



MUNICIPALITY
of the County of Kings

**Tender
22-05
Aylesford Lake Beach Washrooms**

Bids submitted on the attached bid form ONLY in a vendor identified envelope:

Tender # 22-05– Aylesford Lake Beach Washrooms

Addressed to:

Municipality of the County of Kings
181 Coldbrook Village Park Drive,
Coldbrook, Nova Scotia
B4R 1B9

Will be received until **2:00 pm Atlantic Time, June 30, 2022**, for the above Tender as per the specifications and terms and conditions.

Check for changes to this request - Before submitting your bid, visit the Provincial Government Web Portal at www.gov.ns.ca/tenders or contact our office to see if any Addenda detailing changes have been issued on this tender. Changes may be posted up until the tender closing time. It is the bidders' responsibility to acknowledge and take into account all Addenda.

Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed. Bids received after the time and date specified shall be rejected.

Electronic and facsimile bids are not accepted.

The lowest or any submission will not necessarily be accepted.

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Joint Sealants	07 92 00
Metal Doors and Frames	08 11 00
Windows	08 50 00
Door Hardware	08 71 00
Glazing	08 80 00
Gypsum Board Assemblies	09 21 16
Ceramic Tiling	09 30 13
Resinous Flooring	09 67 25
Painting for Minor Works	09 91 00.08
Signage	10 14 00
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Plumbing Pumps	22 10 10
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Appendix A – Aylesford Beach Well Water Chemical Analyses

END

Overview

OVERVIEW

This document is a Supplementary Specification to the Standard Specifications for Municipal Services, developed by the Nova Scotia Roadbuilders - Consulting Engineers of Nova Scotia Joint Committee on Contract Documents.

The Municipality of the County of Kings, in response to a need to standardize their specification practices, reduce review and approval time, and regulate the specifications produced by their consultants, have adopted the Standard Specification for Municipal Services.

These project documents have been prepared for use with and require being read in conjunction with the current version of The Standard Specifications for Municipal Services as published by the Nova Scotia Roadbuilders – Consulting Engineers of Nova Scotia Joint Committee on Contract Documents. Copies of The Standard Specifications for Municipal Services are available from the Joint Committee on Contract Documents, 18 Laurier Street, Dartmouth, NS, B3A 2G7; Telephone (902)233-9362, OR EMAIL: nsmunicipalservices@gmail.com.

Information to Tenderers

PROJECT: Aylesford Beach Public Washrooms
OWNER: Municipality of the County of Kings
181 Coldbrook Village Park Drive
Coldbrook, NS B4R 1B9
ENGINEER: DesignPoint Engineering & Surveying Ltd.
222 Waterfront Drive, Suite 104
Bedford, NS B4A 0H3

1. Tender

Submission

- .1 Submit completed Tender Form for above project
online or in sealed envelope marked as follows: TENDER.

Aylesford Lake Public
Washrooms Tender No. 22-05

Closing up to 2:00 p.m., local time, on June 30, 2022
and delivered to:

If delivered by mail address to: Engineering and Public Works,
Municipality of the County of Kings, Attention: Omar Abdelkhalek,
P.Eng., Supervisor of Engineering Services, 181 Coldbrook Village Park
Drive, Coldbrook, NS, B4R 1B9.

If delivered by hand, deliver to Financial
Services reception area, Municipal Offices at
181 Coldbrook Village Park Drive, Coldbrook, NS, B4R 1B9 for deposit
in the Tender Box until the tender opening.

If submitted online, select the Tender No. 22-05 link at:
<https://www.countyofkings.ca/business/tenders.aspx>

2. Tender Opening

- .1 Tenders will be opened in the Boardroom of the Municipality of the
County of Kings, immediately following the Tender Closing.
Opening will be public.

3. Document
Fee

- .1 A \$50.00 nonrefundable deposit is required, payable to the
Municipality of the County of Kings.

4. Accuracy of Referencing

- .1 Indexing and cross-referencing are for convenience only.

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5. Conditions of Tendering .1 Take full cognizance of content of all Contract Documents in preparation of Tender.
Refer to Section 00 41 43 – Tender Form, clause 3.8 for a complete list of contract documents.
6. Tenderers to Investigate .1 Tenderers will be deemed to have familiarized themselves with existing site and working conditions and all other conditions which may affect performance of the Contract. No plea of ignorance of such conditions as a result of failure to make all necessary examinations will be accepted as a basis for any claims for extra compensation or an extension of time.
- .2 Contact Omar Abdelkhalek, Manager of Engineering at (902) 690-6192 or aomar@countyofkings.ca to arrange for Site visit. Such visit and investigation shall be done at the expense of the Tenderers.
7. Municipality of Kings Preference .1 The Municipality of the County of Kings recognizes the importance of buying locally and using local suppliers as much as possible. This factor will always be taken into account when evaluating effectiveness and efficiency.
- .2 For details on the Municipality of Kings Preference, refer to Section 16 of the Municipality's Procurement Policy, which is located on the Municipality's website:
<http://www.county.kings.ns.ca/business/tenders.aspx>
8. Clarification and Addenda .1 All questions concerning this Tender shall be directed to the following: Omar Abdelkhalek, Manager of Engineering at (902) 690-6192 or aomar@countyofkings.ca. Any attempt by the Proponent or any of its employees, agents, contractors, or representatives to contact members of the Municipal Council or Municipal staff not identified in this clause may lead to disqualifications.
- .2 Notify the Engineer not less than 4 working days before Tender Closing of omissions, errors or ambiguities found in Contract Documents. If Engineer considers that correction, explanation, or interpretation is necessary; a written addendum will be posted on the Municipality's procurement website:
<http://www.county.kings.ns.ca/business/tenders.aspx>
no later than 48 hours before Tender Closing. **The Municipality will not maintain a plan takers' list; prospective bidders shall be responsible to review the website for any addenda that have been issued.**
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- . 3 All addenda will form part of the Contract Documents.
- . 4 Any changes to this tender shall be stated in writing by Addenda. Verbal statements made by Municipal staff or their representatives shall not be binding.
- . 5 Confirm in Tender Form that all addenda have been received.
9. Preparation of Tender Form .1 Complete Tender Form provided with Contract Tender Documents in ink. And fill in all blanks. Have corrections initialed by person signing Tender.
10. Taxes .1 Include all taxes except Harmonized Sales Tax (HST) in tender unit prices.
11. Tender Security .1 Provide Tender Security in amount of ten percent (10%) of the Total Amount Payable with Tender in the form of a Certified Cheque payable to the Owner, or a Bid Bond on CCDC Form 220.
12. Return of Tender Security .1 The initial deposit of the unsuccessful Tenderers will be returned to them after the Contract is awarded or the expiration of validity of their tenders, whichever is the sooner.
13. Contract Security .1 Provide, prior to commencement of the Work Contract Security, in the amount and form as specified in GC 21 and as supplemented in Section 00 73 00
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14. Insurance .1 Provide, prior to commencement of the Work insurance as specified in GC 20.
15. Form of Agreement .1 Form of Agreement is attached for information purposes only.
16. Amendment or Withdrawal .1 Tenders may be amended or withdrawn by post or facsimile prior to the date and time of closing.
- .2 Amendment of individual unit prices is the only acceptable price amendment. Amendments shall not disclose either original or revised Contract Price.
- .3 Head amendment or withdrawal as follows:
"[Amendment]/[Withdrawal] of Tender for the Municipality of the County of Kings, Aylesford Lake Public Washrooms, Tender No. 22-05". Sign and seal as required for Tender, and submit at address given for receipt of Tenders. All submission must be received prior to Tender Closing.
17. Informal or Un- balanced Tenders .1 Tenders which in the opinion of the Owner are considered to be informal or unbalanced may be rejected.
18. Right to Accept or Reject any Tender .1 Owner reserves right to accept or reject any Tender.
19. Safety Certification .1 Provide within 72 hours of Tender submission a copy of Tenderer's current and valid Letter of Good Standing, Certificate of Recognition (COR) Program, issued by an audit provider approved by Workers' Compensation Board of Nova Scotia.
- .2 Out of province companies shall submit, with their Tender, a current and valid Letter of Good Standing from their province of origin or from a recognized Safety Association which utilizes an external audit element.
- .3 In any event, out of province Tenderers will have to satisfy a Workers' Compensation Board of Nova Scotia in respect to their safety status prior to being awarded a contract.
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20. Clearance Letter .1 Provide within 72 hours of Tender submission a copy of Tenderer's current valid Clearance Letter, issued by Workers Compensation Board of Nova Scotia.
21. Regulatory Approvals and Permits .1 It shall be the Contractor's responsibility to apply and pay for all necessary construction permits. It is also the responsibility of the Contractor to conform to the contents of said permits.
22. Contingency Allowance .1 A Contingency Allowance of 10% tendered contract value is included in Section 00 41 13 – Tender Form. This amount covers any cost for extra work, as directed by the Engineer, which is not included in the lump sum price provided. Specific information regarding the use of this Contingency Allowance is provided in Section 00 72 45 – General Conditions, Subsection GC4.2 – Contingency Allowance of the Standard Specification for Municipal Services.
23. NSP Allowance .1 A Nova Scotia Power allowance has been included in Section 00 41 13 – Tender Form. This amount covers any cost associated with the coordination and relocation of Nova Scotia Power infrastructure. It is the responsibility of the Contractor to coordinate and pay for any servicing, inspections, permits and/or any other involvement by NSP and will be paid, upon approval by the Engineer, under this allowance.
24. Water Quality Analysis & Treatment System Design .1 The existing well water has been deemed unsuitable for potable consumption. The existing filtration system is to be upgraded as part of this project with a pre-packaged treatment unit. The well water quality testing reports are included in Appendix A.

END

Tender Form

1. SALUTATION:

- . 1 To: Municipality of the County of Kings
181 Coldbrook Village Park Drive, Coldbrook, NS, B4R 1B9.
- . 2 For: Aylesford Lake Public Washrooms
Tender No. 22-05
- . 3 From: _____

2. TENDERER DECLARES:

- . 1 That this tender was made without collusion or fraud.
- . 2 That the proposed work was carefully examined.
- . 3 That the Tenderer was familiar with local conditions.
- . 4 That Contract Documents and Addenda No. _____ to _____ inclusive were carefully examined.
- . 5 That all the above were taken into consideration in preparation of this Tender.
- . 6 That you are not bound to accept the lowest or any tender which you may receive.

3. TENDERER AGREES:

- . 1 To enter into a contract to supply all labour, material and equipment and to do all work necessary to construct the Work as described and specified herein for the Contract Price stated in Subsection 4 hereunder.
- . 2 That this Tender is valid for acceptance for sixty (60) days from Tender Closing.
- . 3 Declares that the Contract Price set forth in the Tender Form has been correctly computed for the purposes of this tender and that it includes and covers all contingencies and provisional sums; all duties and handling charges; transportation; and all other charges. Harmonized sales tax is not to be included in the Contract Price.
- . 4 That the Municipality of the County of Kings recognizes the importance of buying locally and using local suppliers as much as possible and that this factor will be taken into account when evaluating effectiveness and efficiency.

- . 5 To execute in triplicate the Agreement and forward same together with the specified contract security and insurance documents to the Owner within fourteen (14) days of written notice of award.
- . 6 That failure to enter into a formal contract and give specified insurance documents and contract security within time required will constitute grounds for forfeiture of certified cheque or enforcement of bid bond.
- . 7 That if certified cheque is forfeited, Owner will retain difference in money between amount of Tender and amount for which Owner legally contracts with another party to perform the Work and will refund balance, if any, to Tenderer.
- . 8 That the Contract Documents include:
 - . 1 Standard Specification for Municipal Services as listed in Table of Contents (Current edition)
 - . 2 Tender Form
 - . 3 Form of Agreement
 - . 4 Definitions
 - . 5 General Conditions
 - . 6 Supplementary General Conditions
 - . 7 Supplementary Specifications
 - . 8 Drawings:

<u>Drawing No.</u>	<u>Drawing Title</u>
A-001	Code Review, Abbreviations and Fire Separation Plan
A-101	Floor Plan
A-102	Reflected Ceiling Plan & Roof Plan
A-201	Building Elevations
A-301	Sections
A-302	Wall Sections
A-304	Plan & Section Details
A-601	Interior Elevations
A-602	Interior Elevations
A-603	Interior Elevations
A-604	Exterior Elevations
A-605	Screen, Gate, & Bench Details
M-101	Mechanical Plumbing and Sanitary Layouts
M-501	Mechanical Details and Schedules
E-101	Electrical Site Plan, Legend, Luminaire Schedule, and Lighting Plan
E-102	Electrical Power, and Systems Plans
E-103	Electrical Details and Single Line Diagram
S-100	3D Perspective & Foundation Plan
S-101	Framing Plans
S-102	Grid Elevations
S-103	Structural Details
C-101	New Building Servicing
C-102	Grading Plan

- . 9 Addenda as issued and as confirmed in subsection 2.4 of this section.

4. TENDER SUMMARY

The undersigned Tenderer, having carefully read and examined the Contract Documents prepared by DesignPoint Engineering & Surveying Ltd. for the completion of **Aylesford Lake Beach Park Washroom Facility, Contract No. 22-05**, hereby accepts the same as part and parcel of the Contract herein referred to, and having carefully examined the locality and Site of Works and having full knowledge of the work required and of the materials to be furnished and used, does hereby Tender and offer to enter into a contract to perform and complete the whole of the said works and provide all necessary labour, tools, materials and equipment and pay all applicable taxes as set forth and in strict accordance with the Specifications, Drawings and other Contract Documents and to do all therein called for on the terms and conditions and under these provisions therein set forth for the following:

Item No.	Unit Description	Unit	Estimated Quantity	Unit Rate	Cost
1	Site Preparation and Site Work	LS	1		
2	Environmental Controls (Sedimentation and Erosion)	LS	1		
3	Mass Earthworks/Excavation	LS	1		
4	Yard Piping, incl. Reinstatement	LS	1		
5	Concrete Floor & Foundation	LS	1		
6	Building Superstructure	LS	1		
7	Building Electrical	LS	1		
8	Building Plumbing & Mechanical	LS	1		
9	Testing & Commissioning	LS	1		
	Subtotal				
	Additional Items				
10	Contingency Allowance (10%)	LS	1		
11	NSPI Allowance	LS	1	10,000	10,000
	Subtotal				

Contract Price (Excluding HST)	\$
Add HST (15% of Contract Price)	\$
Total Allowance Payable	\$

Tenderer's HST Registration No. _____

	Provisional Items			
Item No.	Unit Description	Unit	Unit Rate	Cost
1	Septic Pump Replacement	LS		
2	Well Water Treatment System Replacement	LS		

5. COMPLETION TIME

- . 1 Tenderer agrees to achieve Substantial Completion of the Work by **June 20, 2023**, based on an expected date for written notification of award of **August 4, 2022**.
 - . 2 Construction must be substantially completed within the above noted time. Should the Contractor fail to meet this deadline, Liquidated Damages shall be applied as per GC 6.5 – Delays (refer to Section 00 73 10 – Supplementary General Conditions).
-

6. SIGNATURES*

DATED THIS _____ DAY OF _____, 2022.

[Seal]

Name of Firm Tendering

Signature of Signing Officer

Witness

Name and Title (Printed)

Witness

Signature of Signing Officer

Name and Title (Printed)

Company Address

Telephone No.

Fax No.

**NOTE: Tenders submitted by or on behalf of any Corporation must be signed and sealed in the name of such Corporation by a duly authorized officer or agent.*

END

Form of Agreement

This Agreement made on the _____ day of _____ in the year _____.

BY AND BETWEEN

Municipality of the County of Kings

hereinafter called the "Owner"

and

hereinafter called the "Contractor"

The Owner and the Contractor agree as follows:

ARTICLE A1 - THE WORK

The Contractor shall:

- . 1 Perform the Work required by the Contract Documents for

Aylesford Lake Public Washrooms, Tender No. 22-05

located at Kings County, NS

for which the Agreement has been signed by the parties, and for which DesignPoint Engineering & Surveying Ltd

is acting as and is hereinafter called the "Engineer"

and

- . 2 do and fulfill everything indicated by this Agreement, and

- . 3 commence the Work by the _____ day of _____ in the year _____
and attain Substantial Performance of the work as certified by the Consultant by the _____ day of _____ in the Year _____.

ARTICLE A2 – AGREEMENTS AND AMENDMENTS

The Contract supersedes all prior negotiations, representations or agreements, either written or oral, relating in any manner to the work, including the bidding documents that are not expressly listed in Article 3 of the Agreement.

ARTICLE A3 - CONTRACT DOCUMENTS

The following are the Contract Documents referred to in Article A1 of the Agreement – THE WORK:

- .1 Standard Specification for Municipal Services as listed in Table of Contents (current edition).
- .2 Tender Form
- .3 Form of Agreement
- .4 Definitions
- .5 General Conditions
- .6 Supplementary General Conditions
- .7 Supplementary Specifications
- .8 Drawings:

<u>Drawing No.</u>	<u>Drawing Title</u>
A-001	Code Review, Abbreviations and Fire Separation Plan
A-101	Floor Plan
A-102	Reflected Ceiling Plan & Roof Plan
A-201	Building Elevations
A-301	Sections
A-302	Wall Sections
A-304	Plan & Section Details
A-601	Interior Elevations
A-602	Interior Elevations
A-603	Interior Elevations
A-604	Exterior Elevations
A-605	Screen, Bench, and Gate Details
M-101	Mechanical Plumbing and Sanitary Layouts
M-501	Mechanical Details and Schedules
E-101	Electrical Site Plan, Legend, Luminaire Schedule, and Lighting Plan
E-102	Electrical Power, and Systems Plans
E-103	Electrical Details and Single Line Diagram
S-100	3D Perspective & Notes
S-101	Foundation Plan
S-102	Framing Plans
S-103	Grid Elevations
S-104	Structural Details
C-101	New Building Servicing
C-102	Grading Plan

- .9 Addenda

ARTICLE A4 – STIPULATED CONTRACT PRICE

- .1 A Stipulated Contract price forms the basis for payment of the Contract. The Stipulated Contract Price is:

00/100 dollars

- .2 All amounts are in Canadian funds. Contract Price **excludes** Harmonized Sales Tax (HST).

ARTICLE A5 - PAYMENT

- . 1 Subject to the provisions of the Contract Documents, the Owner shall make monthly payments on account to the Contractor for the work performed, as certified by the Consultant, subject to a ten percent (10%) holdback, the Owner shall in Canadian funds:
 - . 1 make progress payments to the Contractor on account of the Contract Price when due in the amount certified by the Consultant together with such Value Added Taxes as may be applicable to such payment, and
 - . 2 upon Substantial Performance of the Work, pay to the Contractor the unpaid balance of the holdback amount when due together with such Value Added Taxes as may be applicable to such payment, and
 - . 3 upon the issuance of the final certificate for payment, pay to the Contractor the unpaid balance of the Contract Price when due together with such Value Added Taxes as may be applicable to such payment.
- . 2 In the event of loss or damage occurring where payment becomes due under the property and boiler insurance policies, payments shall be made to the Contractor in accordance with the provisions of GC11.1
– INSURANCE.
- . 3 Interest:
 - . 1 Should either party fail to make payments as they become due under the terms of the Contract or in an award by arbitration or court, interest at two percent (2%) per annum above the prime rate on such unpaid amounts shall also become due and payable until payment. Such interest shall be compounded on a monthly basis. The bank rate shall be the rate established by the Bank of Canada as the minimum rate at which the Bank of Canada makes short term advances to the chartered banks.
 - . 2 Interest shall apply at the rate and in the manner prescribed by paragraph 5.3.1 of this Article on the settlement amount of any claim in dispute that is resolved either pursuant to Part 8 of the General Conditions – DISPUTE RESOLUTION or otherwise, from the date the amount would have been due and payable under the Contract, had it not been in dispute, until it is paid.

