicable, after noon on the date preceding and/or before noon on the date following, as specified below.

Name of Holiday/Special Event	Date that Closures are Not Permitted	Date that Closures are Not Permitted After Noon	Date that Closures are Not Permitted Before Noon
Good Friday	Friday, April 18, 2025	Thursday, April 17, 2025	N/A
Easter Monday	Monday, April 21, 2025	N/A	N/A
Victoria Day	Monday, May 19, 2025	Friday, May 16, 2025	N/A
Canada Day	Tuesday, July 1, 2025	Monday, June 30, 2025	N/A
Civic Holiday	Monday, August 4, 2025	Friday, August 1, 2025	N/A
Labour Day	Monday, September 1, 2025	Friday, August 29, 2025	N/A
Thanksgiving Day	Monday, October 13, 2025	Friday, October 10, 2025	N/A
Christmas Day	Thursday, December 25, 2025	Wednesday, December 24, 2025	N/A
Boxing Day	Friday, December 26, 2025	N/A	N/A
New Year's Day	Thursday, January 1, 2026	Wednesday, December 31, 2025	N/A
Family Day	Monday, February 16, 2026	Friday, February 13, 2026	N/A
Good Friday	Friday, April 3, 2026	Thursday, April 2, 2026	N/A
Easter Monday	Monday, April 6, 2026	N/A	N/A
Victoria Day	Monday, May 18, 2026	Friday, May 15, 2026	N/A
Canada Day	Wednesday, July 1, 2026	Tuesday, June 30, 2026	N/A
Civic Holiday	Monday, August 3, 2026	Friday, July 31, 2026	N/A
Labour Day	Monday, September 7, 2026	Friday, September 4, 2026	N/A
Thanksgiving Day	Monday, October 12, 2026	Friday, October 9, 2026	N/A
Notes: N/A			

2.0 CLOSURES FOR MOBILIZATION OF EQUIPMENT AND MATERIALS

The use of construction accesses, shoulder closures, lane closures, and ramp closures for mobilization of equipment and materials (i.e., loading and unloading of materials and construction equipment onto and from the travelled portion of the highway) shall only be permitted during the times specified below, subject to restrictions as noted, when applicable.

Location/Description: Glenarm Road (within the contract limits)

Monday	Tues to Thurs	Friday	Saturday	Sunday
½ hour after sunrise to ½ hour before sunset	½ hour after sunrise to ½ hour before sunset	½ hour after sunrise to noon	Not Permitted	Not Permitted
Notes: N/A				

2.1 Delivery and Trucking

The Contractor shall plan and schedule the routes of vehicles transporting all materials to, from or within the job, so that vehicular movements are accomplished with minimum interference and interruptions to traffic. This will necessitate vehicles to “slip-off” or “slip-on” in the direction of traffic, in order to merge with and thereby avoid crossing traffic lanes.

Access to and from the highway right-of-way will be restricted to ramps at the interchanges unless otherwise provided for in the Contract. Median cross-overs shall not be used except where single axle vehicles are entering a passing lane that is closed to traffic.

The Contractor shall obtain the Contract Administrator's prior approval for the location of any "slip-off" or "slip-ons". The Contract Administrator reserves the right to alter, reject or close same as considered necessary. The Contractor shall notify suppliers of materials and equipment of the above requirements.

3.0 CLOSURES FOR CONSTRUCTION OPERATIONS

3.1 Shoulder Closures

Shoulder closures for construction operations shall only be permitted during the times specified below, subject to restrictions as noted.

Location/Description: Glenarm Road (within the contract limits)

Monday	Tues to Thurs	Friday	Saturday	Sunday
½ hour after sunrise to ½ hour before sunset	½ hour after sunrise to ½ hour before sunset	½ hour after sunrise to noon	Not Permitted	Not Permitted
Notes: N/A				

3.2 Lane Closures

Lane closures for construction operations shall only be permitted during the times specified below, subject to restrictions as noted.

Location/Description: Glenarm Road (within the contract limits)
Total Number of Lanes: 2

Closure Type	Monday	Tues to Thurs	Friday	Saturday	Sunday
One Lane	½ hour after sunrise to ½ hour before sunset	½ hour after sunrise to ½ hour before sunset	½ hour after sunrise to noon	Not Permitted	Not Permitted
Two Lanes / Full Closure	Not Permitted	Not Permitted	Not Permitted	Not Permitted	Not Permitted
Notes: N/A					

3.3 Ramp Closures

Ramp closures for construction operations shall only be permitted during the times specified below, subject to restrictions as noted.

N/A

3.3.1 Simultaneous Ramp Closures

The following ramps shall not be closed at the same time:

N/A

3.3.2 Consecutive Ramp Closures

N/A

3.4 Full Mainline Closures

A full mainline closure shall be used:

a) When work affecting the travelled portion of an undivided highway requires the stoppage of traffic across the full width of the traffic lanes in both directions of travel.

b) When work affecting the travelled portion of a freeway or divided highway requires the stoppage of traffic across the full width of the traffic lanes in one direction of travel. When necessary the closure of the adjacent lane on the other side of a median barrier may also be required.

Full mainline closures shall only be permitted during the times and for the work specified below, subject to restrictions as noted, when applicable.

N/A

4.0 CLOSURE REQUIREMENTS

4.1 Closure Notifications

Prior to all closures of lanes and/or ramps and/or shoulders for any reason, the Contractor shall:

1. Inform the Contract Administrator:

    a) at least 1 week prior to the start date, for all closures lasting less than one week.
    b) at least 2 weeks prior to the start date, for all closures lasting more than one week.
    c) of all emergency closures as soon as any details are known.

2. Inform the Contract Administrator of any closure that is being canceled subsequent to 1. above.

3. Obtain a Closure Notification Number from the Contract Administrator for each closure.

4. Fill-in the Field Work Notification Form and e-mail it to EastRegion.TOC@ontario.ca or fax it to 613-748-5287, at least 24 hours prior to any closure.

5. Notify the MTO East Region Traffic Operations Centre by phone 613-748-5296:

    a) immediately prior to the set-up of any closure.
    b) immediately of any changes to the closure or anticipated problems that may delay the opening time, stating details of the changes to and/or problems with the closure.
    c) immediately upon removing the closure.

4.2 Ontario Provincial Police (OPP) Assisted Closures and Speed Control

In addition to the requirements listed in Ontario Traffic Manual (OTM) Book 7, Temporary Conditions, the Contractor has the option to use OPP assisted lane closures and speed control activities to execute the work.

Mandatory use of OPP (or their designate) shall be employed for all full mainline closures.

Mandatory use of OPP (or their designate) shall also be employed for:

N/A

All costs associated with optional and/or mandatory use of OPP for closures and/or speed control activities are deemed to be included in the Temporary Traffic Control Signs tender item. No additional payment will be made to the Contractor for these operations.

If an authorized third party stipulates that additional OPP assisted lane closures or speed control activities are required, the Owner will compensate the Contractor for the cost of the OPP services as a Change in the Work.

5.0 PAYMENT ADJUSTMENTS

5.1 Payment Adjustments for Early Closing

On each occasion when the Contractor closes lanes and/or ramps to traffic earlier than the specified times, the Contract Administrator will assess the Contractor an initial payment reduction of $500.00

Thereafter, a further payment reduction of $ 50.00per minute will be assessed against the Contractor for every minute outside the permitted closure window that the lanes and/or ramps are not open to traffic. The Contract Administrator will be the sole judge of the length of time of the delay.

For progress payment purposes, payment adjustments are made on the monthly progress payment certificate for the month in which the early closing(s) occurs.

5.2 Payment Adjustments for Late Opening

On each occasion when the Contractor fails to reopen the lanes and/or ramps by the specified time, the Contract Administrator will assess the Contractor an initial payment reduction of $500.0

If lanes and/or ramps are not open within 15 minutes after the specified time, a further payment reduction of $500.00 shall be assessed against the Contractor.

Thereafter, a further payment reduction of $50.00 per minute shall be assessed against the Contractor for every minute that the lanes and/or ramps are not open to traffic. The Contract Administrator will be the sole judge of the length of time of the delay.

For progress payment purposes, payment adjustments are made on the monthly progress payment certificate for the month in which the late opening(s) occurs.

PLACING HOT MIX ASPHALT BEFORE SEASONAL SHUTDOWN

Special Provision 199F03 May 2016

This Special Provision shall apply to:

The entire Contract limits

Before seasonal shutdown or by December 24th, whichever is earlier, the following work shall be completed on the above roadways on which construction operations have commenced and which are to remain open to public traffic:

a) The roadbed shall be completed to the specified grade and cross section of the granular base;

b) The roadbed shall be paved with binder course only. At least the first layer of binder course mix as designed for the roadway shall be completed, including ramping at curb and gutter, manholes and catch basins. Surface course paving may proceed, in conformance with OPSS 313, as amended by this contract provided that the underlying work conforms to the contract requirements, and;

c) The shoulders shall be completed to the corresponding elevation of the top of the hot mix.

When, in order to comply with a) above, the Contractor does not comply with the restrictions on placing earth, rock or granular materials over frozen ground, ice or snow, the Contractor shall be responsible for the costs of removal and replacement of the pavement, granular and subgrade materials, subdrains, pavement markings, temporary traffic barriers, signs and other associated work and the provision of traffic control where removal and replacement is deemed necessary by the Contract Administrator.

When, in order to comply with b) above, the Contractor paves over a frozen roadbed or in violation of the temperature restrictions for paving, the Contractor shall be responsible for the costs of removal and replacement of the hot mix pavement, granular base and shouldering materials, pavement markings, temporary traffic barriers and the provision of traffic control.

The removal and replacement work shall conform to the Contract requirements and the Contractor shall comply with any other terms and conditions for carrying out the work as the Contract Administrator may declare in writing at that time.

When the Contractor has performed work which did not comply with the restrictions on placing earth, rock or granular materials over frozen ground, ice or snow, or paves over a frozen roadbed or in violation of the temperature restrictions for paving:

a) The Contractor shall be responsible for the costs incurred by the Owner in maintaining the roadway in a condition satisfactory for the travelling public during seasonal shutdown, excluding the costs of applying de-icing salts, abrasives and snow-plowing operations; and

b) Payment at the contract prices for the work will be withheld until any necessary removal and replacement of the roadway has been completed after it has thawed in the spring.

Information to Bidders

Special Provision No. 199F14 October 2020

Aggregate Sources

The Contractor must demonstrate the ability of aggregate sources to produce aggregate that satisfies the requirements of the Contract Documents.

During tendering, a request for approval for use of an MTO/Crown source not listed on an Aggregate Sources List (ASL) shall be made through the bid enquiry process. Any MTO/Crown sources not listed on an ASL may be used, subject to the approval of the Head, Regional Geotechnical Section. If approval is granted, the ministry's ASL Conditions of Information shall apply.

For enquiries related to Crown sources or sources under permit to MTO, Contractors may contact the appropriate Regional Geotechnical Section to request available Mineral Aggregate Inventory Data Bank (MAIDB) information.

For enquiries related to a specific commercial and/or private source, the Contractor may contact the Aggregate Unit of the appropriate Regional Geotechnical Section to access available Mineral Aggregate Inventory Data Bank (MAIDB) information provided they have written consent from the source owner.