ARTICLE A6 - RECEIPT OF AND ADDRESSES FOR NOTICES

- . 1 Notices in writing between the parties or between them and the Consultant shall be considered to have been received by the addressee on the date of delivery if delivered to the individual, or to a member of the firm, or to an officer of the corporation for whom they are intended by hand or by registered post; or if sent by regular post, to have been delivered within five (5) Working Days of the date of mailing when addressed as follows:
 - . 1 The Owner at Municipality of the County of Kings, 181 Coldbrook Village Park Drive,
Coldbrook, NS, B4R 1B9
 - . 2 The Contractor at _____
 - . 3 The Consultant at 222 Waterfront Drive, Suite 104, Bedford, B4A 0H3

ARTICLE A7 - SUCCESSION

The aforesaid Contract Documents are to be read into and form part of the Agreement and the whole shall constitute the Contract between the parties and subject to law and the provisions of the Contract Documents shall enure to the benefit of and be binding upon the parties hereto, their respective heirs, legal representatives, successors and assigns.

ARTICLE A8 - RIGHTS AND REMEDIES

No action or failure to act by the Owner, Consultant, or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

ARTICLE A9 - TIME

Time shall be construed as being of the essence of the Contract. The Works will be completed by the date indicated in Article A1 herein and shall be referred to as the Date of Completion.

In witness whereof the parties hereto have executed this Agreement and by the hands of their duly authorized representatives.

SIGNED AND DELIVERED

In the presence of:

OWNER

Municipality of the County of Kings

Name of Owner

WITNESS

Signature

Name and Title of Person Signing

Signature

Signature

Name and Title of Person Signing

Name and Title of Person Signing

CONTRACTOR

Name of Contractor

WITNESS

Signature

Name and Title of Person Signing

Signature

Signature

Name and Title of Person Signing

Name and Title of Person Signing

N.B. Where legal jurisdiction, local practice or Owner or Contractor requirements calls for (a) proof of authority to execute this document, attach such proof of authority in the form of a certified copy of a resolution naming the representative(s) authorized to sign the Agreement for and on behalf of the corporation or partnership; or (b) the affixing of a corporate seal, this Agreement should be properly sealed.

END

General Conditions

1. **STANDARD FORM**

- .1 The General Conditions of Contract are part of this Specification, a copy of which is bound herein at the end of this document.
 - .2 The General Conditions, including Supplementary Conditions - Document 00 73 00 and any further modifications, shall become part of the contract and shall apply to all contractors and subcontractor.
 - .3 The terms “Municipality” and “Municipality of the County of Kings” shall be considered equal in the following documents.
-

MUNICIPALITY OF THE COUNTY OF KINGS

GENERAL CONDITIONS OF CONTRACT

GC1	DEFINITIONS	GC22	IRREVOCABLE STANDBY LETTER OF CREDIT
GC2	DOCUMENTS	GC23	CHANGES IN WORK
GC3	DETAIL DRAWINGS AND INSTRUCTIONS	GC24	VALUATION OF CHANGES
GC4	COPIES FURNISHED	GC25	CLAIMS AGAINST CONTRACTOR
GC5	SHOP DRAWINGS	GC26	CERTIFICATES AND PAYMENTS
GC6	DRAWINGS AND SPECIFICATIONS ON THE WORK	GC27	PERMITS, NOTICES, LAWS AND RULES
GC7	OWNERSHIP OF DRAWINGS AND MODELS	GC28	PATENT FEES
GC8	SAMPLES	GC29	USE OF PREMISES
GC9	CONSULTANT AND CONTRACTOR	GC30	CLEANING UP
GC10	CONSULTANT'S DECISIONS	GC31	CUTTING, PATCHING AND DIGGING
GC11	CONTRACTOR'S PERSONNEL	GC32	DELAYS
GC12	MATERIALS, APPLIANCES AND EMPLOYEES	GC33	MUNICIPALITY OF THE COUNTY OF KINGS RIGHT TO DO WORK
GC13	INSPECTION OF WORK	GC34	MUNICIPALITY OF THE COUNTY OF KINGS RIGHT TO TERMINATE CONTRACT
GC14	CORRECTION BEFORE FINAL PAYMENT	GC35	CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT
GC15	DEDUCTIONS FOR UNCORRECTED WORK	GC36	MUTUAL RESPONSIBILITY OF CONTRACTORS
GC16	CORRECTION AFTER FINAL PAYMENT	GC37	SEPARATE CONTRACTS
GC17	PROTECTION OF WORK AND PROPERTY	GC38	ASSIGNMENT
GC18	EMERGENCIES	GC39	SUB-CONTRACTS
GC19	WORKERS COMPENSATION ACT	GC40	RELATIONS OF CONTRACTOR AND SUBCONTRACTOR
GC20	INSURANCE	GC41	TAXES
GC21	GUARANTY BONDS	GC42	PROGRESS ESTIMATES
		GC43	APPLICATION FOR PAYMENT
		GC44	PAYMENT
		GC45	RELATIONSHIP OF MUNICIPALITY OF THE COUNTY OF KINGS AND CONTRACTOR

GC1 **DEFINITIONS**

The following Definitions shall apply to all Contract Documents.

.1 The Contract

The Contract is the undertaking by the parties to perform their respective duties, responsibilities and obligations as prescribed in the Contract Documents and represents the entire agreement between the parties.

.2 Contract Documents

The Contract Documents consist of those documents listed in ARTICLE IV OF THE AGREEMENT and subsequent amendments thereto made pursuant to the provisions of the Contract and agreed upon between the parties.

.3 Municipality of the County of Kings

The Municipality of the County of Kings is identified as such in the Agreement. The term Municipality of the County of Kings means the Municipality of the County of Kings or his authorized representative as designated to the Contractor in writing but does not include the Consultant. Where the term “Owner” appears in the contract it shall be read as “Municipality of the County of Kings”.

.4 Consultant

The Consultant is the person, firm or corporation identified as such in the Agreement. The term Consultant means the Consultant or his authorized representative as designated to the Municipality of the County of Kings in writing. Where no Consultant exists on the project the term “Consultant “ shall be read as “Municipality of the County of Kings”.

.5 Contractor

The Contractor is the person, firm or corporation identified as such in the Agreement. The term Contractor means the contractor or his authorized representative as designated to the Municipality of the County of Kings in writing.

.6 Subcontractor

A Subcontractor is a person, firm or corporation having a direct contract with the Contractor to perform a part or parts of the Work, or to supply products worked to a special design according to the Contract Documents, but does not include one who merely supplies products not so worked.

.7 Supplier

One who furnishes material not worked to a special design.

.8 Other Contractor

Other Contractor means a person, firm or corporation employed by or having a separate contract directly or indirectly with the Municipality of the County of Kings for work other than that required by the Contract Documents.

.9 Project

The Project means the total construction contemplated of which the Work may be the whole or a part.

.10 The Work

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

.11 Place of Work

The Place of the Work is the designated site or location of the Project of which the Work may be the whole or a part.

.12 Products

Products means material, machinery, equipment and fixtures forming the Work but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work and normally referred to as construction machinery and equipment.

.13 Time

- (a) The Contract Time is the time stipulated in the Contract Documents for Substantial Performance of the Work.
- (b) The date of Substantial Performance of the Work is the date certified as such by the Consultant.
- (c) Day means the calendar day.
- (d) Working Day means days other than Saturdays, Sundays and holidays which are observed by the construction industry in the area of the Place of Work.

.14 Change in the Work

Change in the Work means an addition, deletion, or other revision to the Work within the general scope of the Contract Documents.

.15 Extra Work

Extra work means any work or service, the performance of which is beyond the general scope for the Contract Documents.

.16 Contemplated Change Order (CCO)

If a change arises on the project, the Consultant will discuss the change with the Municipality Project Manager. Upon approval, the Consultant will detail the change on CCO forms provided by the Municipality. This CCO, along with the Consultant's letter explaining the reason for the contemplated change and an estimate of the costs involved, will be forwarded to the Municipality for formal approval. At the same time, the Consultant is to forward a copy of the CCO to the Contractor to expedite pricing.

.17 Change Order

A Change Order is a written instrument prepared by the Consultant and signed by the Municipality of the County of Kings, with written recommendation from the Consultant stating their agreement upon all of the following:

- .1 A Change in the Work or Extra Work;
 - .2 the change in the Contract Price, if any;
 - .3 the change in the Contract time, if any.
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.18 Change Directive

A Change Directive is a written order prepared by the Consultant and signed by the Municipality of the County of Kings and Consultant, directing a Change in the Work and stating a proposed basis for adjustment, if any, in the Contract Price or Contract time, or both. A Change Directive is used in the absence of total agreement necessary for a Change Order.

.19 Substantial Performance of the Work

Substantial Performance shall have been reached when the Work is ready for use or is being used for the purpose intended and when the work to be done under this Contract is capable of completion or correction at a cost of not more than two and one half percent of the contract price as so certified by the Consultant and the Municipality of the County of Kings.

.20 Completion of Work

Completion shall have been reached when the Work, including all deficiencies documented during the Substantial Performance Inspection have been corrected as so certified by the Consultant and/or the Municipality of the County of Kings.

.21 Completion of the Contract

Completion of the Contract shall have been reached when the work has been certified as being complete and any deficiencies documented during the specified warranty period have been corrected as so certified by the Consultant and/or the Municipality of the County of Kings.

GC2 DOCUMENTS

- .1 The Contract Documents shall be signed in duplicate by the Municipality of the County of Kings and Contractor.
 - .2 The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all.
 - .3 The intent of the Contract Documents is to include the labour, products and services necessary for the performance of the Work in accordance with these documents. It is not intended, however, that the Contractor shall supply products or perform work not consistent with, covered by or properly inferable from the Contract Documents.
 - .4 Descriptions of materials or Work in words which so applied have well known technical or trade meanings shall be held to refer to such recognized meanings.
 - .5 References to Municipality of the County of Kings, Consultant, Contractor, Subcontractor, supplier and manufacturer is referred to throughout the Contract Documents as if singular in number and masculine in gender.
 - .6 In the event of conflicts between Contract Documents the following shall apply:
 - (a) Documents of later date shall govern.
 - (b) Figured dimensions shown on a Drawing shall govern even though they may differ from dimensions scaled on the same Drawing.
 - (c) Drawings of larger scale shall govern over those of smaller scale of the same date.
 - (d) Schedules shall rule over drawings.
 - (e) Specifications shall govern over Drawings and Schedules.
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- (f) The General Conditions shall govern over Specifications.
- (g) Supplementary Conditions shall govern over the General Conditions.
- (h) The executed Agreement between the Municipality of the County of Kings and Contractor shall govern over all documents.

GC3 DETAIL DRAWINGS & INSTRUCTIONS

- .1 The Consultant shall furnish as necessary for the execution of the Work additional instructions, by means of Drawings or otherwise. All such additional instructions shall be consistent with the Contract Documents. The Work shall be executed in conformity therewith and the Contractor shall do no Work without such additional instructions. In giving such additional instructions, the Consultant shall have authority to make minor changes in the Work, consistent with the intent of the Contract Documents.
- .2 The Contractor and the Consultant, if either so requests, shall jointly prepare a schedule, subject to change from time to time in accordance with the progress of the Work, fixing the dates at which the various detail Drawings will be required and the Consultant shall furnish them in accordance with the schedule. Under like conditions, a schedule shall be prepared, fixing the dates for the submission of shop drawings, for the beginning of manufacture and installation of materials and for the completion of the various parts of the Work.

GC4 COPIES FURNISHED

- .1 In addition to the signed duplicates of the Contract Documents, the Municipality of the County of Kings shall furnish to the Contractor, free of charge, a maximum of **10** copies of all Drawings and Specifications for the proper execution of the Work. All additional copies shall be supplied by the Municipality of the County of Kings and charged at cost to the Contractor.

GC5 SHOP DRAWINGS

- .1 The Contractor shall furnish to the Consultant at proper times, all shop and setting drawings or diagrams which the Consultant may deem necessary in order to make clear the Work intended or to show its relation to adjacent Work of other trades. The Contractor shall make any changes in such drawings or diagrams which the Consultant may require consistent with the Contract and shall submit two copies of the revised prints to the Consultant, one of which shall be returned to the Contractor and the other retained by the Consultant. When submitting shop and setting drawings the Contractor shall notify the Consultant in writing of changes made therein from the Consultant's Drawings or Specifications. The Consultant's approval of such Drawings or of the revised Drawings shall not relieve the Contractor from responsibility for errors made by the Contractor therein or for changes made from the Consultant's Drawings or Specifications not covered by the Contractor's written notification to the Consultant. All models and templates submitted shall conform to the spirit and intent of the Contract Documents.
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GC6 DRAWINGS & SPECIFICATIONS ON THE WORK

- .1 The Contractor shall keep one copy of all Drawings and Specifications on the Work, in good order, available to the Consultant and his representatives.

GC7 OWNERSHIP OF DRAWINGS & MODELS

- .1 All Drawings, Specifications and copies thereof and all models furnished by the Consultant are his property. They are not to be used on other Work and with the exception of the signed Contract Set of Drawings and Specifications, are to be returned to him on request on the completion of the Work.

GC8 SAMPLES

- .1 The Contractor shall furnish for the Consultant's approval such samples as he may reasonably require. The Work shall be in accordance with approved samples.

GC9 CONSULTANT & CONTRACTOR

- .1 The Consultant shall have general supervision and direction of the Work, but the Contractor shall have complete control, subject to GC11 of his organization.

GC10 CONSULTANT'S DECISION

- .1 The Consultant shall decide on questions arising under the Contract Documents, whether as to the performance of the Work or the interpretation of the Specifications and Drawings, but should the Contractor hold such decisions to be at variance with the contract Documents, or to involve changes in work already built, fixed, ordered or in hand in excess of the Contract or to be given in error, he shall notify the Consultant in writing before proceeding to carry them out.

GC11 CONTRACTOR'S PERSONNEL

- .1 The Contractor shall keep on the Work, during its progress, a competent foreman and any necessary assistants, all satisfactory to the Consultant. The foreman shall not be changed except with the consent of the Consultant, unless the foreman proves to be unsatisfactory to the Contractor and ceases to be in his employ. The foreman shall represent the Contractor in his absence and directions on minor matters given to him shall be held to be given to the Contractor. Important directions shall be given in writing to the Contractor. The Contractor shall give efficient supervision to the Work, using his best skill and attention.
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GC12 MATERIALS, APPLIANCES AND EMPLOYEES

- .1 Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labour, water, tools, equipment, light and power necessary for the execution of the Work.
- .2 Unless otherwise specified, all materials shall be new. Both workmanship and materials shall be of the quality specified.
- .3 The Contractor shall not employ on the Work any unfit person or anyone not skilled in the Work assigned him.

GC13 INSPECTION OF WORK

- .1 The Municipality of the County of Kings or the Consultant on his behalf and their representative shall at all times have access to the Work wherever it is in preparation or progress and the Contractor shall provide proper facilities for such access and for inspection.
- .2 If the Specifications, the Consultant's instructions, laws, ordinances or any public authority require any Work to be specially tested or approved, the Contractor shall give the Consultant timely notice of its readiness for inspection and if the inspection is by an authority other than the Consultant of the date and time fixed for such inspection. Inspections by the Consultant shall be made promptly. If any such Work should be covered up without approval or consent of the Consultant, it must, if required by the Consultant, be uncovered for examination and made good at the Contractor's expense.
- .3 Re-examination of questioned Work may be ordered by the Consultant. If such Work be found in accordance with the Contract, the Municipality of the County of Kings shall pay the cost of re- examination and replacement. If such Work be found not in accordance with the Contract, through the fault of the Contractor, the Contractor shall pay such cost.

GC14 CORRECTION BEFORE FINAL PAYMENT

- .1 The Contractor shall promptly remove from the premises all materials condemned by the Consultant as failing to conform to the Contract, whether incorporated in the Work or not, and the Contractor shall promptly replace and re-execute his own Work in accordance with the Contract and without expense to the Municipality of the County of Kings and shall bear the expense of making good all Work of other Contractors destroyed or damaged by such removal or replacement.
 - .2 If the Contractor does not remove such condemned materials or Work within the time fixed by written notice, the Municipality of the County of Kings may remove them and may store such materials at the expense of the Contractor. If the Contractor does not pay the expense of such removal within five days thereafter, the Municipality of the County of Kings may, upon ten days' notice, sell such materials at auction or at private sale and shall account for the net proceeds thereof, after deducting all costs and any other costs and expenses that should have been borne by the Contractor.
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GC15 DEDUCTIONS FOR UNCORRECTED WORK

- .1 If in the opinion of the Consultant it is not expedient to correct defective Work or Work not done in accordance with the Contract Documents, the Municipality of the County of Kings may deduct from the Contract price the difference in value between the Work as done and that called for by the Contract, the amount of which shall be determined in the first instance by the Consultant.

GC16 CORRECTION AFTER FINAL PAYMENT

- .1 Neither the final certificate nor payment thereunder, nor any provision in the Contract Documents shall relieve the Contractor from responsibility for faulty materials or workmanship which shall appear within a period of one year from the date of Substantial Performance of the Work and he shall remedy any defects due thereto and pay for any damage to other Work resulting therefrom which shall appear within such period of one year. The Municipality of the County of Kings shall give notice of observed defects promptly. This article shall not be deemed to restrict any liability of the Contractor arising out of any law in force in the Province.

GC17 PROTECTION OF WORK & PROPERTY

- .1 The Contractor shall maintain continuously adequate protection of all his Work from damage and shall protect the Municipality of the County of Kings's property from all injury arising in connection with this Contract. He shall make good any such damage or injury, except such as may be directly due to errors in the Contract Documents. He shall protect adequately adjacent property as required by law and Contract Documents.

GC18 EMERGENCIES

- .1 The Consultant has authority to stop the progress of the Work whenever in his opinion such stoppage may be necessary to ensure its proper execution. In an emergency affecting or threatening the safety of life or of the structure or of adjoining property, he has authority to stop the progress of the Work and make such changes and to order such Work extra to the Contract or otherwise as may in his opinion be necessary.

GC19 WORKERS COMPENSATION ACT

- .1 The Contractor shall furnish evidence of coverage under the Worker's Compensation Act, R.S.N.S. and a Clearance letter indicating the Contractor, Sub Contractor(s) and other Contractor(s) are in good standing.