Regional Geotechnical Section offices are located in:

Location/Office	Region	Telephone #
Kingston	East	(613) 545-4794 (613) 530-5561
North Bay	Northeast	(705) 497-5478 (705) 358-4610
Thunder Bay	Northwest	(807) 473-2037 (807) 633-6222

For aggregate related enquiries for sources located in Central Region or West Region, please contact:

Location/Office	Region	Telephone #
Engineering Materials Office, Soils and Aggregates Section	Central or West	(416) 806-2141 (416)-420-0964

Access to the information in MAIDB is provided for the convenience of the Contractor only. Since MAIDB information is dated and subject to interpretation, the information is not guaranteed.

For Contracts that include concrete items, Structural Concrete Aggregate Source Lists and Concrete Base/Pavement Aggregate Source Lists, as applicable, are available from the MTO Technical Publications website at https://www.library.mto.gov.on.ca/SydneyPLUS/TechPubs/Portal/tp/TechnicalPublications.aspx under the Construction, Qualification, and Materials heading.

Earth Borrow, Rock Supply, Granular Base, and Conventional Hot Mix Aggregates

This contract does not include an Aggregate Sources List (ASL) for earth borrow, rock supply, granular base, and conventional hot mix aggregates. For information regarding commercial sources, Contractors may refer to the following sources of information:

a) Commercial Aggregate and Membership Directory, available through Ontario Stone, Sand & Gravel Association (OSSGA);

b) Aggregate License/Permit List, available through the Ministry of Natural Resources and Forestry (MNRF); www.ontario.ca/environment-and-energy/find-pits-and-quarries, and

c) Aggregate Resources Inventory Papers (ARIPs), available through the Ministry of Energy, Northern Development and Mines (ENDM). www.geologyontario.mndm.gov.on.ca/index.html

ENVIRONMENTAL EXEMPTIONS AND PERMITS

Special Provision No. 199F31 April 2016

The following environmental exemptions and permits are provided for the Work.

Exemption and Permit Identification
N/A

The exemptions and permits provided above do not relieve the Contractor of other obligations imposed by statute or by municipal bylaw.

Pending Environmental Exemptions and Permits

The following environmental exemptions and permits are pending for the Work. The areas formed by a line joining the points in the table(s) below, where each point enclosing an area is in a separate row in the table, are prohibited from entry until Contract Administrator notification that the pending exemptions and permits listed have been obtained. The pending exemptions and permits are expected to be obtained by the date shown.

No.	Highway	Pending Exemption and Permit Identification	Date Expected
1	Glenarm Road	ECA Application for site to be added to existing MTO facilities ECA for SWM facility, sewage systems and storm sewers, servicing the Fenelon MPY	September, 2024

Points

No.	Township	Station (or Latitude)	Offset (or Longitude)
1	Kawartha Lakes	9+020	212 m RT
2	Kawartha Lakes	9+053	31 m RT
3	Kawartha Lakes	9+072	15 m RT
4	Kawartha Lakes	9+177	15 m RT
5	Kawartha Lakes	9+182	201 m RT
5	Kawartha Lakes	9+341	139 m RT
6	Kawartha Lakes	9+342	15 m RT

CONSTRUCTION NOISE CONSTRAINTS

Special Provision No. 199F33 January 2020

Noise Sensitive Areas

This Special Provision covers the requirements for control of construction noise produced by the Contractor's operations.

Noise constraints in noise sensitive areas are as follows:

Noise Sensitive Area # 1

Noise Sensitive Area Limits	
Entire Contract	
Constraint	**Constraint Details**
Equipment Maintenance	Equipment shall be maintained in an operating condition that prevents unnecessary noise, including but not limited to non-defective muffler systems, properly secured components, and the lubrication of moving parts.
Equipment Operation	Idling of equipment shall be restricted to the minimum necessary to perform the specified work.
Timing of Work	Limit construction activities to daytime hours where possible, especially activities with high noise impact.

SEASONAL SHUTDOWN

Special Provision No. 199F45 August 2019

1.0 Scope

This Special Provision covers the requirements for the seasonal shutdown of construction operations prior to the transfer of the Roadway to the Owner.

2.0 General

For the purposes of this Contract, seasonal shutdown shall be the period from:

December 1, 2025 to May 17, 2026

At the commencement of the seasonal shutdown period, all permanent highway lanes, shoulders, structures and interchange ramps which were in place prior to the start of construction, their reconstructed counterparts, or the lane configuration specified in the Contract Documents for the seasonal shutdown period, shall be open to traffic and shall remain unrestricted at all times to public traffic during the seasonal shutdown period.

The Contractor’s Critical Path Schedule shall at all times reflect the seasonal shutdown Contract requirements

as defined in this Special Provision.

The Contractor shall schedule and carry out operations in accordance with Seasonal Shutdown Requirements, including the construction and/or removal of any temporary transitions between the existing pavement structure and the new pavement structure.

All Work associated with the seasonal shutdown requirements specified below shall be deemed to be included in the Contract price for the appropriate tender items in the Contract Documents and no additional payment shall be made.

All hot mix paving work performed by the Contractor to meet seasonal shutdown requirements, that does not meet the full requirements of OPSS 313, shall be considered temporary paving and all costs associated with the placement and subsequent removal of the temporary pavement shall be at the Contractor's expense.

3.0 Seasonal Shutdown Requirements

The requirements in this Special Provision are additional to seasonal shutdown requirements specified elsewhere in the Contract Documents and shall not relieve the Contractor of any other requirements contained in the Contract, without the written approval of the Contract Administrator.

All operations shall be completed to the satisfaction of the Contract Administrator and as follows:

a) The minimum acceptable pavement structure for seasonal shutdown will be either the existing full depth pavement structure or the new proposed pavement structure up to and including the upper binder course.

b) No vertical pavement drop-offs will be permitted except on closed portions of the Roadway(s) separated from public traffic by temporary construction barrier or other approved barrier system.

c) All pavement marking obliteration that is required to remove temporary pavement markings on a surface other than the final pavement surface shall be completed by grinding using equipment as specified in the DSM listing for Line Removal Systems, Pavement Markings, or by abrasive blasting, using equipment and material as specified in the DSM listing for Line Removal Systems, Pavement Markings. If the temporary pavement markings are on the final pavement surface, all required pavement marking obliteration shall be completed by abrasive blasting, using equipment and material as specified in the DSM listing for Line Removal Systems, Pavement Markings.

d) Pavement markings to be left in place during seasonal shutdown shall be painted markings only and shall have had a second application of paint according to the requirements specified elsewhere in the Contract Documents.

e) All guide rail systems that are to remain in place during seasonal shutdown shall be installed to the elevation requirements for the pavement surface that will be in place during seasonal shutdown. The shoulders shall be graded to reflect the required guide rail height. Sufficient room on the posts shall be left to allow for adjustment to final guide rail height.

GENERAL REQUIREMENTS OF SAMPLES FOR QUALITY ASSURANCE, REFEREE AND OTHER TESTING BY THE OWNER OR THE OWNER'S AGENT

Special Provision No. 199F57 May 2023

Scope

This Special Provision covers the minimum requirements for the handling, identification, and delivery of samples to a laboratory for quality assurance, referee and other testing by the Owner or the Owner's agent.

Sampling and Identification

All samples shall be obtained and packaged by the Contractor, in the presence of the Contract Administrator or a designated representative. All samples shall be provided with a unique number by the Contract Administrator for identification purposes.

Sampling, handling, and storage of samples shall be as specified in the Contract Documents. Notwithstanding, the Owner may take samples for its own purposes at any time from any location. The Contractor shall furnish all reasonable assistance to the Owner and shall require its Subcontractors and suppliers to do the same.

The Contractor shall supply sample containers and all relevant Safety Data Sheets. All containers used for samples of materials controlled under the Workplace Hazardous Materials Information System shall be appropriate for the materials and shall be labelled and accompanied with the relevant Safety Data Sheets.

The Contractor shall package all samples to minimize risk of damage or contamination during transport. Once packaging is complete, the Contractor shall inspect all samples and confirm each sample and packaging is acceptable to the Contract Administrator for delivery.

After inspecting and determining that each sample is acceptable for delivery, the Contractor shall enter the sample data information. Upon the Contractor submitting the sample data information, the Contractor accepts responsibility that the information entered is accurate.

The Contractor shall place bags or containers of samples into clear polyethylene security bags supplied by the Owner when instructed by the Contract Administrator. At this point, the Contract Administrator shall take possession of, and assume responsibility for the samples. The Contract Administrator or their representative may apply security seals.

The Contractor shall be responsible for all costs associated with obtaining new samples if the original samples did not conform to the sampling requirements (e.g., weight and size) and were deemed unsuitable for testing by the laboratory or the Owner.

Sample Delivery by the Contractor

The Contractor shall be responsible for the delivery of concrete cylinders for strength and grout cubes for strength determination, and bridge bearing pads, to the laboratory designated by the Owner. All other samples shall be delivered by the Contract Administrator.

Samples delivered by the Contractor shall be within the time limits and locations specified in the Contract Documents. The Contractor shall normally deliver samples during normal business hours. Normal business hours are deemed to be from 8:00 a.m. to 5:00 p.m., each Business Day. Where a sample has to be delivered outside these hours, the Contractor shall give the laboratory one full Business Day notice.

If the time limits and/or locations for delivering samples are not specified in the Contract Documents, then the sample shall be delivered by the Contractor no later than 1 Business Day(s) from the date of sampling to the regional quality assurance laboratory located within a 150 km radius of the Contract limits.

For all samples delivered by the Contractor, the Contractor shall maintain a record of the date and time of delivery, and the printed name and signature of the authorized individual receiving the sample. The Contractor shall sign the laboratory’s records to confirm the date and time of delivery.

The Contractor shall be responsible for all costs associated with obtaining new samples if the original samples delivered by the Contractor are lost or deemed unsuitable for testing by the laboratory or the Owner.

The regional quality assurance laboratory shall be designated by the Owner.

600 MM X 1200 MM MAINTENANCE HOLES, CATCH BASINS, AND DITCH INLETS - Item No. 19

Special Provision

Amendment to OPSS.PROV 407

407.01 SCOPE

Section 407.01 is amended by the addition of the following:

The Contractor shall install an orifice plate on the inside of the ditch inlet drainage structure at the location detailed in the contract drawings.

407.02 REFERENCES

Section 407.02 is amended by the addition of the following:

ASTM International

A 653/A 653M-11 Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

407.04 DESIGN AND SUBMISSION REQUIREMENTS

OPSS.PROV 407.04 is amended by the addition of the following requirements:

407.04.01 Submissions Requirements

407.04.01.01 Precast Components

The submission shall also include the following information:

c) Orifice plate details including connection/fastening method between the structure and orifice plate;

OPSS.PROV 407.05 is amended by the addition of the following subsection:

407.05 MATERIALS

OPSS.PROV 407.05 is amended by the addition of the following subsection:

407.05.12 Orifice Plate

The orifice plate shall be galvanized steel in accordance with ASTM A 653/A 653M-11.

407.07 CONSTRUCTION

Section 407.07 of OPSS.PROV 407 is amended by the addition of the following subsections:

407.07.24 Installation of Orifice Plate

The elevation of the orifice plate shall be confirmed. The invert of the orifice shall be within +/- 10 mm of the design elevation shown on the plan. Once the elevation has been confirmed, the plate shall be affixed to the structure per the provided detail at the confirmed elevation.