GC20 INSURANCE

- .1 Contractor's liability insurance:
 - .1 The Contractor shall maintain such insurance and pay such assessments as will protect the Contractor and the Municipality of the County of Kings from claims
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- under the Worker's Compensation Act and from any other claims for damages for bodily injury, sickness or disease, including death and from claims for property damage which may arise from operations under this Contract. The minimum limits of such insurance shall be not less than \$5,000,000 with respect to each occurrence or accident, on an occurrence (not claims made) basis.
- .2 The liability insurance to be maintained by the Contractor shall include Commercial General Liability Insurance covering Premises and Operations Liability, elevators, broad form property damage, broad form automobile, owners and contractors protective, blanket contractual, personal injury, completed operations liability contingent employers liability, cross liability clause, non-owned automobile liability, and a 30 day notice of cancellation clause. Liability coverage of not less than \$5,000,000 is required with regard to operations of owned automobiles.
 - .3 All liability insurance policies shall be written in such terms as will fully protect the Contractor and the Municipality of the County of Kings as an additional named insured.
 - .4 Prior to commencement of any Work hereunder, the Contractor shall file with the Municipality of the County of Kings a certified copy of each insurance policy and certificate required. All such insurance shall be maintained until final completion and acceptance of the Work including the making good of faulty Work or materials pursuant to GC16, except that coverage of completed operations liability shall in any event be maintained for twelve (12) months from date of Substantial Performance as certified by the Consultant, and approved by the Municipality of the County of Kings.
- .2 Comprehensive builder's risk coverage
- .1 Prior to the commencement of any Work hereunder the Contractor shall maintain and pay for Broad Form (All Risks) Builders Risk Coverage in the joint names of the Municipality of the County of Kings and the Contractor totalling not less than 100% of the total value of the Work done and materials delivered on the site (contract value), so that any loss under such policies of insurance will be payable to the Municipality of the County of Kings and the Contractor as their respective interests appear. The Builders Risk Insurance shall include all materials related to the work while in transit or at other locations.
 - .2 Should a loss be sustained under the Builders Risk Coverage, the Contractor shall act on behalf of the Municipality of the County of Kings and Contractor for the purpose of adjusting the amount of such loss with the insurance companies. As soon as such adjustment has been satisfactorily completed, the Contractor shall proceed to repair the damage and complete the Work and shall be entitled to receive from the Municipality of the County of Kings in addition to any sum due under the Contract, the amount at which the Municipality of the County of Kings' interest has been appraised in the adjustment made with the insurance companies as referred to above, said amount to be paid to the Contractor as the Work of restoration proceeds. Any loss or damage which may occur shall not affect the rights and obligations of either party under the Contract except as
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aforesaid and except that the Contractor shall be entitled to a reasonable extension of time for the performance of the Work, as the Municipality of the County of Kings may decide.

- .3 Upon approval by the Municipality of the County of Kings of the final certificate issued by the Consultant, the Contractor's obligation to maintain Builder Risk Insurance shall cease and the Municipality of the County of Kings shall assume full responsibility for insuring the whole of the Work against loss or damage.
- .4 All insurance policies shall be endorsed to provide a minimum advance written notice of not less than 30 days in the event of cancellation, termination, or reduction in coverage or limits, such notice to be made by the Insurer to the Municipality of the County of Kings.
- .5 All insurance policies or certification documents shall specify coverage being applicable to this contract.
- .6 Prior to commencement of work, file with the Municipality of the County of Kings a certified copy of each complete insurance policy or certification documents required. All such insurance shall be maintained until Substantial Performance of the contract.
- .7 The Contractor shall not do or omit to do or suffer anything to be done or omitted to be done which will in any way impair or invalidate such policy or policies of insurance.

GC21 GUARANTY BONDS

- .1 The Bid Bond of the successful bidder in an amount not less than ten per cent (10%) of the Bid as set out in the Instructions to Bidders shall be replaced within ten (10) days of the award of Contract by a Performance Bond and a Payment Bond, each in the amount of fifty percent (50%) of the Bid sum, on the forms provided by and acceptable to the Municipality of the County of Kings, the cost to be included in the Bid Price. The Bonds shall guarantee the faithful performance of the Contract and payment of all obligations arising from the Contract. The General Contractor shall require Performance Bonds and Payment Bonds of the Sub-Contractors as set out in the Instructions to Bidders and otherwise comply with the requirements set out there in respecting security for Contract.

GC22 IRREVOCABLE STANDBY LETTER OF CREDIT

- .1 As an alternative to Guaranty Bonds (GC21), an Irrevocable Standby Letter of Credit shall be provided as security for Bid, Performance, Labour and Material payment and warranty of the work. The Irrevocable Standby Letter of Credit shall be issued by a certified financial institution subject to the The Uniform Customs and Practice for Documentary Credits, 2007 Revision, International Chamber of Commerce (ICC) Publication no. 600 ("UCP"), for a sum equal to ten percent (10%) of the Contract Price. The Irrevocable Standby Letter of Credit is to remain in effect for a period of not less than twelve (12) months after the issue of Substantial Performance Certificate by the Municipality of the County of Kings. Upon expiry of the Irrevocable Standby

Letter of Credit, Supplemental Security in a form acceptable to the Municipality of the County of Kings shall be provided for work requiring extended warranties. Certified financial Institution is to endorse the Irrevocable Standby Letter of Credit in the name of the Municipality of the County of Kings. Include the cost of providing the Irrevocable Standby Letter of Credit in the Contract Price.

GC23 CHANGES IN WORK

- .1 The Municipality of the County of Kings or the Consultant, without invalidating the Contract, may make changes by altering, adding to or deducting from the Work, the Contract Price being adjusted accordingly. All such Work shall be executed under the conditions of the Contract except that any claim for extension or reduction of time caused thereby shall be adjusted at the time of ordering such change.
- .2 Except as provided in GC18, no change shall be made unless in pursuance of a Change Order or Change Directive from the Municipality of the County of Kings and no claim for an addition to or deduction from the Contract Price shall be valid unless a Change Order or Change Directive is issued.
- .3 The Contractor shall notify the Sureties named in the Performance Bond and Payment Bond provided by it under this Contract of all such changes made in pursuance of a Change Order or Change Directive is issued from the Municipality of the County of Kings.

GC24 VALUATION OF CHANGES

- .1 The value of any change shall be determined in one or more of the following ways as determined by the Consultant:
 - (a) By estimate and acceptance in a lump sum, submitted with sub-contractors' and suppliers' signed quotations and breakdown estimates for material and labour. (i.e. Itemized materials lists and labour, including labour rates and number of hours to perform work)
For changes where the individual trade cost is anticipated to be less than \$1000, the requirement for the detailed cost breakdowns may be waived but individual trade quotation must be supplied.
 - (b) By unit prices agreed upon or as listed in the contract.
 - (c) Cost of work and percentage or by cost and fixed fee.
 - (d) If appropriate breakdown is not provided as required above, the Municipality of the County of Kings will not be held responsible for costs of delay associated with this Work.
- .2 In cases of additional work to be paid for under method "C", the Contractor shall keep and present in such form as the Consultant may direct, a correct account of the net cost of labour and materials, together with vouchers. In any case, the Consultant shall certify to the amount due to the Contractor including the profit and overhead as described in the Schedule. Pending final determination of value, payments on account of changes shall be made on the Consultant's certificate.
- .3 (a) In determination of method .1(a) or .1(c) above, the labour costs to be calculated

by the actual estimated hours at an hourly rate determined as follows:

The hourly labour rate to be total payroll costs including hourly wage, statutory contributions to EI, WCB and CPP and other applicable labour burdens paid directly by the employer such as vacation pay, holiday pay, pension plan etc.

Such burdens shall be verified by submission of payroll evidence. The Municipality of the County of Kings reserves the right to verify the payroll costs by independent audit. To the total payroll cost the following percentage factors will be recognized.

- small tools/expenditures 5% (on payroll costs)

- site supervision 5% (on payroll costs)

- (b) In determination of methods ".1a)" and ".1c)" above, the material costs to be calculated as follows:

Contractors net costs, including contractor discounts from suppliers, FOB the project site plus applicable taxes.

- (c) In determination of methods ".1a)" and ".1c)" above, equipment rental costs for major pieces of equipment required will be at local industry rates.

- (d) In determination of methods ".1a)" and ".1c)" above, overhead and fees shall be calculated as follows:

The cost of any authorized change shall be determined by the net total of labour and material or equipment as outlined in .3(a), .3(b) and .3 c) above on which the percentage mark-up shall be determined as follows:

For Extras Up to \$5,000:

Sub-Contractors Own Work - Overhead & Fee - 15% total

General Contractors Own Work - Overhead & Fee - 15% total

General Contractor on Sub-Contractors Work - 10% total

(No percentage markup shall be applied to deductions)

For Extras Above \$5,000:

Sub-Contractors Own Work - Overhead & Fee - 10% total

General Contractors Own Work - Overhead & Fee - 10% total

General Contractor on Sub-Contractors Work - 8% total

(No percentage markup shall be applied to deductions)

- .4 Submit to the Consultant and the Municipality of the County of Kings' representative detailed breakdown of the hourly labour rate as defined in paragraph .3(a) of GC24.
- .5 Itemization of hourly labour rates including burdens shall be submitted on the Itemized Breakdown of Employee Hourly Labour Rate Form provided by the Municipality of the County of Kings.

GC25 CLAIMS AGAINST CONTRACTOR

- .1 The Contractor shall promptly pay for all labour, services and materials, in or about the construction of the Work. All payments for such purposes shall be made by the Contractor at least as often as payments are made by the Municipality of the County of Kings to the Contractor. Proof of payment to subcontractors and

- suppliers will be in the form of a statutory declaration provided by the General Contractor to the Municipality of the County of Kings.
- .2 The Municipality of the County of Kings will maintain holdback funds in accordance with the Builders's Lien Act. The Builders' Lien Act provides that where the Province is the owner of a property the claims for lien may be served upon the Municipality of the County of Kings of Justice.
 - .3 Before final settlement is made for Work done and materials furnished under the Contract, the Contractor shall produce and furnish evidence satisfactory to the Municipality of the County of Kings that the Work and all its parts are free and clear from all lawful claims for labour, workmanship, materials or otherwise. The Contractor shall indemnify and hold harmless the Municipality of the County of Kings and all his property from any and all kinds of claims accruing from labour and services performed and materials furnished, or otherwise, and any of the same, in or about said Work.

GC26 CERTIFICATES & PAYMENTS

- .1 Payments equal to percentage stipulated in the Agreement of the value of the Work done, as valued by the Consultant, will be made to the Contractor monthly as the Work progresses on the written certificate of the Consultant that the Work for or on account of which the certificate is granted has been duly executed to his satisfaction; stating the value of such Work as computed by him and said certificate shall be a condition precedent to the right of the Contractor to be paid the said percentage or any part thereof. No such monthly payment shall be construed to be an acceptance of any defective Work or improper materials.
 - .2 Whenever the Work is finished according to the Plans and Specifications and to the satisfaction of the Consultant, the Consultant shall make and certify the final estimate for same. The Municipality of the County of Kings will then pay the Contractor the remainder which shall be found to be due, within thirty (30) days after the execution of said Final Certificate for Payment, excepting therefrom such sum(s) as may be lawfully deducted or retained under any of the provisions of the Contract or as necessary under the Builder's Lien Act. The Final Certificate for Payment of the Consultant certifying the final completion of said Work to his entire satisfaction shall be a condition precedent to the right of the Contractor to receive or to be paid the balance due or any part thereof. The right is reserved by the Municipality of the County of Kings to reject the whole or any part of the Work, should said certificate be found to be inconsistent with the terms of the Contract or otherwise improperly given.
 - .3 The Consultant's progress certificates and the payment of progress estimates based upon the same shall not be construed as acceptance or approval of the Work, but only as temporary advances to the Contractor. He shall be bound, notwithstanding such progress estimates, to well and truly complete, finish and hand over in good condition, to the entire satisfaction of the Consultant, by the time specified and in accordance with the terms and conditions of the Specifications, the whole of the Work included herein. All the percentage retained by the Municipality of the County of Kings shall be payable five (5) days following the expiration of the lien period set out in the Builders' Lien Act except that the Municipality of the County of Kings may retain such sums necessary to satisfy any liens.
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GC27 PERMITS, NOTICES, LAWS & RULES

- .1 The Contractor shall obtain and pay for all necessary permits or licenses required for the execution of the Work (but this shall not include the obtaining of permanent easements or building permits).
- .2 The Contractor shall give all necessary notices and pay all fees required by law and comply with all laws, ordinances, rules and regulations relating to the Work and to the preservation of the public health and safety and if the Specifications and Drawings are at variance therewith any resulting additional expense incurred by the Contractor shall constitute an addition to the Contract Price.

GC28 PATENT FEES

- .1 The Contractor shall pay all royalties and license fees and shall save the Municipality of the County of Kings harmless from loss on account of suits or claims which may arise by reason of the Work for infringement of patents.

GC29 USE OF PREMISES

- .1 The Contractor shall confine his apparatus, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the Consultant and shall not unreasonably encumber the premises with his materials.
- .2 The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.
- .3 The Contractor shall enforce the Consultant's instructions regarding signs, advertisements, fires and smoking.

GC30 CLEANING UP

- .1 The Contractor shall at all times keep the premises free from accumulations of waste materials or rubbish caused by the employees or Work and at the completion of the Work he shall remove all his rubbish from and about the building and all his tools, scaffolding and surplus materials, leaving his Work broom clean or its equivalent, unless more exactly specified. In case of dispute, the Municipality of the County of Kings may remove the rubbish and charge the cost to the Contractor as the Consultant shall determine to be just.

GC31 CUTTING, PATCHING & DIGGING

- .1 The Contractor shall do all cutting, fitting or patching of his Work that may be required to make its several parts come together properly and fit it to receive or be received by Work of other Contractors shown upon, or reasonably implied by, the Contract Documents and he shall make good after them, as the Consultant may direct.
 - .2 Any cost caused by ill-timed Work shall be borne by the party responsible therefor.
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- .3 The Contractor shall not endanger any existing Work by cutting, digging or otherwise and shall not cut or alter the Work of any other Contractor save with the consent of the Consultant.

GC32 DELAYS

- .1 If the Contractor is delayed in the completion of the Work by any act or neglect of: The Municipality of the County of Kings or Consultant, any employee or either any other Contractor employed by the Municipality of the County of Kings, changes ordered in the Work, strikes, lockouts, fire, unusual delay by common carriers, unavoidable casualties, any other cause of any kind whatsoever beyond the Contractor's control or by any cause within the Contractor's control which the Consultant shall decide as justifying the delay, then the time of completion shall be extended for such reasonable time as the Consultant may decide.
- .2 No such extension shall be made for delay occurring more than seven days before claim therefore is made in writing to the Consultant, provided however that in the case of a continuing cause of delay, only one claim shall be necessary.
- .3 If no schedule is made under GC3, no claim for delay shall be allowed on account of failure to furnish Drawings until two weeks after demand for such Drawings and not then unless such claim be reasonable.
- .4 The Consultant shall not, except by written notice to the Contractor, or as provided in GC18, stop or delay any part of the main Contract Work pending decisions or proposed changes.

GC33 MUNICIPALITY OF THE COUNTY OF KINGS'S RIGHT TO DO WORK

- .1 If the Contractor should neglect to prosecute the Work properly or fail to perform any provision of this Contract, the Municipality of the County of Kings, after three days written notice to the Contractor and the Surety, may without prejudice to any other remedy he may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.

GC34 MUNICIPALITY OF THE COUNTY OF KINGS'S RIGHT TO TERMINATE CONTRACT

- .1 If the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency or if he should, except in cases recited in Article GC33, refuse or fail to supply enough properly skilled workmen or proper materials after having received seven days' notice in writing from the Consultant to supply additional workmen or materials, or if he should fail to make prompt payment to Sub-Contractors or for material or labour, or persistently disregard laws, ordinances or the instructions of the Consultant, or otherwise be guilty of a substantial violation of the provisions of the Contract, then the Municipality of the County of Kings may, without prejudice to any other right or remedy, by giving the Contractor and the Surety written notice, terminate the employment of the Contractor and take possession of the premises and

of all materials, tools and appliances thereon and finish the Work by whatever method he may deem expedient, but without undue delay or expense. In such case, the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the contract price shall exceed the expense of finishing the Work, such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Municipality of the County of Kings.

GC35 CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

- .1 If the Work should be stopped under an order of any court, or other public authority, through no act or fault of the Contractor or of anyone employed by him, then the Contractor may, upon three days' written notice to the Municipality of the County of Kings and Consultant, stop Work or terminate this Contract and recover from the Municipality of the County of Kings payment for all Work executed and any loss sustained upon any plant or material with reasonable profit and damages.

GC36 MUTUAL RESPONSIBILITY OF CONTRACTORS

- .1 Should the Contractor suffer damage by any act, neglect or default of any other Contractor employed by the Municipality of the County of Kings upon the Work, the Municipality of the County of Kings shall be responsible therefore, but shall be subrogated to the rights of the damaged Contractor against the Contractor causing the damages. The Contractor shall make his claim in writing against the Municipality of the County of Kings within seventy-two hours after the happening of the event causing such damage to the Contractor.
- .2 Should the Contractor cause damage to any other Contractor on the Work, the Contractor agrees, upon due notice, to settle with such other Contractor by agreement if he will so settle. If such other Contractor sues the Municipality of the County of Kings on account of any damage alleged to have been so sustained the Municipality of the County of Kings shall notify the Contractor, who shall defend such proceedings at his own expense and if any final order or judgement against the Municipality of the County of Kings arises therefrom, the Contractor shall be responsible and shall pay and satisfy it promptly together with all costs incurred by the Municipality of the County of Kings.

GC37 SEPARATE CONTRACTS

- .1 The Municipality of the County of Kings reserves the right to let other contracts in connection with the undertaking of which the Work is a part and the Contractor shall connect properly and coordinate his Work with that of other Contractors. If any part of the Contractor's Work depends for its proper execution or result upon the Work of another Contractor, the Contractor shall report promptly to the Consultant any defects in the Work of such other Contractor as may interfere with the proper execution of the Contractor's Work. Should the Contractor fail so to inspect and report, he shall have

no claim against the Municipality of the County of Kings by reason of the defective or unfinished Work of any other Contractor, except as to latent defects not reasonably noticeable at the time of the commencement of the Contractor's Work.

GC38 **ASSIGNMENT**

- .1 This Contractor shall not assign the Contract or assign any monies due or accruing under the Contract under any circumstances.

GC39 **SUB-CONTRACTS**

- .1 The Contractor agrees that the list of names of Sub-Contractors when request with the Bid is the list of Sub-Contractors proposed to be used to carry out those parts of the Work noted thereon and he shall not employ any to whom the Consultant may reasonably object.
- .2 The Contractor agrees to supply within ten (10) days of award of Contract or immediately prior to commencement of Work (whichever occurs first) the names of all Sub-Contractors. Those listed shall be contracted by the Contractor to carry out those parts of the Work noted thereon and the Contractor shall not employ any to whom the Consultant may reasonably object.
- .3 If the change of any name on such list is required by the Municipality of the County of Kings and the Work has to be awarded to a higher bidder, the Contract Price shall be increased by the difference between the two bids.
- .4 The Consultant shall, on request, furnish to any Sub-Contractor, wherever practicable, evidence of the amounts certified to on his account.
- .5 The Contractor shall be held as fully responsible to the Municipality of the County of Kings for the acts and omissions of his Sub-Contractors and of persons directly or indirectly employed by them, as for the acts and omissions of persons directly employed by him.
- .6 In view of this responsibility for the acts and omissions of his Sub-Contractors, the Contractor shall not be obliged to employ as a Sub-Contractor any person or firm to whom he may reasonably object.
- .7 Nothing contained in the Contract Documents shall create any contractual relation between any Sub-Contractor and the Municipality of the County of Kings.

GC40 **RELATIONS OF CONTRACTOR & SUB-CONTRACTOR**

- .1 The Contractor agrees to bind every Sub-Contractor by the terms of the Contract Documents, as far as applicable to his Work.

GC41 **TAXES**

- .1 Harmonized Sales Tax
 - .1 The Municipality is not exempt for Harmonized Sales Tax (HST) purposes. As a result, the aggregate amount of the bid for Municipality contracts is subject to

HST, however, prices submitted shall not include HST.

- .2 The Contractor agrees he has not included in his bid, Harmonized Sales Tax on materials and services to be provided in connection with this Contract.
- .3 The HST, payable by the Municipality, will be added as a separate item during the processing of progress payments and therefore HST will not appear as a cost in the aggregate amount of Bid.

GC42 PROGRESS ESTIMATES

- .1 Progress estimates must be submitted with each claim for payment, based upon the approved Schedule of Values for the various parts of the work.
- .2 All claims for material on site, but not installed, must be supported by supplier's invoices showing supplier's unit prices, including taxes. When material has been taken from Contractor's or Sub-Contractor's general stock on hand, they shall supply invoices priced at current cost prices without Contractor's or Sub-Contractor's profit.

GC43 APPLICATION FOR PAYMENT

- .1 Application for payment shall be as set out in the Form of Agreement between the Municipality of the County of Kings and the Contractor.

GC44 PAYMENT

- .1 Payment shall be as set out in the Form of Agreement between the Municipality of the County of Kings and the Contractor.

GC45 RELATIONSHIP OF MUNICIPALITY OF THE COUNTY OF KINGS AND CONTRACTOR

- .1 The relationship between the Municipality of the County of Kings and Contractor shall be as set out in the form of agreement between the Municipality of the County of Kings and the Contractor

END

Supplementary General Conditions

The following supplements modify the "General Conditions of Contract". Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

1.0 GC1 - Definitions

- .1 Item GC1.2
 - .1 Where the words "ARTICLE IV OF THE AGREEMENT" are used substitute "List of Contents and List of Drawings".
- .2 Item GC1.4 - Change the first sentence to read
 - .1 The Consultant is the person, firm or corporation identified as such by the Municipality of the County of Kings.
- .3 Item GC1.5 - Change the first sentence to read
 - .1 The Contractor is the person, firm or corporation identified as such.

2.0 GC 11- Contractor's Personnel

- .1 Change GC11.1 to read:

The Contractor shall keep on the Work, during its progress, a competent Site Superintendent and any additional named personnel, all satisfactory to the Consultant and approved by the Municipality of the County of Kings. The foreman, Site Superintendent, or additional named personnel shall not be changed except with the consent of the Consultant, unless they prove to be unsatisfactory to the Contractor and/or ceases to be in his employ. The foreman and named personnel shall represent the Contractor in his absence and directions on minor matters given to him shall be held to be given to the Contractor.

Important directions shall be given in writing to the Contractor. The Contractor shall give efficient supervision to the Work, using his best skill and attention.
- .2 Add new Paragraph GC11.2 to read:

The General Contractor shall provide, throughout the duration of the project, including project closeout:

 - .1 and until total completion is certified by the Municipality of the County of Kings;
 - .1 One full-time Site Superintendent.
 - .2 This individual shall have a minimum of ten (10) years of experience in the role of Construction Project Site Superintendent and shall have previously worked on similarly sized and designed projects.
 - .2 and until the warranty period has elapsed;
 - .1 One Construction Project Manager on minimum of a half-time basis.
 - .2 This Individual shall have a minimum of eight (8) years of experience in the role of Construction Project Manager and will have previously managed similarly sized and designed projects.
 - .3 One Project Coordinator on a minimum of a half-time basis.
 - .1 This individual shall have a minimum of three (3) years of experience in the role

of Project Coordinator and shall have previously managed similarly sized and designed projects. The Project Coordinator can be based out of the General Contractor's office, and is not required to be based on the job site.

.3 Add new Paragraph GC11.3 to read:

The Contractor, the Site Superintendent designated above, shall ensure all sediment and erosion controls used on the project are in accordance with the "Erosion and Sedimentation Control Handbook for Construction Sites" (1988; DOEL) and Division 7 of the Standard Specification Highway Construction and Maintenance" (1997(R2002); TIR). The contractor shall carry out regular inspections of all erosion and sediment controls ensuring proper installations are maintained, especially prior to and after major storm events. All projects involving site work where erosion may be an issue, shall require that the contractor's full-time on site foreman possess a Certificate of Training for successful completion of the Erosion and Sediment Control workshop offered by the Centre for Water Resource Studies (CWRS), Dalhousie University and TIR.

3.0 GC20 - Insurance

.1 Item GC20.1.1 - Change the last sentence to Read:

The minimum limits of such insurance shall be not less than \$5,000,000 annual aggregate \$5,000,000 on an occurrence (not claims made) basis.

.2 Item GC20.2.1 - Add the following sentence:

The Builders Risk Insurance shall include earthquake coverage extension and include flood coverage extension.

.3 Add Item GC20.2.8 to read:

The Contractor has care, custody and control (or the equivalent) of the entire property site. Provide insurance coverage not less than 100% of the total replacement cost value of all buildings and structures on the entire site plus 100% of the value of the Contract.

4.0 GC21 - Guaranty Bonds

.1 Item GC21.1 - Change to Read:

.1 The successful bidder, as set out in the Instructions to Bidders, shall provide within ten (10) days of the award of Contract a Performance Bond and a Payment Bond, each in the amount of fifty percent (50%) of the tendered bid sum, on the forms provided by and acceptable to the Municipality of the County of Kings, the cost to be included in the Bid Price. The Bonds shall guarantee the faithful performance of the Contract and payment of all obligations arising from the Contract. The General Contractor shall, as set out in the Instructions to Bidders, comply with the requirements set out therein respecting security for Contract.

5.0 GC25 - Claims Against the Contractor

.1 Item GC25.1 - Add a sentence to the end, as follows: *The Statutory Declaration, Standard Construction Document* provided in the tender documents is to be used for all statutory declarations for this Contract.

6.0 GC32 - Delays

- .1 Add Item GC32.5 to Read:
 - .5 The Municipality of the County of Kings and the Contractor agree that, in the event that the Work, or portions of the Work, as identified in contract documents, are not completed by the required dates, the Municipality of the County of Kings will suffer damages which are very difficult to identify with precision because of the nature or the project. The Municipality of the County of Kings and the Contractor agree that a fair pre-estimate of the amount of set damages is \$1000.00 per calendar day. Therefore, the parties agree that the Contractor shall pay to the Municipality of the County of Kings for each and every calendar day after the identified Substantial Performance date, the sum of \$1000.00 per day, determined by the parties hereto to be liquidated damages, not a penalty. These damages will be deducted from the contract amount.

7.0 GC26 - Certificate and Payments

- .1 Item GC26.1 - Delete from the first sentence the words “percentage stipulated in the Agreement of”.

8.0 GC42 - Progress Estimates

- .1 Item GC42.1 - Change to Read:

Progress estimates must be submitted with each claim for payment, on forms and in format acceptable to the consultant, for the various parts of the work.

9.0 GC 43 - Application for Payment - Change to Read:

- .1 The period covered by each Application for Payment Document shall be one calendar month ending on the last day of the month.
- .2 Each Application for Payment Document shall be based upon the approved payment schedule submitted by the Contractor in accordance with the Contract Documents. The approved payment schedule shall allocate the entire Contract Price among the various portions of the Work and be prepared in such form and supported by such data to substantiate its accuracy as the Consultant may require. This Schedule, unless objected to by the Consultant, shall be used as a basis for reviewing the Contractor's Applications for Payment.
- .3 Applications for Payment shall indicate the percentage for completion of each portion of the Work as of the end of the period covered by the Application for Payment.
- .4 Subject to the provisions of the contract Documents, the amount of each progress payment shall be computed as follows:
 - .1 Take that portion of the Contract Price properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Price allocated to that portion of the Work in the approved payment schedule, less retainage of ten percent (10%). Pending final determination of cost to the Municipality of the County of Kings of changes in the Work, amounts not in dispute may be included even though the Contract Price has not yet been adjusted by Change Order.

- .2 Add the portion of the Contract Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Municipality of the County of Kings, suitably stored off the site at a location agreed upon in writing), less retainage of ten percent (10%).
- .3 Subtract the aggregate of previous payments made by the Municipality of the County of Kings.
- .4 Subtract amounts, if any, for which the Consultant has withheld or nullified.
- .5 The progress payment amount determined in accordance with **GC43.4** shall be further modified under the following circumstances:
 - .1 Add, upon Substantial Performance of the Work, a sum sufficient to increase the total payments to ninety seven and one-half percent (97.5%) of the Contract Price, less the retainage of ten percent (10%) and such amounts as the Consultant shall determine for incomplete Work. The retainage of ten percent (10%) shall be payable five (5) days following the expiration of the lien period set out in the Builders' Lien Act, except that the Municipality of the County of Kings may retain such sums as necessary to satisfy any liens.
 - .2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with **GC43.6**.
- .6 If on account of climatic or other conditions reasonably beyond the Contractor's control, there are items of work that cannot readily be completed, the payment in full for the work which has been completed shall not be delayed on account thereof, but the Municipality of the County of Kings may withhold a sufficient and reasonable sum until the uncompleted work is finished and such as will adequately protect the Municipality of the County of Kings in connection with his responsibilities.
- .7 Final payment, constituting the entire unpaid balance of the Contract Price, shall be made by the Municipality of the County of Kings to the Contractor when
 - .1 The Contract has been fully performed by the Contractor except for the Contractor's responsibility to correct nonconforming Work as provided in Subparagraph .1 of GC16 of the General Conditions and to satisfy other requirements, if any, which necessarily survive final payment; and
 - .2 A Final Certificate for Payment has been issued by the Consultant; such final payment shall be made by the Municipality of the County of Kings not more than thirty (30) days after the issuance the Consultant's Final Certificate for Payment, except that the Municipality of the County of Kings may retain such sums necessary under the Builder's Lien Act.

10.0 GC 44 - Payment - Change to Read:

- .1 The Municipality of the County of Kings undertakes and agrees:
 - .1 To pay the Contractor in lawful money of Canada for the performance of the Contract the written amount identified as the Contract Price; subject to additions and deductions as provided in the General Conditions of the Contract and

- .1 Based upon Applications for Payment submitted to the Consultant by the Contractor and Certificates for Payment issued by the Consultant, to make progress payments on account of the Contract Price to the Contractor as provided herein and elsewhere in the Contract Documents.
- .2 Provided an application for Payment is received by the Consultant not later than the first day of a month, the Municipality of the County of Kings shall make payment to the Contractor not later than the first day of the next month. If an Application for Payment is received by the Consultant after the application date fixed above, payment shall be made by the Municipality of the County of Kings not later than thirty (30) calendar days after the Consultant receives the Application for Payment.

11.0 GC 45 - Relationship of Municipality of the County of Kings and Contractor- Change to Read:

- .1 The Contractor and the Municipality of the County of Kings for themselves, their successors, executors, administrators and assigns, hereby undertake and agree to the full performance of the covenants contained in the Bid Documents and the Contract Documents, including but not limited to, the General Conditions of the Contract and that this Agreement with the Bid, Instructions to Bidders, General Conditions of the Contract, Supplementary General Conditions of the Contract, the Specifications and Drawings constitute the Contract.
- .2 Upon notification of award of contract by the Municipality of the County of Kings, the Contractor shall promptly provide the Municipality of the County of Kings the address to which all correspondence concerning the Work shall be sent. If and whenever the Municipality of the County of Kings desires to give notice to the Contractor under or in connection with this Contract, the Contract Documents, including but not limited to or the General Conditions of the Contract, such notice will be effectively given if sent by Registered Mail to the Contractor at this address and will be considered as having been so given at the time of the deposit thereof in the Post Office.

12.0 GC 2.5 – Documents - Add:

- .1 References to the male gender in the General Conditions and Contract are for simplification and are to be applied on a gender-neutral basis.

13.0 GC 7 – Ownership of Drawings & Modes – Change GC7.1 to: read

- .1 All Drawings, Specifications and copies thereof and all models furnished by the Municipality of the County of Kings are the Municipality's property. They are not to be used on other Work and with the exception of the signed Contract Set of Drawings and Specifications, are to be returned to him on request on the completion of the Work.

14.0 GC 11 – Contractor’s Personnel – Add GC11.2 as follows:

- .1 The Contractor is solely responsible for all aspects of employment and labour relations in connection with its workforce. The Contractor is the employer of its workforce and such employees are not employees or agents of the Municipality. All such employees shall be under the direct management and sole supervision of the Contractor. No employment relationship is created between the Contractor or any of the employees and the Municipality. The Contractor shall be responsible for all payroll functions and shall pay in a timely manner all salaries and benefits, taxes, employment insurance premiums, Canada Pension Plan premiums or contributions, Workers Compensation Act assessments and any other assessments or contributions of any kind or nature whatsoever that are payable to any governmental authority in respect of the Contractor’s employees. It is the express mutual understanding and intention of the Contractor and the Municipality that the Contractor is not a successor to, or common employer with the Municipality and nothing in the Contract shall be construed, interpreted, understood or implied contrary to that mutual intention and understanding.

15.0 GC 13 – Inspection of Work – Change GC13.3 to read:

- .1 Re-examination of questioned Work may be ordered by the Consultant. If such Work be found not in accordance with the Contract, through the fault of the Contractor, the Contractor shall pay such cost.

16.0 GC 22 – Irrevocable Standby Letter of Credit – Change to read:

- .1 As an alternative to Guaranty Bonds (GC21), an Irrevocable Standby Letter of Credit shall be provided as security for Bid, Performance, Labour and Material payment and warranty of the work. The Irrevocable Standby Letter of Credit shall be issued by a certified financial institution subject to the Uniform Customs and Practice for Documentary Credits, 2007 Revision, International Chamber of Commerce (ICC) Publication no. 600 ("UCP"), for a sum equal to twenty percent (20%) of the Contract Price. The Irrevocable Standby Letter of Credit is to remain in effect for a period of not less than twelve (12) months after the issue of Substantial Performance Certificate by the Municipality of the County of Kings. Upon expiry of the Irrevocable Standby Letter of Credit, Supplemental Security in a form acceptable to the Municipality of the County of Kings shall be provided for work requiring extended warranties. Certified financial Institution is to endorse the Irrevocable Standby Letter of Credit in the name of the Municipality of the County of Kings. Include the cost of providing the Irrevocable Standby Letter of Credit in the Contract Price.

17.0 GC 45 – Relationship of Municipality of the County of Kings and Contractor – Add GC45.3 as follows:

- .1 The parties are independent contractors. The Contract does not create or establish any relationship as partners, joint-ventures, employer and employee, master and servant or principal and agent.

18.0 GC 46 – Warranty – Add GC45 as follows:

- .1 The Contractor warrants that all Work will be performed with reasonable care, diligence and skill and at least in accordance with the standards of care generally practiced by competing Contractors of similar services. The Contractor further warrants the goods or equipment supplied and work and/or services performed under this Contract will conform to the

specifications herein, are free from defects and/or imperfections, are merchantable and fit for the purposes for which they are ordinarily employed, and are available for delivery to the Municipality at the time of submission of the Contractor's bid or at the time specified by the Municipality in the RFP. The Contractor shall be liable for all damages incurred by the Municipality and its officers, officials, employees, agents and volunteers as a result of any defect or breach of warranty contained in this Contract. The Contractor's warranty shall extend for no less than a period of twelve (12) months after the goods, equipment, or Work are delivered and accepted by the Municipality and applied to their intended use.

19.0 GC 47 – Clear Title – Add GC47 as follows:

- .1 The Contractor warrants clear title to materials and equipment supplied by them and will indemnify and hold the Municipality harmless against any or all lawsuits, claims, demands and/or expenses, patent litigation, intellectual property infringement, materialman's or labourer's liens, or any claims by third parties in or to the goods and services mentioned and supplied by the Contractor.

END

PART 1 **GENERAL**

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, Including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
 - .1 Project information.

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Project information.
 - .2 Work Covered by Contract Documents.
 - .3 Purchase contracts.
 - .4 Access to site.
 - .5 Coordination with occupants.
 - .6 Work restrictions.
 - .7 Specification and drawing conventions.
- .2 Types of items you will not find described in this Section:
 - .1 Owner-furnished products.

1.3 PROJECT INFORMATION

- .1 Project Identification: Aylesford Washroom Facility – 22-05
 - .1 Project Location: Aylesford, Nova Scotia.
- .2 Owner: Municipality of the County of Kings
 - .1 Owner's Representative: DesignPoint Engineering & Surveying Ltd..
 - .2 Consultant: DesignPoint Engineering & Surveying Ltd.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- .1 The Work of the Project is defined by the Contract Documents and consists of the following:
 - .1 Provide all labour and materials to complete the new Washroom Building.
 - .2 Provide all labour and materials to complete the site work.
- .2 Type of Contract
 - .1 Project will be constructed under a single lump sum contract (stipulated price).

1.5 ACCESS TO SITE

- .1 General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- .2 Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

- .2 Limits: Where the Work involves site work, limit site disturbance, including earthwork and clearing of vegetation, to 12.2 m beyond building perimeter; 3 m beyond surface walkways, patios, surface parking, and utilities less than 300 mm in diameter; 4.5m beyond primary roadway curbs and main utility branch trenches; and 7.6 m beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.
- .3 Existing Tree Lines: The existing tree lines are to be retained and protected from all construction. Area is to be cordoned off throughout the project. It is the responsibility of the Contractor to maintain and protect this area.
- .4 Driveways, Walkways and Entrances: For Work adjacent to other buildings and properties, keep driveways and loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - .1 Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - .2 Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.6 COORDINATION WITH OCCUPANTS

- .1 Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - .1 Owner's Representative will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 - .2 Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - .3 Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - .4 On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.7 WORK RESTRICTIONS

- .1 Work Restrictions, General: Comply with restrictions on construction operations.
 - .1 Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
 - .2 On-Site Work Hours: Limit work in the existing building to normal business working hours of the Owner, Monday through Friday.