FIBRE ROLL FLOW CHECK DAMS - Item No. 49
ROCK FLOW CHECK DAMS - Item No. 50

Special Provision No. 804F02 October 2021

Amendment to OPSS 804, April 2021

Timing Constraints for Temporary Erosion Control Measures

804.07 CONSTRUCTION

804.07.01 General

Subsection 804.07.01 of OPSS 804 is amended by the addition of the following clause:

804.07.01.01 Timing Constraints

Temporary erosion control shall be applied and removed during specified construction operations and associated activities that will result in earth disturbance, according to the timing constraints set out in Table A below:

TABLE A

Construction Operation	Points				Tender Item(s)	Timing
	No.	Location	Station	Offset		
MPY Site Construction	1	Glenarm Road	9+295	9.0m RT	0804-0155 Fibre Roll Flow Check Dams	Prior to contractor undertaking construction activities
MPY Ditch Grading	1	MPY Entrance	0+016	22.8m LT	0804-0155 Fibre Roll Flow Check Dams	Immediately following completion of perimeter ditch construction.
	2		0+061	16.0m LT		
	3		0+084	16.2m LT		
	4		0+103	15.8m LT		
	5	MPY Baseline 1	1+021	12.2m RT		
	6		1+089	12.1m RT		
	7		1+137	13.2m RT		
	8		1+175	9.1m RT		
	9		1+197	8.4m RT		
	10	MPY Baseline 2	2+002	7.2m LT		
	11		2+084	19.4m LT		
	12		2+141	7.9m LT		
	1	MPY Baseline 1	1+114	12.7m RT	0804-0165 Rock Flow Check Dams	Immediately following completion of perimeter ditch construction.
	2	MPY Baseline 2	2+031	8.3m LT		
	3		2+154	13.8m LT		

LIGHT-DUTY SEDIMENT BARRIERS - Item No. 51
FIBRE ROLL BARRIERS - Item No. 52
HEAVY-DUTY SEDIMENT BARRIERS - Item No. 53

Special Provision No. 805F01 January 2021

Amendment to OPSS 805, November 2020

Timing Constraints for Temporary Sediment Control Measures

805.07 CONSTRUCTION

805.07.01 General

805.07.01.05 Construction and Removal of Measures

Clause 805.07.01.05 of OPSS 805 is deleted and replaced by the following:

Further to requirements specified in the Contract Documents, the following items shall be installed and removed according to the timing constraints set out in Table A below:

Table A

Tender Item	Location	Timing Constraints	
		Installation	Removal
Light Duty Sediment Barrier	See Contract Drawings	Prior to contractor undertaking construction activities	Upon receiving direction from the contract administrator/site inspector
Fibre Roll Barriers	See Filter Sock in Mud Mat Detail	Prior to contractor undertaking construction activities	Upon receiving direction from the contract administrator/site inspector
Heavy Duty Sediment Barrier	See Contract Drawings	Prior to contractor undertaking construction activities	Upon receiving direction from the contract administrator/site inspector

SHRUB, 600 MM HEIGHT - Item No. 54
CONIFEROUS TREE, 2.0 M HEIGHT - Item No. 55
DECIDUOUS TREE, 50 MM CALIPER - Item No. 56
DECIDUOUS TREE, 60 MM CALIPER - Item No. 57

Special Provision No. LAND0001

REQUIREMENTS FOR PLANTING

1.0 SCOPE

This specification covers the requirements for the planting of trees, shrubs, perennials, bulbs and aquatic vegetation.

2.0 REFERENCES

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 801 Protection of Trees

Ontario Ministry of the Environment

Interim Guidelines for the Production and Use of Aerobic Compost in Ontario
Guideline for the Production of Compost in Ontario.

Other

Canadian Nursery Trades Association/Landscape Canada
Canadian Standards for Nursery Stock
International Code of Botanical Nomenclature for Cultivated Plants
Standardized Plant Names

3.0 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Aquatic Vegetation means a plant that grows partly or wholly in water whether rooted in the streambed, floating without anchorage or rooted along a waterbody bank.

Broken Bud means the point at which buds swell and bud scales split apart.

Composite Soil Sample means several smaller subsamples taken randomly throughout the field, then mixed together for one large representative sample.

Green Organic Waste Material means a solid mature product resulting from composting, which is a managed process of bio-oxidation of a solid heterogeneous organic substrate including a thermophilic phase.

Horticultural soil means a mixture of existing topsoil and other recommended amendments as specified in the Contract Documents.

Root Crown means the part of the root system from which the stem arises.

Root Zone means the area of roots and soil beneath the canopy of the tree measured 38 cm out from the trunk for every 2.5 cm of trunk diameter; or in the case of newly planted trees the root zone is the volume comprised of roots and soil contained within the wire basket, burlap or container.

Streambed means the bottom of the channel where a watercourse flows.

Subsoil means the layer of soil under the topsoil on the surface of the ground. Like topsoil it is composed of a variable mixture of small particles such as sand, silt and/or clay, but it lacks the organic matter and humus content of topsoil.

Systemic Herbicide means a chemical substance used to destroy or inhibit the growth of plants.

Topsoil means the upper, outermost layer of soil usually the top 2 inches (5.1 cm) to 8 inches (20.3 cm).

Waterbody means any permanent or intermittent, natural or constructed body of water including lakes, ponds, wetlands and watercourses, but does not include sewage works as defined in the Ontario Water Resources Act.

Waterbody Bank means the slope on or adjacent to a waterbody from the normal water level to the top of slope.

Watercourse means a stream, creek, river, or channel including ditches, in which the flow of water is permanent, intermittent, or temporary.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

4.01 Proof of Qualifications

Proof that all personnel performing planting and related work are qualified and experienced in doing such work shall be provided to the Contract Administrator prior to commencement of planting. This shall include proof that the crew foreman has at least five (5) years of horticultural planting experience and that at least one member of the crew has a horticultural diploma unless otherwise specified in the Contract Documents.

4.02 Submission of Soil Analysis Report

A soil analysis report shall be submitted to the Contract Administrator at least twenty four (24) hours prior to use of the material as horticultural soil.

A soil analysis report shall be submitted for each distinct source and type of material intended for use as horticultural soil.

A soil sample submission form shall be completed in full for each soil sample submitted.

The soil analysis report shall include:

a) Texture analysis or particle size analysis, percent composition by mass of sand, silt and clay;
b) Level of soluble salts;
c) Organic matter percent composition;
d) Acidity or alkalinity (pH); and
e) Phosphorus (P), Potassium (K), Magnesium (Mg), Chloride (Cl) and Sodium (Na) nutrient levels.

The soil analysis report shall include the soil science laboratory recommendations for improving any of the tested soil values for the following indicators:

a) Organic matter
b) Acidity (pH)
c) Phosphorus (P), Potassium (K) and Magnesium (Mg)

5.0 MATERIALS

5.01 Aquatic Vegetation

Preference shall be given to aquatic vegetation collected on-site from areas specified in the Contract Documents.

5.02 Horticultural Soil

Horticultural soil shall be a fertile, loose, friable, natural sandy loam containing not less than 15% organic matter with and acidity value ranging from pH 6.0 to pH 7.5. Clods from 1 to 3 inches (2.5 to 7.5 cm) shall make up less than 10% of the soil volume and clods 3 to 6 inches (7.5 to 15 cm) shall be < 5%.

Horticultural soil shall not contain any unsuitable materials greater than 2 inches (5 cm) in diameter. Unsuitable materials include but are not limited to, debris, man-made materials, roots, stumps, rocks stones, subsoil, or other foreign material

Horticultural soil shall be free of toxic chemical substances and contaminants that adversely affect plant growth.

5.03 Compost

Compost shall be derived from well-composted green organic waste matter or cow or sheep manure and shall contain a minimum of 15% organic matter.

All compost material shall meet or exceed the Ontario Ministry of the Environment and Climate Change (MOECC) requirements for compost as a product for unrestricted use as described in the MOECC publication Guideline for the Production of Compost in Ontario.

5.04 Fertilizer

Fertilizer used at the time of planting shall be in granular form, dry, free flowing, free of lumps and shall consist of superphosphate, with a minimum content of 20% phosphoric acid.

All fertilizer shall be supplied in bags bearing the manufacturer's label indicating mass and chemical composition.

5.06 Stakes

All stakes shall be new wood stakes with a hole drilled 50 mm from the top to accommodate a support wrap.

Stakes used for staking trees shall be 50 mm by 50 mm by 2 m. A minimum of 60 cm of the stake shall be underground with the stake no higher than half the height of the tree.

Stakes used for guying trees shall be 50 mm by 50 mm by 150 cm.

5.07 Support Wraps

All support wraps shall be bio-degradable fabric.

Wire and rubber hose for guying trees shall not be permitted.

5.08 Anti-Desiccant

Anti-desiccant emulsion shall be specifically manufactured to provide a flexible surface film to reduce transpiration yet not impede passage of carbon dioxide and oxygen.

5.09 Mulch

Mulch shall be shredded bark, free of twigs, leaves, branches and other foreign material in a finished product size of 20 mm to 50 mm.

5.10 Tree Guards

Tree guards to protect deciduous trees from rodent damage shall be a spiral plastic tree wrap, perforated, ultra-violet protected, and supplied in minimum 600 mm lengths.

5.11 Plant Material

All plant material shall be nursery grown and meet the horticultural standards for grading and quality according to the Canadian Standards for Nursery Stock except for those plants that have been designated for protection and relocation.

Only nursery stock that has been propagated vegetatively or from seed shall be utilized. Native plant material collected from the natural environment shall not be accepted.

Nomenclature of specified plants shall be according to the International Code of Botanical Nomenclature for Cultivated Plants and shall be according to the approved scientific names given in the latest edition of the Standardized Plant Names.

All plant material upon arrival at the site shall be clearly identified by labels indicating species, size and supplier. Substitutions for the specified plants will not be accepted unless approved in writing by the Contract Administrator.

Plant material shall be true to type and structurally sound, with straight trunks and leaders intact, and be well and characteristically branched for the species. All plant materials shall be free of disease, insect infestation, rodent damage, sun scald, frost cracks and other abrasions or scars to the bard. Plant material shall be densely foliated when in leaf and have a healthy, well developed root system.

Container grown plant material shall have been grown in the same container for a minimum period of six (6) continuous months prior to planting.

Plant material shall not be cut back from larger sizes to meet the material requirements.

Bare root plant material shall not have broken bud at the time of planting.

Root balls shall be free from pernicious perennial weeds.

5.12 Burlap, Rope and Tie Materials

Where balled and burlapped plant material is specified, the burlap, rope, and any tie materials shall be manufactured from natural organic fibers.

Burlap used for rootballs shall be untreated and free from toxic contaminants.

5.13 Bulbs

Bulbs shall be number one size and supplied from a local supplier.

5.14 Water

Water shall be free from contaminants which would adversely affect plant growth.

6.0 EQUIPMENT

6.01 Pruning Tools

All pruning equipment shall be designed specifically for tree work and shall be capable of producing clean, flush cuts without tearing or fraying the bark.

Pruning equipment shall be disinfected between each use to reduce contamination.

7.0 CONSTRUCTION

7.01 Operational Constraints

All planting and related work shall be done by experienced, qualified personnel under the direction and supervision of foremen with at least five (5) years of horticultural and planting experience. At least one person on the crew shall have a horticultural diploma.

Planting shall be performed within the time periods specified in Table 1 or as specified in the Contract Documents.

Container grown or balled and burlapped plant material of the same species and variety may be substituted for bare root plants, at no additional cost to the Owner.

The location of trees and the perimeter of areas to be planted with shrubs shall be laid out by staking as specified in the Contract Documents a minimum of five (5) Business Days in advance of the commencement of planting for approval by the Contract Administrator.

7.02 Mixing Existing Topsoil and Compost

Existing topsoil shall be mixed with compost in the following ratios:

Topsoil	0.7 per m^3
Compost	0.3 per m^3
Superphosphate	0.6 per kg

After mixing, the organic matter content shall not exceed 15% or be less than 10%.