- .3 Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - .1 Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 - .2 Obtain Owner's Representative written permission before proceeding with utility interruptions.
- .4 Noise, Vibration, and Odours: For work in or near occupied facilities, coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - .1 Notify Owner's Representative not less than two days in advance of proposed disruptive operations.
 - .2 Obtain Owner's Representative's written permission before proceeding with disruptive operations.
- .5 Controlled Substances: Use of tobacco products and other controlled substances on the Project site is not permitted.
- .6 Employee Identification: Owner may provide identification tags for Contractor personnel working on the Project site. Require personnel to utilize identification tags at all times.

1.8 SPECIFICATIONS AND DRAWING CONVENTIONS

- .1 Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - .1 Imperative mood and streamlined language are generally used in the Specifications. The words *shall*, *shall be*, or *shall comply with*, depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - .2 Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- .2 Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- .3 Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:
 - .1 Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

PART 2 **PRODUCTS (NOT USED)**

PART 3 **EXECUTION (NOT USED)**

END OF SECTION

PART 1 **GENERAL**

1.1 SUMMARY

- .1 Section includes administrative and procedural requirements governing allowances.
 - .1 Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
 - .2 Types of allowances include the following:
 - .1 Lump-sum allowances.

1.2 SELECTION AND PURCHASE

- .1 At the earliest practical date after award of the Contract, advise Owner's Representative of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- .2 At Owner's Representative's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- .3 Purchase products and systems selected by Owner's Representative from the designated supplier.
- .4 When specifically requested by the Owner's Representative, obtain proposals from not less than three suppliers and sub-contractors for work covered by an allowance, and have their proposals submitted in sealed envelopes directly to the office of the Owner's Representative for private opening.
 - .1 Submit list of names of proposed suppliers and sub-contractors to Owner's Representative prior to obtaining proposals. Owner's Representative reserves the right to reject any supplier and sub-contractor proposed.
 - .2 Award work to supplier or sub-contractor selected from proposals submitted by Owner's Representative.
 - .1 The Owner's Representative reserves the right not to award the work to the lowest or any bidder.

1.3 ACTION SUBMITTALS

- .1 Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

- .1 Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- .2 Submit time sheets and other documentation to show labour time and cost for installation of allowance items that include installation as part of the allowance.
- .3 Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

- .1 Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 TAXES

- .1 Cash allowances listed do not include value added taxes, such as the goods and services tax, the harmonized sales tax, and other similar taxes.

1.7 LUMP-SUM, UNIT-COST, AND QUANTITY ALLOWANCES

- .1 Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Owner's Representative under allowance and shall include freight, and delivery to Project site.
- .2 Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labour, installation, overhead and profit, and similar costs related to products and materials selected by Owner's Representative under allowance shall be included as part of the Contract Sum and not part of the allowance.
- .3 Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - .1 If requested by Owner's Representative, retain and, prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.
- .4 At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.8 ADJUSTMENT OF ALLOWANCES

- .1 Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - .1 Include installation costs in purchase amount only where indicated as part of the allowance.
 - .2 Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - .3 Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- .2 Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labour, installation, overhead, and profit.
 - .1 Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.

- .2 No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 **PRODUCTS (NOT USED)**

PART 3 **EXECUTION**

3.1 EXAMINATION

- .1 Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- .1 Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- .2 Allowance No. 1: Interior and Exterior Signage: Include the sum of \$10,000.

END OF SECTION

PART 1 **GENERAL**

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Administrative and procedural requirements for substitutions.
- .2 Types of items you will not find described in this Section:
 - .1 Products selected under an allowance.
 - .2 Requirements for submitting comparable product submittals for products by listed manufacturers.
 - .3 Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

- .1 Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - .1 Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - .2 Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

- .1 Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - .1 Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - .1 Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - .2 Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - .3 Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific

- features and requirements indicated. Indicate deviations, if any, from the Work specified.
- .4 Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - .5 Samples, where applicable or requested.
 - .6 Certificates and qualification data, where applicable or requested.
 - .7 List of similar installations for completed projects with project names and addresses and names and addresses of Owner's Representatives and owners.
 - .8 Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - .9 Research reports evidencing compliance with building code in effect for Project.
 - .10 Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - .11 Cost information, including a proposal of change, if any, in the Contract Sum.
 - .12 Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - .13 Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- .2 Owner's Representative's Action: If necessary, Owner's Representative will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Owner's Representative will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- .1 Forms of Acceptance: Change Order, Construction Change Directive, or Owner's Representative's Supplemental Instructions for minor changes in the Work.
 - .2 Use product specified if Owner's Representative does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- .1 Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- .1 Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 **PRODUCTS**

2.1 SUBSTITUTIONS

- .1 Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - .1 Conditions: Owner's Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner's Representative will return requests without action, except to record noncompliance with these requirements:
 - .1 Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - .2 Substitution request is fully documented and properly submitted.
 - .3 Requested substitution will not adversely affect Contractor's construction schedule.
 - .4 Requested substitution has received necessary approvals of authorities having jurisdiction.
 - .5 Requested substitution is compatible with other portions of the Work.
 - .6 Requested substitution has been coordinated with other portions of the Work.
 - .7 Requested substitution provides specified warranty.
 - .8 If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 - .2 Substitutions for Convenience: Owner's Representative will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Owner's Representative.
 - .1 Conditions: Owner's Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner's Representative will return requests without action, except to record noncompliance with these requirements:
 - .1 Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Owner's Representative for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - .2 Requested substitution does not require extensive revisions to the Contract Documents.
 - .3 Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - .4 Substitution request is fully documented and properly submitted.
 - .5 Requested substitution will not adversely affect Contractor's construction schedule.

- .6 Requested substitution has received necessary approvals of authorities having jurisdiction.
- .7 Requested substitution is compatible with other portions of the Work.
- .8 Requested substitution has been coordinated with other portions of the Work.
- .9 Requested substitution provides specified warranty.
- .10 If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 **EXECUTION (NOT USED)**

END OF SECTION

PART 1 **GENERAL**

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Administrative and procedural requirements for handling and processing Contract modifications.
- .2 Types of items you will not find described in this Section:
 - .1 Administrative procedures for handling requests for substitutions made after Contract award.

1.2 MINOR CHANGES IN THE WORK

- .1 Owner's Representative will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Price or the Contract Time.

1.3 CONTEMPLATED CHANGE ORDERS

- .1 Owner-Initiated Contemplated Change Order: Owner's Representative will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Price or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - .1 Proposal Requests issued by Owner's Representative are not instructions either to stop work in progress or to execute the proposed change.
 - .2 Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Price and the Contract Time necessary to execute the change.
 - .1 Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - .2 Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
 - .3 Include costs of labour and supervision directly attributable to the change.
 - .4 Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - .5 Quotation Form: Use forms acceptable to Owner's Representative.
- .2 Contractor-Initiated Contemplated Change Order: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Owner's Representative.
 - .1 Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Price and the Contract Time.

- .2 Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - .3 Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
 - .4 Include costs of labour and supervision directly attributable to the change.
 - .5 Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - .6 Comply with requirements in Division 01 Section *Substitution Procedures* if the proposed change requires substitution of one product or system for product or system specified.
 - .7 Proposal Request Form: Use form acceptable to Owner's Representative.
- .3 Change in Contract Time.
 - .4 When requested by the Owner's Representative, provide a critical path analysis substantiating any request for a change in the Contract Time, should the proposed change be implemented. Modify sequence of events if a different approach may reduce the impact on the Contract Time without impacting the Contract Price. If no critical path analysis is provided to the Owner's Representative within 5 days of a request, the Contractor agrees to undertake the change for the price quoted with any extension to the Contract Time determined solely by the Owner's Representative.

1.4 CHANGE ORDER PROCEDURES

- .1 On Owner's approval of a Proposal Request, Owner's Representative will issue a Change Order for signatures of Owner and Contractor.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- .1 Construction Change Directive: Owner's Representative may issue a Construction Change Directive as may be permitted in the Contract. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - .1 Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Price or the Contract Time.
- .2 Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - .1 After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 **PRODUCTS (NOT USED)**

PART 3 **EXECUTION (NOT USED)**

END OF SECTION

PART 1 **GENERAL**

1.1 SUMMARY

- .1 Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- .2 Related Requirements:
 - .1 Procedural requirements governing the handling and processing of allowances.
 - .2 Administrative requirements governing the use of unit prices.
 - .3 Administrative procedures for handling changes to the Contract.
 - .4 Administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 DEFINITIONS

- .1 Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

- .1 Coordination: Coordinate preparation of the schedule of values as follows:
 - .1 Submit the schedule of values to Owner's Representative at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - .2 Sub-schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values coordinated with each phase of payment.
 - .3 Sub-schedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide sub-schedules showing values coordinated with each element.
- .2 Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - .1 Identification: Include the following Project identification on the schedule of values:
 - .1 Project name and location.
 - .2 Name of Owner's Representative.
 - .3 Owner's Representative's project number.
 - .4 Contractor's name and address.
 - .5 Date of submittal.
 - .2 Provide a breakdown of the Contract Price in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal sub-contract amounts in excess of five percent of the Contract Price.
 - .3 Round amounts to nearest whole dollar; total shall equal the Contract Price.

- .4 Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- .5 Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - .1 Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

1.4 APPLICATIONS FOR PAYMENT

- .1 Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Owner's Representative and paid for by Owner.
 - .1 Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- .2 Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- .3 Application for Payment Forms: Use forms acceptable to Owner's Representative and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.
- .4 Application Preparation: Complete every entry on form. Owner's Representative will return incomplete applications without action.
 - .1 Entries shall match data on the schedule of values. Use updated schedules if revisions were made.
 - .2 Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - .3 Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- .5 Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored on site, but not yet installed.
 - .1 Provide certificate of insurance, and consent of surety to payment, for stored materials.
 - .2 Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - .3 Provide summary documentation for stored materials indicating the following:
 - .1 Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - .2 Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.

- .3 Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- .6 Transmittal: Submit one signed and notarized original copies of each Application for Payment to Owner's Representative by a method ensuring receipt within 24 hours.
- .7 Attachments: Attach following documentation with each Application for Payment. Owner's Representative will return incomplete applications without action.
 - .1 Letter of Good Standing from Workplace Health, Safety and Compensation Commission.
 - .2 Statutory Declaration attesting that they have made all payments to subcontractors, suppliers, and workmen on behalf of whom amounts were included in the previous claim for payment.
 - .3 Other submissions required by other Specification Sections.
- .8 Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - .1 List of subcontractors.
 - .2 Schedule of values.
 - .3 Contractor's construction schedule (preliminary if not final).
 - .4 Products list (preliminary if not final).
 - .5 Schedule of unit prices.
 - .6 Submittal schedule (preliminary if not final).
 - .7 List of Contractor's staff assignments.
 - .8 List of Contractor's principal consultants.
 - .9 Copies of building permits.
 - .10 Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - .11 Initial progress report.
 - .12 Report of preconstruction conference.
 - .13 Certificates of insurance and insurance policies.
 - .14 Performance and payment bonds.
 - .15 Data needed to acquire Owner's insurance.
- .9 Application for Payment at Substantial Completion
 - .1 Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
- .10 Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 - .1 Evidence of completion of Project closeout requirements.
 - .2 Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - .3 Updated final statement, accounting for final changes to the Contract Price.

- .4 Statutory Declaration attesting that they have made all payments to subcontractors, suppliers, and workmen on behalf of whom amounts were included in the previous claim for payment.
- .5 Evidence that claims have been settled.
- .6 Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 **PRODUCTS (NOT USED)**

PART 3 **EXECUTION (NOT USED)**

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - .1 General project coordination procedures.
 - .2 Administrative and supervisory personnel.
 - .3 Coordination drawings.
 - .4 Requests for Information (RFIs).
 - .5 Project meetings.
 - .2 Types of items you will not find described in this Section:
 - .1 Preparing and submitting Contractor's construction schedule.
 - .2 Procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - .3 Coordinating closeout of the Contract.
 - .4 Coordinating the Work with Owner's commissioning authority.

1.2 DEFINITIONS

- .1 RFI: Request from Owner, Owner's Representative, or Contractor seeking information from each other during construction.

1.3 COORDINATION

- .1 Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - .1 Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - .2 Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - .3 Make adequate provisions to accommodate items scheduled for later installation.
- .2 Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - .1 Preparation of Contractor's construction schedule.
 - .2 Preparation of the schedule of values.
 - .3 Installation and removal of temporary facilities and controls.
 - .4 Delivery and processing of submittals.
 - .5 Progress meetings.

- .6 Preinstallation conferences.
 - .7 Project closeout activities.
 - .8 Startup and adjustment of systems.
 - .9 Project closeout activities.
- .3 Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
- .1 Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 COORDINATION DRAWINGS

- .1 Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on design drawings or Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
 - .1 Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - .1 Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - .2 Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - .3 Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - .4 Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - .5 Indicate required installation sequences.
 - .6 Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Owner's Representative indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - .2 Coordination Drawing Organization: Organize coordination drawings as follows:
 - .1 Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings were required to adequately represent the Work.
 - .2 Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components

- within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
Indicate areas of conflict between light fixtures and other components.
- .3 Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
 - .4 Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 - .5 Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 - .6 Mechanical and Plumbing Work: Show the following:
 - .1 Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - .2 Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - .3 Fire-rated enclosures around ductwork.
 - .7 Electrical Work: Show the following:
 - .1 Runs of vertical and horizontal conduit 38mm diameter and larger.
 - .2 Light fixture, exit light, emergency battery pack, smoke detector, and other fire alarm locations.
 - .3 Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - .8 Fire Protection System: Show the following:
 - .1 Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 - .9 Review: Owner's Representative will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Owner's Representative determines that the coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Owner's Representative will so inform the Contractor, who shall make changes as directed and resubmit.
 - .10 Coordination Drawing Prints: Prepare coordination drawing prints in accordance with requirements of Division 01 Section *Submittal Procedures*.

1.5 CONCEALMENT

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Owner's Representative if there is interference. Install as directed by Owner's Representative.

1.6 LOCATION OF FIXTURES

- .1 Locate fixtures, outlets, and mechanical and electrical items within 1500 mm of locations shown if so directed by Owner's Representative prior to installation, for no change in Contract Price.

1.7 KEY PERSONNEL

- .1 Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and Quality Control Manager. and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 - .1 Post copies of list in project meeting rooms, in any temporary field office, and by any and all temporary telephones. Keep list current at all times.

1.8 REQUESTS FOR INFORMATION (RFIS)

- .1 General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI form.
 - .1 Owner's Representative will return RFIs submitted to Owner's Representative by other entities controlled by Contractor with no response.
 - .2 Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- .2 Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - .1 Project name.
 - .2 Project number.
 - .3 Date.
 - .4 Name of Contractor.
 - .5 Name of Owner's Representative.
 - .6 RFI number, numbered sequentially.
 - .7 RFI subject.
 - .8 Specification Section number and title and related paragraphs, as appropriate.
 - .9 Drawing number and detail references, as appropriate.
 - .10 Field dimensions and conditions, as appropriate.
 - .11 Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Price, Contractor shall state impact in the RFI.
 - .12 Contractor's signature.
 - .13 Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - .1 Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- .3 RFI Forms: Contractor's form acceptable to the Owner's Representative.

- .4 Owner's Representative's Action: Owner's Representative will review each RFI, determine action required, and respond. Allow seven working days for Owner's Representative's response for each RFI. RFIs received by Owner's Representative after 1:00 p.m. will be considered as received the following working day.
 - .1 The following RFIs will be returned without action:
 - .1 Requests for approval of submittals.
 - .2 Requests for approval of substitutions.
 - .3 Requests for coordination information already indicated in the Contract Documents.
 - .4 Requests for adjustments in the Contract Time or the Contract Price.
 - .5 Requests for interpretation of Owner's Representative's actions on submittals.
 - .6 Incomplete RFIs or inaccurately prepared RFIs.
 - .2 Owner's Representative's action may include a request for additional information, in which case Owner's Representative's time for response will date from time of receipt of additional information.
 - .3 Owner's Representative's action on RFIs that may result in a change to the Contract Time or the Contract Price may be eligible for Contractor to submit Change Proposal according to Division 01 Section *Contract Modification Procedures*.
 - .1 If Contractor believes the RFI response warrants change in the Contract Time or the Contract Price, notify Owner's Representative in writing within 10 days of receipt of the RFI response.
- .5 On receipt of Owner's Representative's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Owner's Representative within seven days if Contractor disagrees with response.

1.9 PROJECT MEETINGS

- .1 General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - .1 Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Owner's Representative of scheduled meeting dates and times.
 - .2 Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - .3 Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Owner's Representative, within three days of the meeting.
- .2 Preconstruction Conference: Owner's Representative will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Owner's Representative, but no later than 15 days after execution of the Agreement.
 - .1 Conduct the conference to review responsibilities and personnel assignments.
 - .2 Attendees: Authorized representatives of Owner, Owner's Commissioning Authority if applicable, Owner's Representative, and their consultants; Contractor and its

superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

- .3 Agenda: Discuss items of significance that could affect progress, including the following:
 - .1 Tentative construction schedule.
 - .2 Phasing.
 - .3 Critical work sequencing and long-lead items.
 - .4 Designation of key personnel and their duties.
 - .5 Lines of communications.
 - .6 Procedures for processing field decisions and Change Orders.
 - .7 Procedures for RFIs.
 - .8 Procedures for testing and inspecting.
 - .9 Procedures for processing Applications for Payment.
 - .10 Distribution of the Contract Documents.
 - .11 Submittal procedures.
 - .12 Sustainable design requirements.
 - .13 Preparation of record documents.
 - .14 Use of the premises and existing building.
 - .15 Work restrictions.
 - .16 Working hours.
 - .17 Owner's occupancy requirements.
 - .18 Responsibility for temporary facilities and controls.
 - .19 Procedures for moisture and mold control.
 - .20 Procedures for disruptions and shutdowns.
 - .21 Construction waste management and recycling.
 - .22 Parking availability.
 - .23 Office, work, and storage areas.
 - .24 Equipment deliveries and priorities.
 - .25 First aid.
 - .26 Security.
 - .27 Progress cleaning.
- .4 Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- .3 Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - .1 Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Owner's Representative, and Owner's Commissioning Authority if applicable, of scheduled meeting dates.
 - .2 Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

- .1 Contract Documents.
 - .2 Options.
 - .3 Related RFIs.
 - .4 Related Change Orders.
 - .5 Purchases.
 - .6 Deliveries.
 - .7 Submittals.
 - .8 Review of mockups.
 - .9 Possible conflicts.
 - .10 Compatibility problems.
 - .11 Time schedules.
 - .12 Weather limitations.
 - .13 Manufacturer's written recommendations.
 - .14 Warranty requirements.
 - .15 Compatibility of materials.
 - .16 Acceptability of substrates.
 - .17 Temporary facilities and controls.
 - .18 Space and access limitations.
 - .19 Regulations of authorities having jurisdiction.
 - .20 Testing and inspecting requirements.
 - .21 Installation procedures.
 - .22 Coordination with other work.
 - .23 Required performance results.
 - .24 Protection of adjacent work.
 - .25 Protection of construction and personnel.
- .3 Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - .4 Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - .5 Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- .4 Project Closeout Conference: Schedule and conduct a Project closeout conference, at a time convenient to Owner and Owner's Representative, but no later than thirty days prior to the scheduled date of Substantial Completion.
 - .1 Conduct the conference to review requirements and responsibilities related to Project closeout.
 - .2 Attendees: Authorized representatives of Owner, Owner's Commissioning Authority if applicable, Owner's Representative, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - .3 Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

- .1 Preparation of record documents.
 - .2 Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - .3 Submittal of written warranties.
 - .4 Requirements for preparing sustainable design documentation.
 - .5 Requirements for preparing operations and maintenance data.
 - .6 Requirements for demonstration and training.
 - .7 Preparation of Contractor's punch list.
 - .8 Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - .9 Submittal procedures.
 - .10 Coordination of separate contracts.
 - .11 Owner's partial occupancy requirements.
 - .12 Installation of Owner's furniture, fixtures, and equipment.
 - .13 Responsibility for removing temporary facilities and controls.
- .4 Minutes: Entity conducting meeting will record and distribute meeting minutes.
- .5 Progress Meetings: Conduct progress meetings at monthly intervals.
- .1 Coordinate dates of meetings with preparation of payment requests.
 - .2 Attendees: In addition to representatives of Owner, Owner's Commissioning Authority if applicable and Owner's Representative, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - .3 Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
- .1 Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - .1 Review schedule for next period.
 - .2 Review present and future needs of each entity present, including the following:
 - .1 Interface requirements.
 - .2 Sequence of operations.
 - .3 Status of submittals.
 - .4 Deliveries.
 - .5 Off-site fabrication.
 - .6 Access.
 - .7 Site utilization.
 - .8 Temporary facilities and controls.