Compost shall be mixed into planting areas on site.

7.03 Transportation, Storage and Excavation

7.03.01 General

All plant material shall be protected from damage according to OPSS 801, and protected from environmental conditions during transport and until planted.

All plant material, including balled, burlapped and container grown, shall be kept moist at all times.

The Contract Administrator shall be notified of the source of plant material at least seven (7) Days in advance of transportation to the site. Plant material shall be made available for inspection upon arrival at the site. Approval of plant materials at source of supply shall not ensure acceptance upon arrival at the site or during

the course of construction.

Labels shall not be removed from plants until they have been inspected, planted and approved by the Contract Administrator.

Roots, trunks and branches of all trees and shrubs shall be protected from abrasion, breakage, and exposure to sun and wind during transport.

Plant materials shall be transported in enclosed vehicles or covered with a tarpaulin. The temperature during transportation shall be maintained as uniformly as possible by mechanical or other means and shall not be cracked, broken, or damaged at time of planting.

All plant materials that cannot be planted immediately upon arrival on the site shall be well protected with soil or similar materials to prevent drying out.

Transport of plant material and excavation of planting holes shall be co-ordinated to ensure minimum time lapse between excavation and planting.

Root masses collected from job sites or adjacent properties as authorized prior to construction shall be kept moist and shaded prior to installation. Masses shall be installed with the root crown at the same elevation existing prior to removal.

7.04.02 Bare Root Stock

All bare root material shall be dug according to the Canadian Standards for Nursery Stock.

Bare root material shall be moved while dormant with the major portion of the fibrous root system provided.

Bare root stock shall be kept dry. Plants not immediately installed shall be kept in refrigerated conditions.

7.04.03 Balled and Burlapped or Container Grown Stock

Balled and burlapped or container grown plant material shall be dug and potted according to the Canadian Standards for Nursery Stock.

All deciduous trees and shrubs which have broken bud and all coniferous trees shall be thoroughly sprayed with an anti-desiccant.

7.05 Aquatic Vegetation

Where aquatic vegetation is excavated from a streambed or waterbody bank, there shall be a 20 cm radius from the stem of the vegetation and 20 cm depth excavated to ensure sufficient root material remains intact. The streambed material excavated with the roots of the vegetation shall also be kept intact.

Aquatic vegetation purchased from a nursery shall be transported in a manner that keeps it moist and free of damage.

Aquatic vegetation shall be stored on-site in a manner that keeps it moist and free from damage prior to planting.

7.06 Area Preparation

Excavation shall not commence prior to the Contract Administrator’s inspection and approval of staking.

Areas of established turf such as riparian areas and other areas of undisturbed ground shall be cultivated prior to planting. Cultivating shall occur to a depth of 600 mm and areas shall be protected between

cultivation and planting to prevent compaction by other machinery on site.

Areas that are to be planted with shrubs in mass shall have the entire area cultivated in two directions, perpendicular to one another, and prepared.

7.07 Excavation of Planting Pits

For bare root plant material, all planting pits shall be excavated and prepared to accommodate the size of the bare root. The minimum width of excavation shall be two times the circumference of the root system.

Disturbed subgrade or fill below the rootball shall be compacted to prevent settlement such that the top of the rootball remains at the proper finished grade. Planting pits or areas shall be tested for drainage and percolation by filling with water prior to planting. Water should percolate at a rate no less than 2.5 to 5 cm/hour. Poor drainage or percolation shall be reported to the Contract Administrator.

Planting pits for trees shall have a minimum width of excavation of five times the root ball or root system diameter at the top, and three times the root ball or root system diameter at the bottom.

The bottom of all planting pits shall be protected from freezing.

7.08 Planting of Trees, Shrubs, Perennials, and Bulbs

All plant material shall be placed in the planting pit on undisturbed ground.

All trees shall be planted so that their normal root crown is 50 mm above existing grade. All shrubs shall be planted so that the ground elevation in the pit after planting is 25 mm above existing grade. Perennials shall be set 25 mm above grade.

Plant material supplied in plastic containers shall have the containers carefully removed prior to planting. The rootball shall be cut vertically three times evenly around the circumference. Depth of cut shall be 10 mm to 15 mm. Plants with circling roots will not be accepted and shall be replaced.

Plant material supplied in fiber pots shall have the pot removed prior to planting. If roots have grown into fiber pot, the pot shall be left in place and slit vertically from top to bottom of pot in three locations.

Plant material supplied bare root shall be placed so that the roots lie in their natural position. Broken roots shall be pruned prior to planting.

Plant material supplied balled and burlapped shall have the burlap, ropes, and ties removed from the top of the rootball by folding down at least 100 mm into the excavated pit. All synthetic materials shall be removed prior to planting.

Plant material supplied in wire baskets shall have the wire baskets cut. The top 100 mm of the wire basket shall be removed from the entire circumference of the wire basket after placement of the plant material and prior to backfilling.

Outside roots of root bound plants shall be gently loosened. Rootballs shall be pruned if defects are present.

Following planting, all shrubs shall be sprayed with rodent guard according to the manufacturers recommendations to prevent rodent damage.

All bulbs shall be planted according to the planting recommendations for that particular bulb (rhizome or tuber).

7.09 Planting Aquatic Vegetation

Aquatic vegetation shall be planted as soon as practicable after on-site collection or purchase from a nursery.

A hole large enough to accommodate the roots of the aquatic vegetation shall be dug into the streambed or waterbody bank. The roots shall be placed in the hole and any remaining voids in the hole filled in with previously excavated or adjacent streambed material.

The streambed material surrounding the planted aquatic vegetation shall be tamped down to secure the vegetation into the streambed.

7.10 Backfilling of Planting Pit

The planting pit shall be backfilled with the horticultural soil firmly tamped layers of 150 mm depth, taking care not to injure the root system or create air pockets. Each layer shall be watered after tamping.

When the planting pit has been backfilled, an earth berm of 100 mm height and 150 mm width shall be formed around each planting pit. The berm may be formed from the excavated material. If the pit is on a slope, the lower edge and sides shall be built up to match the edge height on the opposite side.

Horticultural soil that is in a frozen or saturated condition shall not be used to backfill.

7.11 Watering

All plant material shall be watered immediately after planting.

Water shall be uniformly applied to each tree by two injection applications directly into the soil. Both injections shall be located at the outer edge of the planting pit area and shall penetrate the ground to a depth of 450 mm at the commencement of the watering operation. The second injection shall be located 180 degrees from the initial injection. Sufficient water shall be applied to each tree to thoroughly soak the root zone.

Water shall be applied to each shrub uniformly at a maximum precipitation rate of 5 mm per hour. A soft spray nozzle shall be used to thoroughly soak the root zone and to avoid damage or dislodging of the soil.

7.12 Guying, Staking and Tying

All shrubs, deciduous trees less than 2.0 m in height, and coniferous trees less than 1.5 m in height, do not require staking or guying.

Trees shall be staked or guyed as follows:

a) All deciduous trees greater than 2.0 m and less than 3.0 m in height require one stake.
b) All deciduous trees 45 mm caliper require one stake.
c) All deciduous trees 60 mm caliper or greater require two stakes.
d) All coniferous trees equal to or greater than 1.5 m in height require guying.

All trees requiring staking and guying shall be staked and guyed immediately following planting to ensure vertical alignment and plant stability.

Bright red plastic surveyor's tape shall be tied to all guy wires. The tape shall be tied halfway up the length of wire and shall be clearly visible. Guy wires shall be tightened using galvanized turnbuckles or guy wire tighteners.

Support wraps and stakes shall be removed from the tree after one growing season and shall be inspected periodically within the one year period for trunk damage. One finger width of space shall be maintained between the trunk and support wrap to allow movement in the trunk. Wraps shall not criss cross.

Stakes shall not be driven through any part of the root ball.

7.13 Pruning

Each deciduous tree or shrub shall be pruned to remove dead, broken or injured branches after planting. Pruning shall not change the natural shape of the plant and shall be carried out according to size and species in accordance with accepted arboricultural practice.

Coniferous trees shall be pruned only to remove dead, broken or injured branches.

7.14 Tree Guard Installation

Tree guards shall be installed around all deciduous trees prior to the application of mulch.

Deciduous trees less than 1.75 m in height shall be protected using a spiral, plastic, perforated tree wrap installed according to the manufacturer's instructions. Wrap should be cut short of branches if branches are lower than 600 mm. Tree guards shall be installed with no gaps between the wraps. Wrap shall touch the soil surface.

7.15 Mulch Application

Immediately after planting, initial watering and tree guard installation, mulch shall be applied in a uniform continuous blanket of 100 mm minimum depth to the surface area surrounding each individual plant.

For all trees the bark chip surface area shall extend over the actual planting pit and the earth berm and shall include a 200 mm radius beyond the circumference of the planting pit. Mulch is to come no closer than 100 mm to trunk of tree.

For all shrubs the complete surface area of each shrub bed, including the entire surface area within the perimeter of the shrub grouping, shall be covered with mulch. Mulch shall extend a minimum of 500 mm from the centre of the outside row of shrubs.

7.16 Management of Excess Material

Management of excess material shall be as specified in the Contract Documents.

8.0 QUALITY ASSURANCE

8.01 Prior to Planting

All plant material will be inspected by the Contract Administrator upon delivery to the site.

Plant material shall be acceptable when it is structurally sound, well furnished with living foliage, normal colour, show adequate annual growth and formation of buds and be free from blight of any description.

Roots shall be well established and uniformly spread throughout the specimen. Roots shall be free of defects, disease or evidence of girdling.

Plant material which does not meet the above requirements or which has severely “died back” and has re-grown from a bud or shoot, or been damaged by rodents, shall be rejected.

Rejected plant material shall be removed from the Working Area and replaced with acceptable material.

8.02 After Planting

8.02.01 Establishment

A minimum thirty (30) day establishment period shall take effect immediately after all planting has been completed to allow for evidence that new plants are alive and thriving. If planting is not completed until after October 15th the minimum thirty (30) day establishment period shall commence on May 15th of the following year.

Plants that fail to meet the acceptance criteria shall be replaced within 30 days of notification by the Contract Administrator and within the time constraints identified in Table 1. If there is insufficient time remaining within the time constraints identified in Table 1 then replacement shall be completed the following year within 30 days of the commencement of the time constraints identified in Table 1.

There shall be a maximum one-time replacement of plants required during the establishment period. The establishment period shall extend for an additional 30 days from the date that all necessary replacements have been completed after which time the warranty period shall commence.

The establishment period does not apply to bulb planting.

8.02.02 Maintenance

Maintenance shall be provided from the time of planting to the end of the warranty period.

Maintenance shall include watering and fertilizing, control of weeds and grasses in all mulched areas, application of rodent protection and pesticides as required, repairs to stakes, ties, wire and hose, tree guards, and the wrapping and unwrapping of all coniferous trees 1.25 m or greater for winter protection.

Stakes, guy wires and support ties shall be maintained then removed after one full growing season. Ties shall be checked every three (3) months to ensure that they are not rubbing against the bark, and shall be loosened, repaired or replaced as necessary. All stakes, guy wires and support ties shall be removed after the first growing season.

Plant material shall only be pruned to remove all dead, damaged, weak, or diseased, wood or growth that poses a threat to human health and safety.

Plant material shall be fertilized only as required to correct symptoms of nutrient deficiency, except where otherwise recommended on the basis of soil or tissue test results. All work shall be done in accordance with the Canadian Fertilizer Act and in agreement with all applicable local legislation federal, provincial and municipal, codes and by-laws, which may restrict or prohibit certain activities such as the application of pesticides.

The Contract Administrator shall be notified twenty four (24) hours prior to commencing any maintenance operation. A monthly maintenance report shall be provided to the Contract Administrator, indicating the maintenance that was carried out and the dates on which it was completed.

8.02.03 Warranty

If all plants are accepted at the end of the initial 30 day establishment period then the warranty period shall commence immediately after the initial 30 day establishment period.

If all plants are not accepted at the end of the initial 30 day establishment period then the warranty period shall commence 30 days from the date that all necessary replacements are completed.

The warranty period shall extend for two years (24 months) and shall cover any defects in material and workmanship. Plants that fail to meet the acceptance criteria at any time during the warranty period shall be

replaced within 30 days of notification by the Contract Administrator.

Plants that fail to meet the acceptance criteria more than twice shall only be replaced after consultation with the ministry Landscape Architect to determine alternate solutions.

Plants damaged by ungulates are exempt from replacement.

8.02.04 Acceptance and Replacement

Plants may be inspected for acceptance any time after planting provided the date is prior to leaf drop or last frost. If the date is after leaf drop or frost, the inspections shall be scheduled for 30 days after the start of the next growing period. No inspections will occur after leaf drop. Plants that do not meet the acceptance criteria shall be replaced within 30 days notification by the Contract Administrator.

Plants shall be accepted when they are:

a) alive and thriving,
b) structurally sound,
c) furnished with living foliage of normal colour,
d) show adequate annual growth and formation of buds, and
e) are free from blight of any description.

Plants that do not meet this criteria or that have severely “died back” and regrown from a bud or shoot, or have been damaged by rodents, shall be replaced.

Replacements shall be plants of the same size and species and shall be supplied and planted as specified in the Contract Documents and this specification. The Owner reserves the right to extend the warranty responsibilities for one (1) additional year if, at the end of the initial warranty period, leaf development and growth is not sufficient to ensure future survival.

9.0 MEASUREMENT FOR PAYMENT

9.01 Actual Measurement

9.01.01 Aquatic Vegetation
Bulb
Shrub Root Mass
Shrub, 600 mm Height
Shrub, 1.0 m Height
Coniferous Tree, 500 mm Height
Coniferous Tree, 1.0 m Height
Coniferous Tree, 1.5 m Height
Coniferous Tree, 2.0 m Height
Deciduous Tree, 2.0 m Height
Deciduous Tree, 45 mm Caliper
Deciduous Tree, 50 mm Caliper
Deciduous Tree, 60 mm Caliper
Deciduous Tree, Whip
Perennial, 10 cm Pot
Perennial, 1 Gal. Pot

For measurement purposes, a count shall be made of the number of bulbs, perennials, trees, shrubs, shrub root masses, and aquatic vegetation planted.

9.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

10.0 BASIS OF PAYMENT

10.01 Aquatic Vegetation - Item
Bulb - Item
Shrub Root Mass - Item
Shrub, 600 mm Height - Item
Shrub, 1.0 m Height - Item
Coniferous Tree, 500 mm Height - Item
Coniferous Tree, 1.0 m Height - Item
Coniferous Tree, 1.5 m Height - Item
Coniferous Tree, 2.0 m Height - Item
Deciduous Tree, 2.0 m Height - Item
Deciduous Tree, 45 mm Caliper - Item
Deciduous Tree, 50 mm Caliper - Item
Deciduous Tree, 60 mm Caliper - Item
Deciduous Tree, Whip - Item
Perennial, 10 cm Pot - Item
Perennial, 1 Gal. Pot - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

Progress payments shall be based on the following percentages of the Contract price for milestones accepted by the Contract Administrator:

a) 50% for planting

b) 30% at the end of the establishment period

c) 20% at the end of the warranty period

Final payment for these Contract items shall occur at the end of the warranty period, provided all plant material has been properly maintained, stakes, guys and ties have been removed and unacceptable plant material properly replaced.

The replacement of plants that fail to meet the acceptance criteria shall be at no additional cost to the Owner.

Table 1
Time Constraints for Planting

Plant Type	**Southwestern Ontario** (Note 1)	**Southern Ontario** (Note 2)	**Northern Ontario** (Note 3)
Bare Root Deciduous Shrubs and Trees	May 1 - to May 31	May 1 - Jun 7	Jun 1 - Jun 30
Balled and Burlapped or Container Grown Deciduous Shrubs and Trees	May 1 - Jun 30 Sep 1 - Sep 30	May 1 - Jun 30 Sep 1 - Sep 30	May 1 - Jun 30 Sep 1 - Sep 15
Balled and Burlapped or Container Grown Coniferous Trees	Frost Free Conditions	Frost Free Conditions	Frost Free Conditions

Notes:
1. That area south of a line joining Grand Bend and Clarkson.
2. That area between the boundaries of Southwestern and Northern Ontario.
3. That area north of a line joining Waubaushene, Severn Bridge, Bancroft and Ottawa.

HIGH VOLTAGE CABLES, IN DUCTS - Item No. 63
LOW VOLTAGE CABLES, IN DUCTS - Item No. 64

Special Provision

Amendment to OPSS 604, November 2017

604.07 CONSTRUCTION

604.07.13 Splices and Terminations

Subsection 604.07.13 is amended by the addition of the following:

High-voltage, low-voltage and traffic signal lengths provided shall be of sufficient length such that there are no splices between any cable provided for site electrical installations included under Ontario Provincial Standard Specifications (OPSS) and cabling required to complete building and facility installations that are included under the National Master Specifications (NMS) unless otherwise noted in the contract package.

LED ROADWAY LIGHTING LUMINAIRES AND BRACKET ASSEMBLIES - Item No. 71

Special Provision No. 617F03 January 2020

Amendment to OPSS 617, November 2019

617.05 MATERIALS

617.05.01 Luminaires

617.05.01.04 LED Roadway Lighting Type

Clause 617.05.01.04 of OPSS 617 deleted in its entirety and replaced with the following:

LED roadway lighting luminaires shall be according to the Contract Documents and the requirements as described in Table 2.

TABLE 2
Description of LED Roadway Lighting Luminaires

Description
Intersection of MPY at Glenarm Road – Poles P12 & P13*
LED roadway lighting luminaire(s) - **88** -Watt, IES type **III** distribution, for **347** -Volt operation. Manufacturer's Name & Photometric curve(s): **American Electric Lighting ATB0-P204-347-R3-4K-P7-SH.ies**.
OR
LED roadway lighting luminaire(s) - **104** -Watt, IES type **III** distribution, for **347** -Volt operation. Manufacturer's Name & Photometric curve(s): **Cooper Lighting Solutions VERD-CA2-100-740-9-T3-AP-PR7-RA1013.ies**.
Site Lighting – Poles P2, P6, P10 & P11*
LED roadway lighting luminaire(s) - **159** -Watt, IES type **III** distribution, for **347** -Volt operation. Manufacturer's Name & Photometric curve(s): **American Electric Lighting ATB0-P453-347-R3-4K-P7-SH.ies**.
OR
LED roadway lighting luminaire(s) - **153** -Watt, IES type **III** distribution, for **347** -Volt operation. Manufacturer's Name & Photometric curve(s): **Cooper Lighting Solutions VERD-M-CA3-150-740-9-T3-AP-PR7-RA1013.ies**.
Site Lighting – All other poles*
LED roadway lighting luminaire(s) - **233** -Watt, IES type **IV** distribution, for **347** -Volt operation. Manufacturer's Name & Photometric curve(s): **American Electric Lighting ATB2-P603-347-R4-4K-P7-SH.ies**.
OR
LED roadway lighting luminaire(s) - **223** -Watt, IES type **IV** distribution, for **347** -Volt operation. Manufacturer's Name & Photometric curve(s): **Cooper Lighting Solutions VERD-M-CA4-220-740-9-T4-AP-PR7-RA1013.ies**.
*All luminaires shall be complete with 7-pin receptacle and shorting cap. Contractor shall supply luminaires from one Manufacturer option for installation.

617.05.01.05 LED High Mast Lighting Type

Clause 617.05.01.05 of OPSS 617 deleted in its entirety and replaced with the following:

LED high mast lighting luminaires shall be according to the Contract Documents and the requirements as described in Table 3.

TABLE 3
Description of LED High Mast Lighting Luminaires

Description
LED high mast lighting luminaire(s), high bay type, ____ -Watt, IES type ____ distribution, for ___ -Volt operation. Manufacturer's Name & Photometric curve(s): _____.

DEWATERING SYSTEM - Item No. 72

Special Provision No. 517F01 February 2024

Amendment to OPSS 517, November 2023

Return Period Flow and Preconstruction Survey Distance

517.04 DESIGN AND SUBMISSION REQUIREMENTS

517.04.01 Design Requirements

Clause 517.04.01.01 of OPSS 517 is amended by deleting the second last paragraph in its entirety and replacing it with the following:

The temporary flow passage system shall allow the work to be conducted as specified in the Contract Documents. Design flow shall include groundwater discharge and flow resulting from a minimum 2 year return period design storm, except for the work specified in Table 1. For the work specified in Table 1, design flow shall include groundwater discharge and flow resulting from a design storm of the minimum return period specified in Table 1. A longer return period shall be used when determined appropriate for the work.

The flow estimates as specified in Table 1 do not include flow volumes from groundwater discharge.

The Owner specifically excludes flow estimates from the warranty in the Reliance on Contract Documents subsection of OPSS 100, MTO General Conditions of Contract.

TABLE 1
Site Location and Reference Information

TEMPORARY FLOW PASSAGE SYSTEMS							
Source of Return Period Flow Estimates:							
Site Name / Station Reference	**Minimum Return Period (Years)**	**Return Period Flow Estimates (m^3/s)** (Note 1)				**Design Engineer Requirements** (Note 2)	**Fish Passage Required** (Note 3)
		2 Year	**5 Year**	**10 Year**	**25 Year**		

DEWATERING SYSTEMS			
Site Name / Station Reference	**Preconstruction Survey Distance (m)** (Note 4)	**Minimum Lowered Groundwater Depth Below Base of Excavation or Work Area (m)** (Note 5)	**Design Engineer Requirements** (Note 2)
Fenelon Falls MPY Vehicle Maintenance Garage	N/A	268.500	No
Fenelon Falls MPY Auxiliary Storage Building	N/A	268.188	No
Fenelon Falls MPY Material Storage Building	N/A	267.000	No

Notes:

1. a) The Design Engineer is to satisfy themselves to the accuracy and applicability of the provided flows.
   b) The intensity-duration-frequency (IDF) information can be accessed through MTO's IDF Curve Lookup web-based application tool at https://idfcurves.mto.gov.on.ca/
   c) The design, operation and maintenance of the temporary flow passage system is the sole responsibility of the Contractor.
2. "Yes" means the design Engineer and design-checking Engineer shall have a minimum of 5 years of experience in designing systems of similar nature and scope to the required work. "No" means a minimum experience level is not required for the design Engineer and design-checking Engineer.
3. "Yes" means that the design Engineer must design the temporary flow passage system to meet the fish passage requirements. "No" means fish passage is not required.
4. "N/A" means a preconstruction survey is not required.
5. Groundwater shall be lowered within the excavation or work area to below this minimum depth.