- .9 Progress cleaning.
 - .10 Quality and work standards.
 - .11 Status of correction of deficient items.
 - .12 Field observations.
 - .13 Status of RFIs.
 - .14 Status of proposal requests.
 - .15 Pending changes.
 - .16 Status of Change Orders.
 - .17 Pending claims and disputes.
 - .18 Documentation of information for payment requests.
- .4 Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- .5 Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 **PRODUCTS (NOT USED)**

PART 3 **EXECUTION (NOT USED)**

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - .1 Startup construction schedule.
 - .2 Contractor's construction schedule - CPM method.
 - .3 Construction schedule updating reports.
- .2 Similar types of items this Section does not describe:
 - .1 Daily construction reports.
 - .2 Site condition reports.
 - .3 Special reports.
 - .4 Submittal procedures for submitting schedules and reports.

1.2 DEFINITIONS

- .1 Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - .1 Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - .2 Predecessor Activity: An activity that precedes another activity in the network.
 - .3 Successor Activity: An activity that follows another activity in the network.
- .2 CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- .3 Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- .4 Event: The starting or ending point of an activity.
- .5 Float: The measure of leeway in starting and completing an activity.
 - .1 Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - .2 Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - .3 Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.3 INFORMATIONAL SUBMITTALS

- .1 Format for Submittals: Submit required submittals in the following format:
 - .1 PDF electronic file.
- .2 Startup construction schedule.

- .3 Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- .4 CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - .1 Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - .2 Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
- .5 Construction Schedule Updating Reports: Submit with Applications for Payment.
- .6 Qualification Data: For scheduling consultant.

1.4 QUALITY ASSURANCE

- .1 Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Owner's Representative's request.
- .2 Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section *Project Management and Coordination*. Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - .1 Review software limitations and content and format for reports.
 - .2 Verify availability of qualified personnel needed to develop and update schedule.
 - .3 Discuss constraints, including phasing work stages, area separations, interim milestones, and partial Owner occupancy.
 - .4 Review delivery dates for Owner-furnished products.
 - .5 Review schedule for work of Owner's separate contracts.
 - .6 Review submittal requirements and procedures.
 - .7 Review time required for review of submittals and resubmittals.
 - .8 Review requirements for tests and inspections by independent testing and inspecting agencies.
 - .9 Review time required for Project closeout and Owner startup procedures, including commissioning activities.
 - .10 Review and finalize list of construction activities to be included in schedule.
 - .11 Review procedures for updating schedule.

1.5 COORDINATION

- .1 Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- .2 Coordinate Contractor's construction schedule with, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - .1 Secure time commitments for performing critical elements of the Work from entities involved.

- .2 Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- .1 Time Frame: Extend schedule from date established for the Notice of Award to date of final completion.
 - .1 Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- .2 Activities: Treat each building story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - .1 Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Owner's Representative.
 - .2 Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - .3 Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section *Submittal Procedures* in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - .4 Startup and Testing Time: Include adequate time for startup and testing.
 - .5 Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Owner's Representative's administrative procedures necessary for certification of Substantial Completion.
 - .6 Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- .3 Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - .1 Phasing: Arrange list of activities on schedule by phase.
 - .2 Work under More Than One Contract: Include a separate activity for each contract.
 - .3 Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - .4 Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section *Summary*. Delivery dates indicated stipulate the earliest possible delivery date.
 - .5 Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section *Summary*. Delivery dates indicated stipulate the earliest possible delivery date.
- .4 Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

- .5 Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - .1 See Division 01 Section *Payment Procedures* for cost reporting and payment procedures.
- .6 Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - .1 Unresolved issues.
 - .2 Unanswered Requests for Information.
 - .3 Rejected or unreturned submittals.
 - .4 Notations on returned submittals.
 - .5 Pending modifications affecting the Work and Contract Time.
- .7 Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required achieving compliance, and dating by which recovery will be accomplished.
- .8 Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - .1 Use Microsoft Project, Primavera, or Meridian Prolog, for Windows Vista or Windows 7 operating system; or approved alternate.

2.2 STARTUP CONSTRUCTION SCHEDULE

- .1 Bar-Chart Schedule: Submit start-up, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice of Award.
- .2 Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE - CPM METHOD

- .1 General: Prepare network diagrams using AON (activity-on-node) format.
- .2 CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
 - .1 Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice of Award.
 - .1 Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Owner's Representative's approval of the schedule.

- .2 Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - .3 Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - .4 Use *one workday* as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- .3 CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.
- .1 Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated timeframes for the following activities:
 - .1 Preparation and processing of submittals.
 - .2 Mobilization and demobilization.
 - .3 Purchase of materials.
 - .4 Delivery.
 - .5 Fabrication.
 - .6 Utility interruptions.
 - .7 Installation.
 - .8 Work by Owner that may affect or be affected by Contractor's activities.
 - .9 Testing and commissioning.
 - .10 Punch list and final completion.
 - .11 Activities occurring following final completion.
 - .2 Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 - .3 Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 - .4 Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - .1 Sub-networks on separate sheets are permissible for activities clearly off the critical path.
- .4 Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- .5 Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight *early start-total float*. Identify critical activities. Prepare tabulated reports showing the following:
 - .1 Contractor or subcontractor and the Work or activity.
 - .2 Description of activity.

- .3 Main events of activity.
 - .4 Immediate preceding and succeeding activities.
 - .5 Early and late start dates.
 - .6 Early and late finish dates.
 - .7 Activity duration in workdays.
 - .8 Total float or slack time.
- .6 Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
- .1 Identification of activities that have changed.
 - .2 Changes in early and late start dates.
 - .3 Changes in early and late finish dates.
 - .4 Changes in activity durations in workdays.
 - .5 Changes in the critical path.
 - .6 Changes in total float or slack time.
 - .7 Changes in the Contract Time.

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- .1 Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
- .1 In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 - .2 Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- .2 Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule before each regularly scheduled progress meeting.
- .1 Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - .2 Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - .3 As the Work progresses, indicate final completion percentage for each activity.
- .3 Distribution: Distribute copies of approved schedule to Owner's Representative Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
- .1 Post copies in Project meeting rooms and temporary field offices.
 - .2 When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

PART 1 **GENERAL**

1.1 SUMMARY

- .1 Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - .1 Daily construction reports.
 - .2 Site condition reports.
 - .3 Special reports.
- .2 Similar types of items this Section does not describe:
 - .1 Construction schedule.
 - .2 Submittal procedures for submitting schedules and reports.
 - .3 Quality requirements for submitting a schedule of tests and inspections.

1.2 INFORMATIONAL SUBMITTALS

- .1 Submit reports as PDF files.

PART 2 **PRODUCTS**

2.1 REPORTS

- .1 Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site. Submit reports at weekly intervals.
 - .1 List of subcontractors at Project site.
 - .2 List of separate contractors at Project site.
 - .3 Approximate count of personnel at Project site.
 - .4 Equipment at Project site.
 - .5 Material deliveries.
 - .6 High and low temperatures and general weather conditions, including presence of rain or snow.
 - .7 Accidents.
 - .8 Meetings and significant decisions.
 - .9 Unusual events (see special reports).
 - .10 Stoppages, delays, shortages, and losses.
 - .11 Meter readings and similar recordings.
 - .12 Emergency procedures.
 - .13 Orders and requests of authorities having jurisdiction.
 - .14 Change Orders received and implemented.
 - .15 Change Directives received and implemented.
 - .16 Services connected and disconnected.
 - .17 Equipment or system tests and startups.
 - .18 Partial completions and occupancies.
 - .19 Substantial Completions authorized.
- .2 Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report to Owner's Representative.

- Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- .3 Special Reports: Submit special reports to Owner's Representative within one day(s) of an occurrence. Distribute additional copies of report to parties affected by the occurrence.
 - .1 Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner's Representative in advance when these events are known or predictable.

PART 3 **EXECUTION (NOT USED)**

END OF SECTION

PART 1 **GENERAL**

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Administrative and procedural requirements for the following:
 - .2 Preconstruction photographs.
 - .3 Periodic construction photographs.
- .2 Types of items you will not find described in this Section:
 - .1 Procedures for submitting photographic documentation.
 - .2 Procedures for submitting photographic documentation as project record documents at project closeout.
 - .3 Submitting video recordings of demonstration of equipment and training of Owner's personnel.
 - .4 Photographic documentation before demolition operations commence.
 - .5 Photographic documentation before site clearing operations commence.

1.2 SUBMITTALS

- .1 Digital Photographs: Submit image files within three days of taking photographs.
 - .1 Identification: Provide the following information with submission:
 - .2 Name of Project.
 - .3 Name of Contractor.
 - .4 Date photograph was taken.
 - .5 Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.3 USAGE RIGHTS

- .1 Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 **PRODUCTS**

2.2 PHOTOGRAPHIC MEDIA

- .1 Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 6 megapixels.

PART 3 **EXECUTION**

3.1 CONSTRUCTION PHOTOGRAPHS

- .1 General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
- .2 Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - .1 Date and Time: Include date and time in file name for each image.

- .2 Field Office Images: Maintain one set of images accessible in any field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Owner's Representative.
- .3 Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Owner's Representative.
 - .1 Take not less than 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - .2 Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- .4 Periodic Construction Photographs: Take not less than 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- .5 Owner's Representative-Directed Construction Photographs: From time to time, Owner's Representative will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

END OF SECTION

PART 1 **GENERAL**

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- .2 Types of items you will not find described in this Section:
 - .1 Requirements for submitting applications for payment and the schedule of values.
 - .2 Requirements for submitting schedules and reports, including contractor's construction schedule.
 - .3 Requirements for submitting operation and maintenance manuals.
 - .4 Requirements for submitting record drawings, record specifications, and record product data.
 - .5 Requirements for submitting video recordings of demonstration of equipment and training of owner's personnel.

1.2 DEFINITIONS

- .1 Action Submittals: Written and graphic information and physical samples that require Owner's Representative's responsive action. Action submittals are those submittals indicated in individual Specification Sections as *action submittals*.
- .2 Informational Submittals: Written and graphic information and physical samples that do not require Owner's Representative's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as *informational submittals*.
- .3 Portable Document Format (PDF): a digital file format licensed by Adobe and other software developers and used to display and print information in a consistent format regardless of computer operating system, monitor, or printer.
- .4 Days: Days of the week, excluding Saturday, Sunday, and any statutory holidays.

1.3 ACTION SUBMITTALS

- .1 Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Owner's Representative and additional time for handling and reviewing submittals required by those corrections.
 - .1 Coordinate submittal schedule with list of subcontracts, and Contractor's construction schedule.
 - .2 Submit Submittal Schedule concurrently with the first complete submittal of Contractor's construction schedule.
 - .3 Format: Arrange the following information in a tabular format:
 - .1 Scheduled date for first submittal.
 - .2 Specification Section number and title.

- .3 Submittal category: Action; informational.
- .4 Name of subcontractor.
- .5 Description of the Work covered.
- .6 Scheduled date for Owner's Representative's final release.
- .7 Scheduled date of fabrication.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- .1 Digital Data Files: Electronic CAD files of the Contract Drawings are available upon request from the Owner's Representative for the Contractor's use in preparing submittals.
 - .1 Available files:
 - .1 Floor plans.
 - .2 Reflected ceiling plans.
 - .2 Owner's Representative makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - .3 Digital Format: Files will be provided in the format generated by the drawing software used to produce the drawing.
- .2 Coordination: Coordinate preparation and processing of submittals with the performance of the construction activities.
 - .1 Coordinate each submittal to accommodate time required for fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - .2 Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - .3 Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - .4 Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - .5 Owner's Representative reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- .3 Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner's Representative's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - .1 Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Owner's Representative will advise Contractor when a submittal being processed must be delayed for coordination.
 - .2 Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - .3 Resubmittal Review: Allow 15 days for review of each resubmittal.
- .4 Identifying Submittals: Place a permanent label or title block on each submittal item for identification.

- .1 Indicate name of firm or entity that prepared each submittal on label or title block.
- .2 Include the following information for processing and recording action taken:
 - .1 Project name.
 - .2 Date.
 - .3 Name of Contractor.
 - .4 Name of subcontractor.
 - .5 Name of supplier.
 - .6 Submittal number or other unique identifier, including revision identifier.
 - .1 Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).
 - .7 Number and title of appropriate Specification Section.
 - .8 Drawing number and detail references, as appropriate.
 - .9 Location(s) where product is to be installed, as appropriate.
 - .10 Other necessary identification.
- .5 Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Owner's Representative may discard submittals received from sources other than Contractor.
 - .1 Transmittal Form for Submittals: Provide locations on form for the following information:
 - .1 Project name.
 - .2 Date.
 - .3 Name of Contractor.
 - .4 Names of subcontractor, manufacturer, and supplier.
 - .5 Category and type of submittal: action or informational as indicated in the applicable Specification Section.
 - .6 Specification Section number and title.
 - .7 Specification paragraph number or drawing designation and generic name for each of multiple items.
 - .8 Drawing number and detail references, as appropriate.
 - .9 Indication of full or partial submittal.
 - .10 Transmittal number, if applicable.
 - .11 Submittal and transmittal distribution record.
 - .12 Remarks.
 - .13 Signature of transmitter.
- .6 Options: Identify options requiring selection by Owner's Representative.
- .7 Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Owner's Representative on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- .8 Resubmittals: Make resubmittals in same form as initial submittal.

- .1 Note date and content of previous submittal.
- .2 Note date and content of revision in label or title block and clearly indicate extent of revision.
- .3 Resubmit submittals until they are marked with approval notation from Owner's Representative's action stamp.
- .9 Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.
- .10 Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Owner's Representative's action stamp.

PART 2 PRODUCTS

2.1 ELECTRONIC SUBMITTAL PROCEDURES

- .1 General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - .1 Submit in PDF format.
- .2 Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - .1 If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - .2 Mark each copy of each submittal to show which products and options are applicable.
 - .3 Include the following information, as applicable:
 - .1 Manufacturer's catalogue cuts.
 - .2 Manufacturer's product specifications.
 - .3 Standard colour charts.
 - .4 Statement of compliance with specified referenced standards.
 - .5 Testing by recognized testing agency.
 - .6 Application of testing agency labels and seals.
 - .7 Notation of coordination requirements.
 - .8 Availability and delivery time information.
 - .4 For equipment, include the following in addition to the above, as applicable:
 - .1 Wiring diagrams showing factory-installed wiring.
 - .2 Printed performance curves.
 - .3 Operational range diagrams.
 - .4 Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - .5 Submit Product Data before or concurrent with Samples.

- .3 Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - .1 Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - .1 Identification of products.
 - .2 Schedules.
 - .3 Compliance with specified standards.
 - .4 Notation of coordination requirements.
 - .5 Notation of dimensions established by field measurement.
 - .6 Relationship and attachment to adjoining construction clearly indicated.
 - .7 Seal and signature of professional engineer if specified.
 - .4 Samples: Submit Samples for review of kind, colour, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - .1 Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - .2 Identification: Attach label on unexposed side of Samples that includes the following:
 - .1 Generic description of Sample.
 - .2 Product name and name of manufacturer.
 - .3 Sample source.
 - .4 Number and title of applicable Specification Section.
 - .5 Specification paragraph number and generic name of each item.
 - .3 Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - .1 Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - .2 Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - .4 Samples for Initial Selection: Submit manufacturer's colour charts consisting of units or sections of units showing the full range of colours, textures, and patterns available.
 - .1 Number of Samples: Submit one full set(s) of available choices where colour, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Owner's Representative will return submittal with options selected.
 - .5 Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of colour and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or

containers of materials; complete units of repetitively used materials; swatches showing colour, texture, and pattern; colour range sets; and components used for independent testing and inspection.

- .1 Number of Samples: Submit two sets of Samples. Owner's Representative will retain one Sample set; remainder will be returned.
 - .1 Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - .2 If variation in colour, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least two sets of paired units that show approximate limits of variations.
- .5 Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - .1 Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - .2 Manufacturer and product name, and model number if applicable.
 - .3 Number and name of room or space.
 - .4 Location within room or space.
- .6 Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section *Project Management and Coordination*.
- .7 Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section *Construction Progress Documentation*.
- .8 Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section *Payment Procedures*.
- .9 Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section *Quality Requirements*.
- .10 Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section *Closeout Procedures*.
- .11 Maintenance Data: Comply with requirements specified in Division 01 Section *Operation and Maintenance Data*.
- .12 Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of design consultants and owners, and other information specified.
- .13 Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record. Include names of firms and personnel certified.
- .14 Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

- .15 Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- .16 Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- .17 Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- .18 Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- .19 Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- .20 Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - .1 Name of evaluation organization.
 - .2 Date of evaluation.
 - .3 Time period when report is in effect.
 - .4 Product and manufacturers' names.
 - .5 Description of product.
 - .6 Test procedures and results.
 - .7 Limitations of use.
- .21 Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- .22 Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- .23 Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- .24 Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- .1 Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents provide products and systems complying with specific performance and design criteria indicated.
 - .1 Submittals shall bear the seal and signature of the Contractor's design professional licensed in the jurisdiction of the project.
 - .2 If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner's Representative.

PART 3 EXECUTION

3.1 CONTRACTOR'S REVIEW

- .1 Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner's Representative.
- .2 Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section *Closeout Procedures*.
- .3 Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 OWNER'S REPRESENTATIVE'S ACTION

- .1 Action Submittals: Owner's Representative will review each submittal, make marks to indicate corrections or revisions required, and return it. Owner's Representative will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- .2 Informational Submittals: Owner's Representative will review each submittal and will not return it, or will return it if it does not comply with requirements.
- .3 Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Owner's Representative.
- .4 Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- .5 Submittals not required by the Contract Documents may be returned by the Owner's Representative without action.