WATER WELL AND PUMP SYSTEM - Item No. 74

Special Provision

1.0 SCOPE

This specification covers the requirements for the supply and placement of two new water wells and pump systems at the Fenelon Falls Patrol Yard (MPY), as shown on the Contract Drawings and as specified herein. One well will service the plumbing fixtures in the Vehicle Maintenance Garage and the other well will be dedicated for the truck wash bay in the Vehicle Maintenance Garage. The scope of work shall include the design, supply and construction of the new well systems including the drilled wells with steel casings, pitless adapters, decorative well head covers, submersible pumps, water supply lines from the wells to the building, well controls including pressure tanks and pressure switches and all appurtenances and other items required for complete functioning well systems. This item does not include the water treatment systems required for each well. See the National Master Specification documents for information regarding the well water treatment systems.

The requirements for the water well and pump system shall be coordinated with the Vehicle Maintenance Garage Building plumbing system requirements specified in the National Master Specifications (NMS) elsewhere in the Contract.

2.0 REFERENCES – Not Used

3.0 DEFINITIONS – Not Used

4.0 DESIGN AND SUBMISSION REQUIREMENTS

Contractor shall submit product documentation to Contract Administrator for review. Shop drawings shall be submitted with the Contractor's stamp and approval as evidence of the Contractor's review and coordination with the affected trades as well as sealed and signed by a Professional Engineer registered in Ontario. Shop drawings shall convey or be accompanied by calculations or other sufficient information to explain the system such as product data. Product data includes catalogue information, material lists, diagrams, performance curves and other descriptive information clearly identifying components being provided. Review of the shop drawings is for compliance with the design intent and does not relieve the Contractor of responsibility for its accuracy or for compliance with the contract documents.

A Request to Proceed shall be submitted to the Contract Administrator at least 10 business days prior to commencement of the work.

The next operation shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

5.0 MATERIALS – Not Used

6.0 EQUIPMENT

The 150 mm dia wells shall be installed at a depth suitable to provide the minimum target pumping rate of 57 LPM (15GPM) for the well servicing the plumbing fixtures of the Vehicles Maintenance Garage and 38 LPM (10GPM) for the well servicing the wash bay of the Vehicle Maintenance Garage. It can be assumed, based on nearby well record information, that the well will be less than 75 m deep. A submersible pump rated for the achieved pumping rate and well depth shall be utilized.

The size of the water supply lines from the well to the building shall be determined by the Contractor as part of the integrated system design. 38mm supply lines are currently shown on the Contract Drawings, but the size shall be confirmed by the Contractor. 38mm is the minimum pipe size.

The well heads shall be covered with a decorative well casing cover. The decorative well casing cover shall be fiberglass and secured to the surrounding ground surface or concrete sidewalk. Three options for the well head cover shall be provided to the Contract Administrator for review and to select the cover for this site.

7.0 CONSTRUCTION

The well system, water pump and associated appurtenances shall be installed according to and at the location specified in the Contract Documents. Bedding to be 19 mm clear stone with Terrafix 270 R geotextile or approved equal.

Construction and development of the well must comply with Ontario Regulation 903 under the Ontario Water Resources Act to provide water to the Arnprior MPY. The well system shall include a submersible pump complete with steel casing, pressure tank, pressure switches, pitless adapters, site piping and all appurtenances. All water lines feeding the building shall be installed below the frost line or have adequate insulation to protect the lines from freezing. Note, insulation will only be accepted as a method of freeze protection directly adjacent to the building foundation where the water lines enter the building since penetrations through the foundation wall will be made above the footing. All other locations shall have frost protection from ground cover.

A licensed well contractor is required when installing a new water supply well under O. Reg. 903 under the Ontario Water Resources Act (OWRA).

Licensed contractors are required to use licensed well technicians who have the proper class of licence to conduct or supervise any work being done on the well.

8.0 QUALITY ASSURANCE

Provide a written warranty for the installed equipment that includes travel and incidentals for one year and provide three sets of O&M Manuals.

Provide the Contract Administrator with licenses for all well contractors and well technicians working on the new well construction. The license information shall be provided to the Contract Administrator a minimum of 10 days prior to starting construction on the well.

The Contract Administrator may request documentation and obtain and test components to ensure compliance with this specification.

The Contract Administrator may perform a visual inspection to determine conformance with the workmanship, design, and dimensional requirements of this specification and the Contract Documents.

Material not in compliance shall be removed and properly disposed off site and replaced by the Contractor at no additional cost to the Owner.

9.0 MEASUREMENT FOR PAYMENT – Not Used

10.0 BASIS OF PAYMENT

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment and Material required to do the work.

UTILITY BUILDING - Item No. 75

Special Provision

1.0 SCOPE

This tender item includes the construction of an Auxiliary Storage Building (Utility Building) at the Fenelon Falls Patrol Yard (MPY). It includes all work described on the Contract Drawings and referenced within the following specification sections.

2.0 REFERENCES

This Contract refers to specifications contained in the National Master Specifications (NMS) as amended or modified elsewhere in the Contract.

The following NMS sections are relevant to this item:

All applicable NMS sections included in the Contract Package.

3.0 DEFINITIONS

National Master Specifications (NMS) mean master specifications prepared by National Research Council Canada. The NMS is the most comprehensive master specification in Canada, serving as an easy-to-use framework for writing construction project specifications. Additional information can be found at *https://nrc.canada.ca/en/certifications-evaluations-standards/canadian-national-master-construction-specification*

Definitions are defined in the relevant specification sections identified above.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

Design and submission requirements are specified in the relevant specification sections identified above.

5.0 MATERIALS

Material requirements are specified in the relevant specification sections identified above.

6.0 EQUIPMENT

Equipment requirements are specified in the relevant specification sections identified above.

7.0 CONSTRUCTION

Construction requirements are specified in the relevant specification sections identified above.

8.0 QUALITY ASSURANCE

Quality assurance inspections will be undertaken by the Contract Administrator as specified in the relevant specification sections identified above.

The Contract Administrator may request documentation and obtain and test components to ensure compliance with this specification.

The Contract Administrator may perform a visual inspection to determine conformance with the workmanship,

design and dimensional requirements of this specification.

Material not in compliance shall be removed from the work area and replaced.

9.0 MEASUREMENT FOR PAYMENT – Not Used

10.0 BASIS OF PAYMENT

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment and Material required to do the work.

GARAGE/ADMINISTRATION BUILDING - Item No. 76

Special Provision

1.0 SCOPE

This tender item includes the construction of a Vehicle Maintenance Garage (Garage/Administration Building) at the Fenelon Falls Patrol Yard (MPY). It includes all work described on the Contract Drawings and referenced within the following specification sections.

2.0 REFERENCES

This Contract refers to specifications contained in the National Master Specifications (NMS) as amended or modified elsewhere in the Contract.

The following NMS sections are relevant to this item:

All applicable NMS sections included in the Contract Package.

3.0 DEFINITIONS

National Master Specifications (NMS) mean master specifications prepared by National Research Council Canada. The NMS is the most comprehensive master specification in Canada, serving as an easy-to-use framework for writing construction project specifications. Additional information can be found at *https://nrc.canada.ca/en/certifications-evaluations-standards/canadian-national-master-construction-specification*

Definitions are defined in the relevant specification sections identified above.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

Design and submission requirements are specified in the relevant specification sections identified above.

5.0 MATERIALS

Material requirements are specified in the relevant specification sections identified above.

6.0 EQUIPMENT

Equipment requirements are specified in the relevant specification sections identified above.

7.0 CONSTRUCTION

Construction requirements are specified in the relevant specification sections identified above.

8.0 QUALITY ASSURANCE

Quality assurance inspections will be undertaken by the Contract Administrator as specified in the relevant specification sections identified above.

The Contract Administrator may request documentation and obtain and test components to ensure compliance with this specification.

The Contract Administrator may perform a visual inspection to determine conformance with the workmanship, design and dimensional requirements of this specification.

Material not in compliance shall be removed from the work area and replaced.

9.0 MEASUREMENT FOR PAYMENT – Not Used

10.0 BASIS OF PAYMENT

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment and Material required to do the work.

SUPPLY AND INSTALLATION OF NEW SALT STORAGE STRUCTURE - Item No. 77

Special Provision

1.0 SCOPE

This tender item includes the construction of a Salt Storage Structure (Material Storage Building) at the Fenelon Falls Patrol Yard (MPY). It includes all work described on the Contract Drawings and referenced within the following specification sections. This includes the winter liquid area and concrete block walls outside the Material Storage Building.

2.0 REFERENCES

This Contract refers to specifications contained in the National Master Specifications (NMS) as amended or modified elsewhere in the Contract.

The following NMS sections are relevant to this item:

All applicable NMS sections included in the Contract Package.

3.0 DEFINITIONS

National Master Specifications (NMS) mean master specifications prepared by National Research Council Canada. The NMS is the most comprehensive master specification in Canada, serving as an easy-to-use framework for writing construction project specifications. Additional information can be found at *https://nrc.canada.ca/en/certifications-evaluations-standards/canadian-national-master-construction-specification*

Definitions are defined in the relevant specification sections identified above.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

Design and submission requirements are specified in the relevant specification sections identified above.

5.0 MATERIALS

Material requirements are specified in the relevant specification sections identified above.

6.0 EQUIPMENT

Equipment requirements are specified in the relevant specification sections identified above.

7.0 CONSTRUCTION

Construction requirements are specified in the relevant specification sections identified above.

8.0 QUALITY ASSURANCE

Quality assurance inspections will be undertaken by the Contract Administrator as specified in the relevant specification sections identified above.

The Contract Administrator may request documentation and obtain and test components to ensure compliance with this specification.

The Contract Administrator may perform a visual inspection to determine conformance with the workmanship, design and dimensional requirements of this specification.

Material not in compliance shall be removed from the work area and replaced.

9.0 MEASUREMENT FOR PAYMENT – Not Used

10.0 BASIS OF PAYMENT

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment and Material required to do the work.

SEPTIC SYSTEM - Item No. 78

Special Provision

1.0 SCOPE

This tender item includes the construction of a new septic (sewage disposal) system at the Fenelon Falls Patrol Yard (MPY). It includes all work described on the Contract Drawings and referenced within the following specification sections. This item includes the septic tanks, pumps, level monitoring systems, leaching field and all items related to the septic system outside of the building.

2.0 REFERENCES

This Contract refers to specifications contained in the National Master Specifications (NMS) as amended or modified elsewhere in the Contract.

The following NMS sections are relevant to this item:

All applicable NMS sections included in the Contract Package.

3.0 DEFINITIONS

National Master Specifications (NMS) mean master specifications prepared by National Research Council Canada. The NMS is the most comprehensive master specification in Canada, serving as an easy-to-use framework for writing construction project specifications. Additional information can be found at *https://nrc.canada.ca/en/certifications-evaluations-standards/canadian-national-master-construction-specification*.

Definitions are defined in the relevant specification sections identified above.

4.0 DESIGN AND SUBMISSION REQUIREMENTS

Design and submission requirements are specified in the relevant specification sections identified above.

5.0 MATERIALS

Material requirements are specified in the relevant specification sections identified above.

6.0 EQUIPMENT

Equipment requirements are specified in the relevant specification sections identified above.

7.0 CONSTRUCTION

Construction requirements are specified in the relevant specification sections identified above.

8.0 QUALITY ASSURANCE

Quality assurance inspections will be undertaken by the Contract Administrator as specified in the relevant specification sections identified above.

The Contract Administrator may request documentation and obtain and test components to ensure compliance with this specification.

The Contract Administrator may perform a visual inspection to determine conformance with the workmanship, design and dimensional requirements of this specification.

Material not in compliance shall be removed from the work area and replaced.

9.0 MEASUREMENT FOR PAYMENT – Not Used

10.0 BASIS OF PAYMENT

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment and Material required to do the work.

SCHEDULE OF MATERIALS TO BE SUPPLIED BY THE OWNER

Pursuant to Subsection GC 5.01, Supply of Material, this Special Provision lists all the Materials to be supplied by the Owner:

(A) The Owner supplies the following Materials F.O.B. haulage vehicles at a point within the Working Area. Deliveries to the Working Area shall be as requested by the Contractor but subject to the approval of the Contract Administrator:

Nil

The Contractor shall complete Owner's Standard Form PH-CC-765 "Contract Material Delivery Schedule", detailing the Contractor's required delivery date for each item of Material to be supplied by the Owner.

The form shall be completed in triplicate and returned to the Team Lead, Contract Tendering Section within the time limit specified by the Owner in a letter to the Contractor.

At any time following the required delivery date which the Contractor enters in Form PH-CC-765 for each item of Material, the Contractor shall either accept delivery of that Material when required by the supplier or shall make alternative arrangements satisfactory to the supplier which do not result in any additional cost to the Owner.

(B) The Owner supplies the following Materials as indicated below:

Material	Quantity	Supply Point
Small Signs, Ground Mounted Sign Boards	17 each	General Contractor Site Office
Sign Boards on Intermediate Sign Supports	2 each	General Contractor Site Office
Contract Information Signs (BuildON)	2 each	General Contractor Site Office

This Special Provision shall take precedence over all other Special Provisions with respect to the supply of the above materials.

THE CONTRACTOR SHALL SUPPLY **ALL** OTHER MATERIALS FOR THIS CONTRACT.

SECTION B - FAIR WAGE PROGRAM

Labour Conditions for Road Building Contracts
(Classifications and wage rates listed in attached schedules)

DEFINITIONS

1. In these Labour conditions,

(1) "Contract" means a Contract between _____(Owner) Ministry/Crown Corporation/agent

and the Contractor for the Work at _____(location).

(2) "Contractor" refers to

_____
(name of business)

_____
(business address)

_____
(business phone no./fax no.)

(3) "Employee" means a person in the employ of the Contractor a Sub-Contractor or any other person doing or contracting to do the whole or any part of the Work contemplated by this Contract.

(4) "Employer" means the Contractor, and/or any of the Contractor's Sub-Contractors, who has control or direction of, or is directly or indirectly responsible for, the employment of a person therein.

(5) "Fair Wage" or "Fair Wage Rates" means the respective wage rates listed in the attached Schedule(s), or any revisions from time to time, for each classification of labour.

(6) "Owner" refers to the ministry, crown corporation or agent named in subsection (1) as one of the contracting parties of the Contract.

(7) "Provincial Zone" means a geographic area in the Province of Ontario which is designated by the Ontario Ministry of Labour from time to time as non-urban, for the purpose of establishing the Fair Wage Rates.

(8) "Regular rate" means

(a) the hourly rate paid to an Employee for her/his normal non-overtime work week; or

(b) in the case of an Employee to whom clause (a) does not apply, the amount obtained by dividing her/his total earnings for the week by the number of hours he or she worked in the week;

(9) "Sub-Contractor" means any person, firm or corporation having a Contract for the execution of a part or parts of the Work included in the Contract, or a person, firm or corporation

furnishing material called for in the Contract and worked to a special design according to the Contract but does not include one who merely furnishes material not so worked.

(10) "Urban Zone" means a geographic area in the Province of Ontario which is designated by the Ontario Ministry of Labour from time to time as urban, for the purpose of establishing the Fair Wage Rates.

(11) "Work on roads" means the preparation, construction, finishing and construction maintenance of roads, streets, highways and parking lots and includes all work incidental thereto other than work on structures.

"Work on structures' means the construction, reconstruction, repair, alteration, remodelling, renovation or demolition of any bridge, tunnel or retaining wall and includes the preparation for and the laying of the foundation of any bridge, tunnel or retaining wall and installation of equipment and appurtenances incidental thereto.

The Ontario Minister of Labour may at his or her sole discretion determine whether any particular work is to be classified as work on roads or as work on structures and such decision may be made notwithstanding the definitions in subsection (11).

GENERAL

2. (1) These Labour Conditions are subject to the Employment Standards Act and the regulations made thereunder.

(2) These Labour Conditions are intended for application primarily to work on the Contract site. Work that is carried out at sites that are not in the immediate vicinity of the Contract site or that are not used exclusively for the purposes of Contracts including municipal contracts containing similar Labour Conditions will not be subject to these Labour Conditions.

HOURS OF WORK -- GENERAL

3. (1) Subject to section 4, the regular work week for a person employed on work on roads being done under this Contract or any other Contract subject to these or similar Labour Conditions shall not exceed fifty-five hours and all time worked by such person in excess of fifty-five hours a week shall be overtime.

(2) Subject to section 4, the regular work week for a person employed on work on structures being done under this Contract or any other Contract subject to these or similar Labour Conditions shall not exceed forty-four hours and all time worked by such person in excess of forty-four hours a week shall be overtime.

HOURS OF WORK -- PROVINCIAL ZONE

4. (1) The regular work week for a person employed on work on roads being done in the provincial zone under this Contract or any other Contract subject to these or similar Labour Conditions shall not exceed fifty-five hours and all time worked by such person in excess of fifty-five hours a week shall be overtime, except that part of the hours of work in excess of fifty-five hours a week which, together with the hours worked in the preceding week, do not exceed fifty-five hours in that preceding week, but in no case shall the number of hours that can be included in the hours of work for that preceding week exceed twenty-two hours.

(2) The regular work week for a person employed on work on structures being done in the provincial zone under this Contract or any other Contract subject to these or similar Labour Conditions shall not exceed fifty hours and all time worked by such person in excess of fifty hours a week shall be overtime, except that part of the hours of work in excess of fifty hours a

week which, together with the hours worked in the preceding week, do not exceed fifty hours in that preceding week, but in no case shall the number of hours that can be included in the hours of work for that preceding week exceed twenty-two hours.

WAGES AND OVERTIME PAY

5. (1) Every person employed by the Contractor or a Sub-Contractor or other person to do any part of the work contemplated by this Contract shall be paid while employed on such work not less than the wage rate set out in the Roads and Structures Fair Wage Schedule for the appropriate classification of such work or not less than such other wage rates as, during the continuance of the work, are fixed by the Ontario Minister of Labour for hours of work that are not overtime.

(2) The Fair Wage rates apply to work performed under a Contract let by a ministry of the Ontario government, a corporation established under the Capital Investment Planning Act, 1993, a third party acting on behalf of the Ontario government as its agent, or a municipality receiving funding from the Ontario government for work performed in this Contract.

(3) The wage rates set out in the Roads and Structures Fair Wage Schedule are subject to change periodically.

(4) Any increase in costs incurred by a change in the wage rates referred to in subsection (3) shall be borne by the Contractor.

6. (1) For Urban Zones only, Fair Wage Rates represent 85% of the union rate established in the specific zone for the respective classification, as determined by the Ontario Ministry of Labour from time to time, plus 15% in lieu of non-statutory benefits.

(2) In Urban Zones, employers may pay a portion of the Fair Wage Rates, up to a maximum of 15% of the applicable Fair Wage Rate, to their Employees in non-statutory benefits, and the remainder of not less than 85% of the Fair Wage Rate shall be paid to these Employees in wages.

(3) In the Provincial Zone, employers shall pay their Employees the full amount (100%) of the Fair Wage Rates in wages, exclusive of non-statutory benefits.

(4) In the event that an Employer is performing Work in an Urban Zone and it chooses to pay a portion of the Fair Wage Rates to its Employees in non-statutory benefits, the Contractor must inform the Owner, prior to commencing the Contract or the relevant sub-contract, as to the total cost of such non-statutory benefits to the Contractor, and/or its Sub-Contractor where a Sub-Contractor has elected to provide these non-statutory benefits. The cost of any non-statutory benefit paid to Employees shall be calculated in accordance with subsection (6).

(5) Upon informing the Owner as to its selection in accordance with subsection (2), the Contractor shall provide documentation to the Owner, prior to commencing the Contract or relevant sub-Contract, to sufficiently substantiate, in the Owner's opinion, the total cost of the all non-statutory benefits to the Contractor and/or respective Sub-Contractor.

(6) The cost to the Contractor, and/or a Sub-Contractor, of any non-statutory benefit shall be calculated on the basis of the total weekly cost to the Contractor/Sub-Contractor of each non-statutory benefit provided to Employees divided by forty-eight (48). The total cost of all non--statutory benefits equals the sum of the costs of each non-statutory benefit provided to Employees.

(7) Where the documentation is not provided to the Owner in accordance with subsections (5) and (6), the Contractor and/or relevant Sub-Contractor is responsible for paying its Employees the full amount (100%) of the Fair Wage Rates in wages, exclusive of non-statutory benefits.

(8) Notwithstanding subsection (7), where the Contractor fails to inform and/or provide such documentary proof to the Owner as required by subsections (4) (5) and (6) and the Contractor or any of its Sub-Contractors proceeds to pay a portion, up to a maximum of 15%, of the Fair Wage Rates in non-statutory benefits, the Owner may withhold payments under the Contract until such time as the Owner is satisfied that the Employees have received their Fair Wages.

(9) Once an Employer has made its selection pursuant to subsection (2), it shall continue to pay its Employees in accordance with its initial selection for the entire duration of the Contract and/or relevant sub-contract.

7. (1) Every person employed by the Contractor or a Sub-Contractor or other person to do any part of the work contemplated by this Contract shall be paid while employed on such work one and one-half times his or her regular rate for all hours of work that are overtime.

(2) Notwithstanding that a Contractor, Sub-Contractor, or other person pays wages in excess of the wage rates set out in the Roads and Structures Fair Wage Schedule, the Contractor, Sub-Contractor or other person shall not, in computing overtime wages payable to an Employee, set off against such overtime wages any part of the wages earned by the Employee in respect of their regular work period.

(3) Where a person is working on more than one Contract that is subject to these conditions, including any municipal Contract that contains similar labour conditions, the regular work week and the entitlement to overtime for that person shall be based upon the total hours worked on all such Contracts and if, on this basis, overtime is worked on this Contract the Contractor shall pay such person at the overtime rate and no waiver by that person of this entitlement to overtime wages and no interposition of a third party by way of an employment agency or as the nominal employer of that person shall relieve the Contractor of the obligation to pay that person the overtime wages.

8. Travelling time will not be subject to the Fair Wage Schedule. The hours and wages or moneys paid for travelling time are to be deleted from the wage record of an Employee in computing his or her wage entitlement.

9. The amount of room and board allowance will be negotiated between the employer and Employee, but in no case shall the amount of wages paid to an Employee net of the allowance be less than the amount the Employee would be entitled to receive if he or she was paid the minimum wage set out in the regulations under the Employment Standards Act less the amount of room and board allowance prescribed in those regulations.

CLASSIFICATION OF WAGE RATES

10. For the purpose of this Contract, the following interpretations apply:

(1) (a) Employees, other than students, learning to operate equipment are classified as "apprentice equipment operators" during their first three months operating equipment which does not require a licensed operator or during their first eighteen months operating equipment which requires a licensed operator.

(b) The wages for apprentice equipment operators are as follows:
(i) Windsor Zone - wage rate for Cement Improver;

(ii) Hamilton Zone - wage rate for Asphalt Raker;
(iii) Toronto Zone - wage rate for Asphalt Raker;
(iv) Ottawa Zone - wage rate for Skilled Labourer;
(v) Provincial Zone - wage rate for Skilled Labourer.