END OF SECTION

PART 1 **GENERAL**

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Health and safety requirements for projects located in Nova Scotia.
- .2 Types of items not described in this Section:
 - .1 Submittal Procedures
 - .2 Environmental Procedures
 - .3 Regulatory Requirements
 - .4 Asbestos Abatement

1.3 REFERENCES

- .1 Code and standards referenced in this section refer to the latest edition thereof.
- .2 Canadian Standards Association (CSA)
 - .1 CSA S269.1 Falsework for Construction Purposes.
 - .2 CAN/CSA-Z259.1 Safety Belts and Lanyards.
 - .3 CAN/CSA-Z259.10 Full Body Harnesses.
 - .4 CAN/CSA-Z259.11 Shock Absorbers for Personal Fall Arrest Systems.
 - .5 CAN/CSA-Z259.2, Fall Arresting Devices, Personnel Lowering Devices and Lifelines.
 - .6 FCC No. 301 Standard for Construction Operations.
- .3 FCC No. 302 Standard for Welding and Cutting.
- .4 Transportation of Dangerous Goods Act Regulations.
- .5 Nova Scotia Occupational Health and Safety Act, Amended.
- .6 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .7 National Building Code of Canada.

1.4 SUBMITTALS

- .1 At least 10 (ten) working days prior to commencing any site work: submit to Owner's Representative copies of:
 - .1 A complete Health and Safety Risk Assessment and Management Plan.
 - .2 Blaster's valid Class 1 Blasting Licence.
 - .3 Blaster's Safety Certificate from the Worker's Compensation Board of Nova Scotia
 - .4 Temporary Magazine License, when required issued, by Natural Resources Canada.
 - .5 Explosives Vehicle Certificate, when required, issued by Transport Canada for transport of explosives regulated under the Transportation of Dangerous Good Act.
 - .6 Acceptable letter of conduct from the Blaster Licensing and Safety Division of the Worker's Compensation Board of Nova Scotia.
 - .7 Blaster resume which clearly states and demonstrates:

- .1 Minimum five (5) years of experience in handling, storage, and detonation of explosives.
- .2 Training at a blaster's school which is acceptable to the provincial government.
- .8 Copies of confined space entry training certificates.
- .2 Acceptance of the Project Health and Safety Risk Assessment and Management Plan and other submitted documents by the Owner's Representative shall only be viewed as acknowledgement that the contractor has submitted the required documentation under this specification section.
- .3 Owner's Representative makes no representation and provides no warranty for the accuracy, completeness and legislative compliance of the Project Health and Safety Risk Management Plan and other submitted documents by this acceptance.
- .4 Responsibility for errors and omissions in the Project Health and Safety risk Assessment and Management Plan and other submitted documents is not relieved by acceptance by Owner's Representative.

1.5 OCCUPATIONAL HEALTH AND SAFETY (PROJECT HEALTH AND SAFETY RISK ASSESSMENT AND MANAGEMENT PLANS)

- .1 Conduct operations in accordance with latest edition of the Nova Scotia Occupational Health and Safety (OH&S) Act and Regulations.
- .2 Prepare a detailed Project Health and Safety Risk Assessment and Management Plan for the Owner. Assessment shall identify, evaluate and control job specific hazards and the necessary control measures to be implemented for managing hazards.
- .3 Provide a copy of the Project Health and Safety Risk Assessment and Management Plan upon request to Occupational Health and Safety, Province of Nova Scotia and the Owner.
- .4 The written Health and Safety Risk Assessment and Management Plan shall incorporate the following:
 - .1 A site-specific health and safety plan, refer to clause 1.5 Site-Specific Health and Safety Risk Assessment and Management Plan of this section for requirements.
 - .2 An organizational structure which shall establish the specific chain of command and specify the overall responsibilities of contractor's employees at the work site.
 - .3 A comprehensive work plan which shall:
 - .1 define work tasks and objectives of site activities/operations and the logistics and resources required to reach these tasks and objectives
 - .2 establish personnel requirements for implementing the plan, and
 - .3 establish site specific training and notification requirements and schedules.
 - .4 A personal protected equipment (PPE) Program which shall detail PPE:
 - .1 Selection criteria based on site hazards.
 - .2 Use, maintenance, inspection and storage requirements and procedures.
 - .3 Decontamination and disposal procedures.
 - .4 Inspection procedures prior to during and after use, and other appropriate medical considerations.

- .5 Limitations during temperature extremes, heat stress and other appropriate medical consideration.
- .5 An emergency response procedure, refer to Clause 1.6 Supervision and Emergency Response Procedure of this section for requirements.
- .6 A hazard communication program for informing workers, visitors, and individuals outside of the work area as required.
- .7 A health and safety training program.
- .8 General safety rules.
- .5 Periodically review and modify as required each component of the Project Health and Safety Risk Assessment and Management Plan when a new hazard is identified during completion of work and when an error or omission is identified in any part of the Project Health and Safety Risk Assessment and Management Plan.
- .6 Implement all requirements of the Project Health and Safety Risk Assessment and Management Plan.
 - .1 Ensure that every person entering the project site is informed of requirements under the Project Health and Safety Risk Assessment and Management Plan.
 - .2 Take all necessary measures to immediately implement any engineering controls, administrative controls, personal protective equipment required or termination of work procedures to ensure compliance with the Project Health and Safety Risk Assessment and Management Plan.

1.6 SITE SPECIFIC HEALTH AND SAFETY PLAN

- .1 Prepare a detailed site-specific Project Health and Safety Plan which shall:
 - .1 Contain certain hazard assessment results.
 - .2 Identify engineering and administrative demonstrative controls (work-practices and procedures) to be implemented for managing identified and potential hazards, and comply with applicable federal and provincial legislation and more stringent requirements that have been specified in these specifications.
- .2 Review for completeness the hazard assessment results immediately prior to commencing work, when a new hazard is identified during completion of work and when an error or omission is identified.
 - .1 Be solely responsible for investigating, evaluation and managing any report of actual or potential hazards.
 - .2 Retain copies of all completed hazard assessments at the project site and make available to the Owner's Representative immediately upon request.

1.7 SUPERVISION AND EMERGENCY RESCUE PROCEDURE

- .1 Carry out work under the direct supervision of competent persons responsible for safety by ensuring the work complies with the appropriate section of OH&S Act and Regulations
- .2 Assign a sufficient number of supervisory personnel to the work site.
- .3 Provide a suitable means of communications for workers required to work alone.

- .4 Develop an emergency rescue plan for the job site and ensure that supervisors and workers are trained in the emergency rescue plan.
- .5 The emergency response plan shall address, as a minimum:
 - .1 Pre-emergency planning.
 - .2 Personnel roles, lines of authority and communication.
 - .3 Emergency recognition and prevention.
 - .4 Safe distances and places of refuge.
 - .5 Site security and control.
 - .6 Evacuation routes and procedures.
 - .7 Decontamination procedures which are not covered by the site-specific safety and health plan.
 - .8 Emergency medical treatment and first aid.
 - .9 Emergency alarm, notification and response procedures including procedures for reporting incidents to local, provincial, and federal government departments.
 - .10 PPE and emergency equipment.
 - .11 Procedures for handling emergency incidents.
 - .12 Site specific emergency response training requirements and schedules.
- .6 The emergency response procedures shall be rehearsed regularly as part of the overall training program.
- .7 Provide adequate first aid facilities for the jobsite and ensure that a minimum number of workers are trained in first aid in accordance with the First Aid Regulations.

1.8 CONTRACTORS SAFETY OFFICER

- .1 The contractor's Safety Officer will be solely responsible for the implementation and monitoring of the Project Health and Safety Risk Assessment and Management Plan, and will have the authority to implement health and safety changes as directed by the Owner's Representative. The General Contractor's Site Superintendent is permitted to be the Contractor's Safety Officer provided all prescribed qualifications are met. The Safety Officer shall have as a minimum:
 - .1 Completed training in hazardous occurrence management and response/protocols.
 - .2 Completed training in the use, maintenance of fall protection systems.
 - .3 Completed training in the design and construction of scaffolding.
 - .4 Completed training in confined space entry protocols and techniques.
 - .5 Completed training in First Aid.
 - .6 Have working knowledge of occupational safety and health regulations.
 - .7 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .8 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .9 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.9 HEALTH AND SAFETY COMMITTEE

- .1 Establish an Occupational Health and Safety Committee where ten or more workers are employed on the job site as per the OH&S Act and Regulations.
- .2 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.10 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.11 UNFORESEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Owner's Representative verbally and in writing.

1.12 INSTRUCTION AND TRAINING

- .1 Workers shall not participate in or supervise any activity on the work site until they have been trained to a level required by this job function and responsibility. Training shall as a minimum thoroughly cover the following:
 - .1 Federal and Provincial Health and Safety Legislation requirements including roles and responsibilities of workers and person(s) responsible for implementing, monitoring and enforcing health and safety requirements.
 - .2 Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.
 - .3 Limitations, use, maintenance, and disinfection-decontamination of personal protective equipment associated with completing work.
 - .4 Limitations, use, maintenance and care of engineering controls and equipment.
 - .5 Limitations and use of emergency notifications and response equipment including emergency response protocol.
 - .6 Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.
- .2 Provide and maintain training of workers, as required, by Federal and Provincial legislation.
- .3 Provide copies of all training certificates to Owner's Representative for review, before a worker is to enter the work site.
- .4 Authorized visitors shall not access the work site until they have been:

- .1 Notified of the names of persons responsible for implementing, monitoring and enforcing the health and Safety Risk Assessment and Management Plan.
- .2 Briefed on safety and health hazards present on the site.
- .3 Instructed in the proper use and limitations of personal protective equipment.
- .4 Briefed as the emergency response protocol including notification and evacuation process.
- .5 Informed of practices and procedures to minimize risks from hazards and applicable to activities performed by visitors.

1.13 CONSTRUCTION SAFETY MEASURES

- .1 Observe construction safety measures of National Building Code, latest edition, Provincial Government, OH&S Act and Regulations, Workplace Health and Safety and Compensation Commission and Municipal Authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.
- .2 Administer the project in a manner that will ensure, at all times, full compliance with Federal and Provincial Acts, regulations and applicable safety codes and the site Health and Safety Risk Assessment and Management Plan.
- .3 Provide Owner's Representative with copies of all orders, directions and any other documentation, issued by the Provincial Department of Government Services, Occupational Health and Safety branch immediately after receipt.

1.14 POSTING OF DOCUMENTS

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

1.15 HEALTH AND SAFETY MONITORING

- .1 Periodic inspections of the contractor's work may be carried out by the Owner's Representative to maintain compliance with the Health and Safety Program. Inspections will include visual inspections as well as testing and sampling as required.
- .2 The contractor shall be responsible for any and all costs associated with delays as a result of contractor's failure to comply with the requirements outlined in this section.

1.16 NOTIFICATION

- .1 For projects exceeding thirty (30) days or more, the contractor shall, prior to the commencement of work, notify in writing the Work Place Health and Safety Division, Department of Labour with the following information:
 - .1 Name and location of construction site.
 - .2 Company name and mailing address of contractor doing the work.
 - .3 The number of workers to be employed.
 - .4 A copy of the Health and Safety Risk Assessment and Management Plan if requested.

1.17 CORRECTION OF NON-COMPLIANCE

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

1.18 WHMIS

- .1 Ensure that all controlled products are in accordance with the Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the OH&S Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.
- .2 Deliver copies of relevant Material Safety Data Sheets (MSDS) to job site and the Owner's Representative. The MSDS must be acceptable to Labour Canada and Health and Welfare Canada for all controlled products that will be used in the performance of this work.
- .3 Train workers required to use or work in close proximity to controlled products as per OH&S Act and Regulations.
- .4 Label controlled products at jobsite as per OH&S and Regulations.
- .5 Provide appropriate emergency facilities as specified in the MSDS where workers might be exposed to contact with chemicals, e.g. eye-wash facilities, emergency shower.
 - .1 Workers to be trained in use of such emergency equipment.
- .6 Contractor shall provide appropriate personal protective equipment as specified in the MSDS where workers are required to use controlled products.
 - .1 Properly fit workers for personal protective equipment.
 - .2 Train workers in care, use and maintenance of personal protective equipment.
- .7 No controlled products are to be brought on-site without prior approved MSDS.
- .8 The MSDS are to remain on site at all times.

1.19 OVERLOADING

- .1 Ensure no part of work or associated equipment is subjected to loading that will endanger its safety or will cause permanent deformation.

1.20 FALSEWORK

- .1 Design and construct falsework in accordance with CSA S269.1.

1.21 SCAFFOLDING

- .1 Design, erect and maintain scaffolding in accordance with CSA S269.2 and Sections 91-97 of the OH&S Act and Regulations.
- .2 Ensure that fall-restraint or fall-arrest devices are used by all workers working at elevations greater than 3.05 metres above grade or floor level in accordance with CSA Z259.

1.22 PERSONAL PROTECTIVE EQUIPMENT

- .1 Ensure workers on the jobsite use personal protective equipment appropriate to the hazards identified in the Risk Assessment and Management Plan and those workers are trained in the proper care, use, and maintenance of such equipment.
- .2 PPE selections shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, task-specific conditions, duration and hazards and potential hazards identified on site.
- .3 Provide workers and visitors to the site with proper respiratory protection equipment.
 - .1 No work shall be performed in an area where an airborne contaminant exceeds one half (½) the IDLH concentration.
 - .2 Respiratory protection shall be provided in accordance with the requirements of the Occupational Health and Safety, Province of Nova Scotia and these specifications.
 - .3 Establish, implement, and maintain a respirator inspection and maintenance program.
 - .4 Copies of all respirator owners' maintenance manuals shall be kept at all times at the contractor's site office.
- .4 Provide and maintain a supply of dermal protection equipment to allow visitors and all workers proper dermal protection.
 - .1 Dermal protection shall be sufficient to act as a protective barrier between the skin and an airborne contaminant or hazardous material. Dermal protection shall also be provided for all physical hazards.
 - .2 Dermal protection equipment shall not be used after exceeding 75% of the break through time. The breakthrough time shall be based on the contaminant which requires the least amount of time to break through the protective equipment.
 - .3 Copies of all dermal protection user specifications, owners and maintenance manuals shall be kept at all times at the contractor's site office.
 - .4 Establish, implement and maintain air inspection program to ensure proper dermal protection in accordance with CSA, NIOSH, U.S. EPA and manufacturer's requirements.
- .5 Provide all workers and up to five (5) visitors to the site with proper hearing protection. Workers and visitors shall not be exposed to noise levels greater than 85 dB (A) over an eight hour shift without proper hearing protection.
- .6 Provide all workers and up to five (5) visitors to the site with CSA approved eye protection sufficient to act as a protective barrier between the eye and airborne contaminants, hazardous materials, and physical hazard.
- .7 Provide workers and up to five (5) visitors to the site with CSA approved hard hats.

1.23 TRAFFIC CONTROL

- .1 Provide traffic control measures when working on, or adjacent to, roadways in accordance with the "Traffic Control Manual for Roadwork Operations", Department of Transportation and Works.

1.24 EXCAVATION SAFETY

- .1 Protect excavations more than 1.25 metres deep against cave-ins or wall collapse by side wall sloping to the appropriate angle of repose, an engineered shoring/sheathing system or an approved trench box.
 - .1 Provide a ladder which can extend from the bottom of the excavation to at least 0.91 metres above the top of the excavation.
- .2 Ensure that all excavations less than 1.25 metres deep are effectively protected when hazardous ground movement may be expected.
- .3 Design trench boxes, certified by a registered Professional Engineer, and fabricated by a reputable manufacturer. Provide the manufacturer's Depth Certificate Statement permanently affixed. Use trench boxes in strict accordance with manufacturer's instructions and depth certification data.
- .4 For excavations deeper than six (6) metres, provide a certificate from a registered Professional Engineer stating that the protection methods proposed have been properly designed in accordance with accepted engineering practice. The engineer's certificate shall verify that the trench boxes, if used, are properly designed and constructed to suit the depth and soil conditions.
 - .1 Ensure that the superintendent and every crew chief, foreperson and lead hand engaged in trenching operations or working in trenches have in his/her possession a copy of the Department of Labour's "Trench Excavation Safety Guide".

1.25 BLASTING OPERATIONS

- .1 Ensure blasting operations are carried out under the direct visual supervision of a qualified Blaster registered with the Provincial Department of Labour. Comply with the requirements of:
 - .1 Explosives Act.
 - .2 Explosives Regulations.
- .2 Store explosives in accordance with the "Explosives Act (Canada)" and transport, handle and use in the manner prescribed by the manufacturer of the substance and subject to specific regulations.
- .3 Ensure that workers required to transport explosives have a valid Transportation of Dangerous Goods Training Certification in accordance with the "Act to Promote Public Safety in the Transportation of Dangerous Goods, and the "Explosives Act (Canada)".
- .4 Advise the public by suitable public notices, advertisements, house to house contacts etc. for blasting operations in close proximity to areas occupied by the public. Advise of the warning device to be sounded and the procedure to be used before detonation of individual blasts.
- .5 Prior to detonation of a blast, give sufficient warning in every direction and ensure that all persons have reached a place of safety before the blast is fired.
- .6 File an Emergency Response Assistance Plan with the Explosives Branch, Natural Resources Canada.
- .7 Blaster shall:
 - .1 Be solely responsible for implementation of the Explosives Management Program.

- .2 Have a valid blaster's safety certificate from the Department of Education Division of Institutions and Industrial Education, and have a valid temporary Magazine License, when required issued by Natural Resources Canada, for storage and explosives.
- .3 Possess a thorough working knowledge of the Federal Explosives Act and Provincial Regulations.
- .4 Possess a specialized training in handling storage and detonation of explosives.

1.26 CONFINED SPACE WORK

- .1 Comply with requirements of Canada Occupational Safety and Health Regulations, Part XI.
- .2 Provide approved air monitoring equipment where workers are working in confined spaces and ensure any test equipment to be used is calibrated, in good working order and used by trained persons.
- .3 Develop a confined space entry program specific to the nature of work performed and in accordance with OH&S Act and Regulations and ensure supervisors and workers are trained in the confined space entry program.
 - .1 Ensure that personal protective equipment and emergency rescue equipment appropriate to the nature of the work being performed is provided and used.
- .4 Provide and maintain training of workers, as required by the Federal and Provincial Legislation.
- .5 Provide Owner's Representative with a copy of an "Entry Permit" for each entry into the confined space to ensure compliance with Federal and Provincial Legislation.

1.27 HAZARDOUS MATERIALS

- .1 Should material resembling hazardous materials (asbestos/mould) be encountered during the execution of work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative.
- .2 Unless otherwise noted, for hazardous materials abatement and repair, employ the services of a recognized Environmental Consultant to provide all air monitoring and testing services for regulatory requirements.

1.28 HEAVY EQUIPMENT

- .1 Ensure mobile equipment used on jobsite is of the type specified in OH&S Act and Regulations fitted with a Roll Over Protective (ROP) Structure.
- .2 Provide certificate of training in Power Line Hazards for operators of heavy equipment.
- .3 Obtain written clearance from the power utility where equipment is used in close proximity to (within 5.5 metres) overhead or underground power lines.
- .4 Equip cranes with:
 - .1 A mechanism which will effectively prevent the hook assembly from running into the top boom pulley.
 - .2 A legible load chart.
 - .3 A maintenance log book.