(2) Employees other than an operator are to be classified as "Pile Driver Operators" and shall be entitled to the wage rate for "Labourer - Structure Section".

(3) Employees engaged as Gravel and Chip Spreaders shall be paid the wage rate of Equipment and Maintenance Operator, Group "B".

(4) The attachment for a farm or industrial tractor must be power operated and be an integral part of the tractor.

(5) (a) Students employed as flagpersons or watchpersons shall be entitled to the wage rate for those classifications.

(b) Students performing work in positions that are classified in the Fair Wage Schedule, other than flagpersons or watchpersons, shall be entitled to receive the student rate, notwithstanding the rate set out in Schedule for the classification applicable to the work.

(c) Students employed for more than three months in a classified position shall then be entitled to the wage rate for that classification.

(d) Students performing work in positions that are not classified in the Fair Wage Schedule shall be entitled to receive the student rate, regardless of the location of the Contract.

DISCRETION OF THE MINISTER OF LABOUR

11. (1) The Ontario Minister of Labour may decide that special circumstances exist which make it expedient for him/her to decide:

(a) what the current or fair and reasonable wage rates for overtime are; and/or

(b) the proper classification of any Work for the purposes of wages and hours.

(2) The Contractor and Sub-Contractor(s), upon receipt of notice of any decision of the Ontario Minister of Labour, shall adjust accordingly the wage rates, hours, classification of Work so as to give effect to such decision.

CONTRACTOR'S OBLIGATIONS

12. The Contractor must comply with the requirements set out in these Labour Conditions.

13. (1) The Contractor shall post and keep posted these Labour Conditions, and the applicable Road and Structure Fair Wage Schedule, and any revisions thereto, in a conspicuous place on the Site.

(2) The Contractor shall ensure that the posted applicable Schedule includes a breakdown of the wages and non-statutory benefits paid to the Employees of the Contractor and each Sub-Contractor electing to pay the Fair Wage Rates in accordance with Section 6(2).

14. (1) The Contractor shall keep proper records showing the names, trades and addresses of all of the Contractor's Employees who perform any part of the work contemplated by this

Contract and the wages paid to and time worked by them, as well as the Contractor's costs for all non-statutory benefits where the Contractor chooses to pay its Employees Fair Wages in accordance with Section 6(2).

(2) The records referred to in subsection (1) shall be kept separate from any records concerning Employees of the Contractor who do not perform any part of the work contemplated by this Contract.

(3) The records referred to in subsection (1) shall be kept in the Province of Ontario and made available for inspection by the Owner's Representative upon request, whether or not any Employee has complained that he or she is not being paid in accordance with section 6.

15. The Contractor shall deliver to the Owner's representative an affidavit or declaration attesting to the Contractor's compliance with these labour conditions accompanying the final invoice to be delivered under this Contract.

CONTRACTOR'S OBLIGATION WITH RESPECT TO SUB-CONTRACTORS

16. (1) The Contractor is responsible for ensuring that Sub-Contractors under the Contractor and any other persons doing or contracting to do the whole or any part of the work contemplated by this Contract under the Contractor comply with these Labour Conditions.

(2) The Contractor must provide all Sub-Contractors with a copy of these Labour Conditions and the applicable Schedule before any work is performed by the Sub-Contractor.

17. Without restricting the generality of Section 16(1), if any Sub-Contractor under the Contractor or any other person doing or Contracting to do the whole or any part of the work contemplated by this Contract under the Contractor fails to pay wages to an Employee of the Sub-Contractor or other person in accordance with section 6, the Contractor shall pay directly to the Employee, regardless of whether or not monies are still owed by the Contractor to the Sub-Contractor, the difference between the amount of wages that the Employee was paid by the Sub-Contractor or other person and the amount of wages that he or she would have been paid had the Sub-Contractor or other person paid wages in accordance with section 6.

18. The Contractor shall, in any Contract with a Sub-Contractor or other person doing or contracting to do the whole or any part of the work contemplated by this Contract who employs an Employee, require the sub-Contractor or other person,

(a) to pay the Employee in accordance with section 6 of these labour conditions;

(b) to keep proper records showing the names, trades and addresses of all Employees who perform any part of the work contemplated by this Contract and the wages paid to and time worked by them, as well as the Sub-Contractors's costs for all non-statutory benefits where the Sub-Contractor chooses to pay its Employees Fair Wages in accordance with Section 6(2);

(c) to keep the records referred to in clause (b) separate from any records concerning Employees who do not perform any part of the work contemplated by this Contract;

(d) to keep the records referred to in clause (b) in the Province of Ontario and to make them available for inspection by the Contractor and/or the Owner's representative upon request, whether or not any Employee has complained that he or she is not being paid in accordance with section 6; and

(e) in any Contract with any other person doing or Contracting to do the whole or any part of the work contemplated by this Contract who employs an Employee, to require that other person

to assume the same obligations in relation to his, her or its Employees as the Contractor is required by this section to require parties with whom the Contractor Contracts to assume in relation to their Employees.

CLAIM PROCEDURE

19. (1) Wage claims with respect to Contracts issued by the Owner should be made directly to the Owner's Representative.

(2) An Employee employed by the Contractor shall file his/her completed form regarding a Fair Wage complaint with the Owner's Representative at the earliest time but no later than forty-five (45) days following total completion of the Contract, as defined in the Construction Lien Act.

(3) An Employee employed by a Sub-Contractor shall file his/her completed form regarding a Fair Wage complaint with the Owner's Representative at the earliest time but no later than forty-five (45) days following total completion of the relevant sub-contract, as defined in the Construction Lien Act.

(4) Third parties may assert a Fair Wage complaint on the Owner's prescribed form on behalf of an Employee where it is based on specific information.

20. In addition to, or alternately to Section 19, an Employee may file a lien claim for wages, in respect of a failure to comply with any requirements under Section 6, under the Construction Lien Act. These lien claims must be filed directly with the Owner.

21. Claims made with respect to Contracts issued by municipalities should be made directly to them under the provisions of the Construction Lien Act.

OWNER'S RIGHT TO HOLD BACK

22. (1) If the Owner receives a complaint that an Employee is not being paid in accordance with section 6 or if Owner finds that an Employee is not being paid in accordance with section 6, the Ministry may withhold from any money that it owes to the Contractor an amount equal to the amount that the complainant alleges is owing or that the Owner has found to be owing to the Employee.

(2) Subsection (1) applies even though the Employee is not the Employee of the Contractor.

(3) The Owner is not required to disclose the identity of a complaining Employee unless the Owner finds that the Employee has not been paid by his or her employer in accordance with section 6 and that Employee is the only Employee of the employer who has not been so paid.

(4) An amount withheld under subsection (1) because the Owner received a complaint that an Employee was not being paid in accordance with section 6 will be paid to the Contractor if,

(i) the Owner finds that the Employee was in fact being paid in-accordance with section 6; or

(ii) the Owner finds that although the Employee was not being paid in accordance with section 6, the Employee has subsequently been paid the difference between the amount of wages that he or she had been paid and the amount of wages that he or she would have been paid had he or she been paid in accordance with section 6.

(5) If the Owner has found that an amount is owing to an Employee, and that amount has not been paid within 105 days of the completion of the work to be performed under this Contract,

the amount withheld may be forfeited to the Crown at the discretion of the Owner in which case the entitlement of the Contractor under this Contract is reduced by the amount forfeited.

FAIR WAGE SCHEDULE
ROADS AND STRUCTURES CONSTRUCTION, ONTARIO
PROVINCIAL ZONE

ROAD BUILDING SECTION

CLASSIFICATION OF LABOUR	**Fair Wage Rate Per Hour not less than:**
	Effective Date: April 1, 1995
LICENSED OPERATORS	$13.83
LICENSED MECHANICS AND WELDERS, CLASS "A"	12.99
EQUIPMENT AND MAINTENANCE OPERATORS, GROUP "A"	12.85
EQUIPMENT AND MAINTENANCE OPERATORS, GROUP "B"	12.20
SKILLED LABOURERS	11.69
TRUCK DRIVERS - Tow Tractor Operators - Rollermen (Grade)	11.48
LABOURERS	11.19
FLAGPERSON	9.40
WATCHPERSON	9.40
STUDENTS (registered in day school)	9.04

STRUCTURE SECTION

CARPENTERS, FORM BUILDERS	13.83
RODMEN, CONCRETE FINISHERS, PAINTERS	12.69
STRUCTURE LABOUR OPERATIONS	11.34
STRUCTURAL TRAINEES	11.48

CLASSIFICATION DEFINITIONS:

Licensed Operators: Includes Shovel, Clam, Gradall, Backhoe, Dragline, Piledriver Operator.

Equipment and Maintenance Operators, Group A: Includes Mechanic and Welder, Class B, Rollerman - Asphalt, Burnerman, Powerman, Boiler Engineer (with papers). Float Driver (over 25 tons), Concrete Paver (over 1 cu. yd.), Bulldozer (75 Drawbar HP and over), Grader, Class A (Finished Grading), Front End Loader (1-1/2 yds. and over), Scraper, Crusher, Asphalt Spreader Operator.

Equipment and Maintenance Operators, Group B: Includes Boiler Fireman, Mixerman, Float Driver (25 tons and under), Front End Loader (under 1-1/2 yds.) Grader, Class B (Gravel and other Grading), Farm and Industrial Tractor with Power Attachments, Driller (Air Track), Bulldozer (under 75 Drawbar HP) Operator.

Skilled Labourers: Includes Air Tool Operator, Asphalt Raker, Form Setter, Pipe Layer, Screedman.

Structure Labour Operations: Includes Labourers on Structures.

Structural Trainee: Means an Employee who is enrolled in the Ontario Road Builders Association Pilot Training Programme.

SECTION C - LIQUIDATED DAMAGES

FIXED COMPLETION DATE AND CHARGES

1. Time

Time shall be of the essence for carrying out and completing the Work.

2. Progress of the Work and Time for Completion

The Contractor shall complete this Contract in its entirety by **28 Aug 2026**.

If the time limit specified above is not sufficient to permit completion of the Work by the Contractor working a normal number of hours each Day or week on a single daylight/night shift basis, it is expected that additional and/or augmented daylight and night shifts will be required throughout the life of the Contract to the extent deemed necessary by the Contractor to ensure that the Work will be completed within the time limit specified. Any additional costs occasioned by compliance with these provisions will be considered to be included in the prices bid for the various items of work and no additional compensation will be allowed therefore.

3. Liquidated Damages

It is agreed by the parties to the Contract that in case all the Work called for under the Contract is not finished or completed within the date of completion specified aforementioned or as extended according to subsection GC3.06, Extension of Contract Time or Interim Completion Dates, of MTO General Conditions of Contract, April 2023, a loss or damage will be sustained by the Owner. Since it is and will be impracticable and extremely difficult to ascertain and determine the actual loss or damage which the Owner will suffer in the event of and by reason of such delay, the parties hereto agree that the Contractor will pay to the Owner the sum of **$5,000.00** as liquidated damages for each and every Day's delay in finishing the Work beyond the date of completion prescribed. It is agreed that this amount is an estimate of the actual loss or damage to the Owner which will accrue during the period in excess of the prescribed date of completion.

The Contractor shall incur interest on Liquidated Damages and pay such interest in accordance with GC 7.19, Accounts Payable. For greater certainty, the Owner may also retain interest charges from monies owing to the Contractor under GC 8.02.04.11, Owner’s Set-Off.

ASSISTANT DEPUTY MINISTER,
TRANSPORTATION INFRASTRUCTURE MANAGEMENT DIVISION
MINISTRY OF TRANSPORTATION, ONTARIO