1.29 TREE AND BRUSH CLEARING

- .1 Ensure workers using chain saws wear the following safety equipment:
 - .1 CSA safety hat.
 - .2 Hearing protection, e.g. ear muffs.
 - .3 CSA approved chain saw pants.
 - .4 CSA approved chain saw boots.
 - .5 Approved eye protection.
- .2 Ensure that all workers using brush saws wear the following safety equipment:
 - .1 CSA approved safety hat fitted with face screen or shield or approved safety glasses.
 - .2 Hearing protection, e.g. ear muffs.
 - .3 CSA approved safety footwear.
 - .4 Equip chain saws with a safety chain break.

1.30 WORK STOPPAGE

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

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 **GENERAL**

1.1 SUMMARY

- .1 Section includes administrative and procedural requirements for quality assurance and quality control.
 - .1 Minimum Quantity or Quality Levels.
 - .2 Contractor's Quality-Control Plan.
 - .3 Quality Control Manager.
 - .4 Construction Superintendent.
 - .5 Quality-Control Testing
 - .6 Inspections.
 - .7 Qualifications of various parties.
 - .8 Mock-ups.
 - .9 Industry Standards.
- .2 Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - .1 Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - .2 Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - .3 Requirements for Contractor to provide quality-assurance and -control services required by Owner's Representative, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - .4 Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

- .1 Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- .2 Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Owner's Representative.
- .3 Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

- .1 Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
- .2 Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
- .3 Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- .4 Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- .5 Product Testing: Tests and inspections that are performed by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- .6 Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- .7 Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- .8 Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- .9 Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - .1 Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- .10 Experienced: When used with an entity or individual, *experienced* means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- .1 Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Owner's Representative for a decision before proceeding.
- .2 Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer un-certainties to Owner's Representative for a decision before proceeding.

1.4 ACTION SUBMITTALS

- .1 Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - .1 Indicate manufacturer and model number of individual components.
 - .2 Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.5 INFORMATIONAL SUBMITTALS

- .1 Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- .2 Qualification Data: For Contractor's quality-control personnel.
- .3 Testing Agency Qualifications: For testing agencies specified in *Quality Assurance* Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- .4 Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - .1 Specification Section number and title.
 - .2 Entity responsible for performing tests and inspections.
 - .3 Description of test and inspection.
 - .4 Identification of applicable standards.
 - .5 Identification of test and inspection methods.
 - .6 Number of tests and inspections required.
 - .7 Time schedule or time span for tests and inspections.
 - .8 Requirements for obtaining samples.
 - .9 Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

- .1 Quality-Control Plan, General: Submit quality-control plan within 10 days of *Notice to Award*, and not less than five days prior to preconstruction conference. Submit in format acceptable to Owner's Representative. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- .2 Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - .1 Project quality-control manager may perform other duties on other projects provided first priority is given to fulfilling all the requirements of the project quality-control manager on this Project.
- .3 Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- .4 Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - .1 Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.

- .2 Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
- .5 Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- .6 Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Owner's Representative has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.
 - .1 For each type of system or component tested or inspected that is located in multiple locations throughout the building, colour code a set of drawings to show the progression of the inspections and testing. Update on a daily basis. Maintain on job site at all times. Indicate on drawings date of test or inspection.

1.7 QUALITY CONTROL MANAGER

- .1 Role: Role of Quality manager includes but is not limited to the following:
 - .1 Implement and track the Quality Control Plan.
 - .2 Perform a walk-about of the entire construction site not less than once per day.
 - .3 Maintain a daily log of quality issues including the status of ongoing Work and submit a copy to the Owner's Representative not less than once a week.
 - .4 .Coordinate and witness all tests and inspections undertaken or required.
 - .5 Maintain a list of all inspections and tests undertaken or required, and documentation of date and reports of each test or inspection undertaken.
 - .6 Notify Superintendent of any work not in compliance with the Contract.
 - .7 Personally confirms work is completed prior to providing Owner's Representative with required notices when part or all of the work is completed and ready for review.
 - .8 The General Contractor's Site Superintendent is permitted to be the Contractor's Quality Control Manager provided all prescribed qualifications are met.

1.8 CONSTRUCTION SUPERINTENDANT

- .1 Qualifications: Employ a competent full-time Superintendent and necessary assistants. Ensure Superintendent is satisfactory to the Owner's Representative and does not change except for good reason and only then after consultation with and agreement by the Owner's Representative.
- .2 Period of Work: Once construction starts on site, ensure Superintendent remains on site at all times while work is being performed and remains on site for all 8 hour weekdays until Substantial Completion is achieved.
- .3 Responsibility to Accept Notices from Owner's Representative: Assign responsibility to Superintendent to represent Contractor at place of work and to accept instructions on behalf of the Contractor by the Owner's Representative.

- .4 New Superintendent at Substantial Completion: Upon receipt of Substantial Completion Certificate from Owner's Representative replace Superintendent with new Superintendent of equal or greater qualifications and experience as Superintendent on site before Substantial Completion. Ensure new Superintendent is satisfactory to the Owner's Representative. Ensure Superintendent remains on site at all times while work is being performed and remains on site for all 8 hour weekdays until Final Completion has been reached, unless otherwise noted.
 - .1 Once all outstanding work has been completed in accordance with the Contract, except for seasonal deficiencies that cannot be complete until the appropriate season, the Superintendent need not remain on site when no work is being undertaken.

1.9 REPORTS AND DOCUMENTS

- .1 Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - .1 Date of issue.
 - .2 Project title and number.
 - .3 Name, address, and telephone number of testing agency.
 - .4 Dates and locations of samples and tests or inspections.
 - .5 Names of individuals making tests and inspections.
 - .6 Description of the Work and test and inspection method.
 - .7 Identification of product and Specification Section.
 - .8 Complete test or inspection data.
 - .9 Test and inspection results and an interpretation of test results.
 - .10 Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - .11 Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - .12 Name and signature of laboratory inspector.
 - .13 Recommendations on retesting and reinspecting.
- .2 Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - .1 Name, address, and telephone number of technical representative making report.
 - .2 Statement on condition of substrates and their acceptability for installation of product.
 - .3 Statement that products at Project site comply with requirements.
 - .4 Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - .5 Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - .6 Statement whether conditions, products, and installation will affect warranty.
 - .7 Other required items indicated in individual Specification Sections.

- .3 Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
 - .1 Name, address, and telephone number of factory-authorized service representative making report.
 - .2 Statement that equipment complies with requirements.
 - .3 Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - .4 Statement whether conditions, products, and installation will affect warranty. Other required items indicated in individual Specification Sections.
- .4 Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.10 QUALITY ASSURANCE

- .1 General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- .2 Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- .3 Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- .4 Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- .5 Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- .6 Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - .1 Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- .7 Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- .8 Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect

- installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- .9 Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
 - .10 Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - .1 Contractor responsibilities include the following:
 - .1 Provide test specimens representative of proposed products and construction.
 - .2 Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - .3 Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - .4 Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - .5 Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - .6 When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
 - .2 Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Owner's Representative and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - .11 Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - .1 Build mockups in location and of size indicated or, if not indicated, as directed by Owner's Representative.
 - .2 Notify Owner's Representative seven days in advance of dates and times when mockups will be constructed.
 - .3 Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 - .4 Demonstrate the proposed range of aesthetic effects and workmanship.
 - .5 Obtain Owner's Representative's approval of mockups before starting work, fabrication, or construction.
 - .6 Allow seven days for initial review and each re-review of each mockup.

- .6 Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
- .7 Demolish and remove mockups when directed unless otherwise indicated.
- .12 Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.
- .13 Room Mockups: Construct room mockups incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Owner's Representative to evaluate quality of the Work. Provide room mockups of the following rooms:
 - .1 None required for this project.
- .14 Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.11 QUALITY CONTROL

- .1 Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - .1 Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - .2 Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the *Contract Price* will be adjusted by Change Order.
 - .3 Owner will engage and pay for an independent testing agency to perform concrete tests and compaction tests for backfilling material.
- .2 Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - .1 Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - .2 Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - .1 Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - .3 Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

- .4 Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - .5 Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - .6 Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- .3 **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section *Submittal Procedures*.
- .4 **Manufacturer's Technical Services:** Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- .5 **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- .6 **Testing Agency Responsibilities:** Cooperate with Owner's Representative, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
- .1 Notify Owner's Representative, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - .2 Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - .3 Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - .4 Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - .5 Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - .6 Do not perform any duties of Contractor.
- .7 **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
- .1 Access to the Work.
 - .2 Incidental labour and facilities necessary to facilitate tests and inspections.
 - .3 Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - .4 Facilities for storage and field curing of test samples.
 - .5 Delivery of samples to testing agencies.

- .6 Preliminary design mix proposed for use for material mixes that require control by testing agency.
- .7 Security and protection for samples and for testing and inspecting equipment at Project site.
- .8 Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - .1 Schedule times for tests, inspections, obtaining samples, and similar activities.
- .9 Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
 - .1 Distribution: Distribute schedule to Owner, Owner's Representative, Commissioning Authority, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 INDUSTRY STANDARDS

- .1 Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
 - .1 Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- .2 Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - .1 Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

1.1 TEST AND INSPECTION LOG

- .1 Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - .1 Date test or inspection was conducted.
 - .2 Description of the Work tested or inspected.
 - .3 Date test or inspection results were transmitted to Owner's Representative.
 - .4 Identification of testing agency or special inspector conducting test or inspection.

- .2 Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Owner's Representative's, Commissioning Authority's, reference during normal working hours.

1.2 REPAIR AND PROTECTION

- .1 General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - .1 Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section *Execution*.
 - .2 Protect construction exposed by or for quality-control service activities.
 - .3 Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 This Section includes definitions for common used industry terms and abbreviations and acronyms

1.2 DEFINITIONS

- .1 General: Basic Contract definitions are included in the Conditions of the Contract.
- .2 *Approved*: When used to convey Owner's Representative's action on Contractor's submittals, applications, and requests, *approved* is limited to Owner's Representative's duties and responsibilities as stated in the Conditions of the Contract.
- .3 *Directed*: A command or instruction by Owner's Representative. Other terms including *requested, authorized, selected, required, and permitted* have the same meaning as *directed*.
- .4 *Indicated*: Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including *shown, noted, scheduled, and specified* have the same meaning as *indicated*.
- .5 *Regulations*: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- .6 *Furnish*: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- .7 *Install*: Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- .8 *Provide*: Furnish and install, complete and ready for the intended use.
- .9 *Project Site*: Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 ABBREVIATIONS AND ACRONYMS

- .1 Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
 - .1 AA - Aluminium Association, 900 19th Street N.W., Washington, D.C., U.S.A. 20006 URL <http://www.aluminum.org>
 - .2 AASHTO - American Association of State Highway and Transportation Officials, 444 N Capitol Street N.W., Suite 249, Washington, D.C., U.S.A. 20001 URL <http://www.aashto.org>
 - .3 ACEC Association of Consulting Engineers of Canada, 130 Albert Street, Ottawa, ON. K1P 5G4 URL <http://www.acec.ca>.
 - .4 AHA - American Hardboard Association, 1210W Northwest Hwy., Palatine, Illinois, U.S.A. 60067 URL : <http://www.ahaa.com>

- .5 AITC - American Institute of Timber Construction, 7012 S. Revere Parkway, Suite 140, Englewood, Colorado, U.S.A. 80112 URL <http://www.aitc-glulam.org>
- .6 AMCA - Air Movement and Control Association Inc., 30 West University Drive, Arlington Heights, Illinois, U.S.A. 60004-1893 URL <http://www.amca.org>
- .7 ANSI - American National Standards Institute, 11 West 42nd Street, New York, New York, U.S.A. 10036 URL <http://www.ansi.org>
- .8 APA - The Engineered Wood Association, P.O. Box 11700, Tacoma, Washington, U.S.A. 98411-0700 URL <http://www.apawood.org>
- .9 API - American Petroleum Institute, 1220 L St. Northwest, Washington, D.C., U.S.A. 20005-4070 URL <http://www.api.org>
- .10 ARI - Air Conditioning and Refrigeration Institute, 4301 North Fairfax Drive, Suite 425, Arlington, Virginia, U.S.A. 22203 URL <http://www.ari.org>
- .11 ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers, 1791 Tullie Circle NE, Atlanta, Georgia, U.S.A. 30329 URL <http://www.ashrae.org>
- .12 ASME - American Society of Mechanical Engineers, United Engineering Centre, Three Park Avenue, New York, New York, U.S.A. 10016-5990 URL <http://www.asme.org>
- .13 ASPT Association for Asphalt Paving Technologists, 400 Selby Avenue, Suite 1, St. Paul, MN 55102 U.S.A. URL <http://www.asphalt.org>
- .14 ASTM - American Society for Testing and Materials, 100 Barr Harbor Drive West, Conshohocken, Pennsylvania 19428-2959 URL <http://www.astm.org>
- .15 AWCI - Association of the Wall and Ceiling Industries International, 803 West Broad Street, Suite 600, Falls Church, VA, U.S.A. 22046 URL <http://www.awci.org>
- .16 AWMAC - Architectural Woodwork Manufacturers Association of Canada, 516 4 Street West, High River, Alberta T1V 1B6 URL <http://www.awmac.com>
- .17 AWPA - American Wire Producer's Association, 6232 Roudsby, Alexandria, VA, U.S.A. 22315-5285 URL <http://www.awpa.org>
- .18 AWPA - American Wood Preservers' Association, P.O. Box 5690, Grandbury Texas, U.S.A. 76049-0690 URL <http://www.awap.com>
- .19 AWS - American Welding Society, 550 N.W. LeJeune Road, Miami, Florida, U.S.A. 33126 URL <http://www.amweld.org>
- .20 AWWA - American Water Works Association, 6666 W. Quincy Avenue, Denver, Colorado, U.S.A. 80235 URL <http://www.awwa.org>
- .21 CCA Canadian Construction Association, 75 Albert St., Suite 400 Ottawa, Ontario, K1P 5E7 URL <http://www.cca-acc.com>
- .22 CCDC Canadian Construction Documents Committee, Refer to ACEC, CCA, CSC or RAIC
- .23 CITC Canadian Institute of Timber Construction, 200 Cooper Street, Ottawa, Ontario K2P 0G1
- .24 CFFM - Canadian Forces Fire Marshal, 101 Colonel By Drive, 8NT MGen George R. Pearkes Bldg., Ottawa, Ontario K1A 0K2
- .25 CGA - Canadian Gas Association, 20 Eglinton Avenue West, Suite 1305, Toronto, Ontario M4R 1K8 URL <http://www.cga.ca>

- .26 CGSB - Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, Quebec K1A 1G6 URL <http://w3.pwgsc.gc.ca/cgsb>
- .27 CISC - Canadian Institute of Steel Construction, 201 Consumers Road, Suite 300, Willowdale, Ontario M2J 4G8 URL <http://www.buildingweb.com/CISC>
- .28 CLA - Canadian Lumbermen's Association, 27 Goulburn Avenue, Ottawa, Ontario, K1N 8C7 URL <http://www.cla.ca.ca>
- .29 CNLA - Canadian Nursery Landscape Association, RR #4, Stn. Main, 7856 Fifth Street, Milton, Ontario. L9T 2X8 URL <http://www.canadanursery.com>
- .30 CRCA - Canadian Roofing Contractors Association, 155 Queen Street, Suite 130C, Ottawa, Ontario K1P 6L1 URL <http://www.roofingcanada.com>
- .31 CSA - Canadian Standards Association International, 178 Rexdale Blvd., Toronto, Ontario M9W 1R3 URL <http://www.csa-international.org>
- .32 CSC - Construction Specifications Canada, 100 Lombard Street, Suite 200, Toronto, Ontario M5C 1M3 URL <http://www.csc-dcc.ca>
- .33 CSDFMA - Canadian Steel Door and Frame Manufacturing Association One Yonge Street, Suite 1400, Toronto, Ontario M5E 1J9
- .34 CSPI - Corrugated Steel Pipe Institute, 201 Consumers Road, Suite 306, Willowdale, Ontario M2J 4G8
- .35 CSSBI - Canadian Sheet Steel Building Institute, 652 Bishop St. N., Unit 2A, Cambridge, Ontario N3H 4V6 URL <http://www.cssbi.ca>
- .36 CUFCA Canadian Urethane Foam Contractor's Association
- .37 CWC - Canadian Wood Council, 1400 Blair Place, Suite 210, Ottawa, Ontario K1J 9B8 URL <http://www.cwc.ca>
- .38 EC - Environment Canada, Conservation and Protection, Ottawa, Ontario KIA 0H3 URL <http://www.ec.gc.ca>
- .39 EEMAC - Electrical and Electronic Manufacturers' Association of Canada, 5800 Explorer Drive, Suite 200, Mississauga, Ontario L4W 5K9 URL <http://www.electrofed.ca>
- .40 EIMA EIFS Industry Manufacturer's Association, 3000 Corporate Center Drive, Suite 270, Morrow, Georgia U.S.A. 30260 URL <http://www.eifsfacts.com>
- .41 FCC - Fire Commissioner of Canada, Place du Portage, Phase II, 165 rue Hotel de Ville, Hull Quebec K1A 0J2 URL <http://www.hrdc-drhc.gc.ca>
- .42 IEEE - Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, New York U.S.A. 10017 URL <http://www.ieee.org>
- .43 MPI - The Master Painters Institute, 4090 Graveley Street, Burnaby, BC V5C 3T6 URL <http://www.paintinfo.com>
- .44 MSS - Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street, N.E., Vienna, Virginia U.S.A.22180
- .45 NAAMM - National Association of Architectural Metal Manufacturers, 8 South Michigan Avenue, Suite 1000, Chicago, Illinois U.S.A. 60603 URL <http://www.naamm.org>
- .46 NABA - National Air Barrier Association, 400-283 Bannatyne Avenue, Winnipeg, Manitoba R3B 3B2
- .47 NEMA - National Electrical Manufacturers Association, 1300 N. 17th Street, Suite 1847, Rosslyn, Virginia 22209 URL <http://www.nema.org>

- .48 NFPA - National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101 Quincy, Massachusetts, U.S.A. 02269-9101 URL <http://www.nfpa.org>
 - .49 NFSA - National Fire Sprinkler Association, 40 Jon Barrett Road, P.O. Box 1000, Patterson, New York, U.S.A. 12563 URL <http://www.nfsa.org>
 - .50 NHLA - National Hardwood Lumber Association, P.O. Box 34518, Memphis, Tennessee, U.S.A 38184-0518 URL <http://www.natlhardwood.org>
 - .51 NLGA - National Lumber Grades Authority, 406 First Capital Place, New Westminster, B.C. V3M 6G2
 - .52 NRC - National Research Council, Montreal Road, Ottawa, Ontario K1A 0S2 URL <http://www.nrc.gc.ca>
 - .53 NSPE National Society of Professional Engineers, 1420 King Street, Alexandria, VA U.S.A. 22314-2794 URL <http://www.nspe.org>
 - .54 PCI - Prestressed Concrete Institute, 209 W. Jackson Blvd., Suite 500, Chicago, Illinois, U.S.A. 60606 URL <http://www.pci.org>
 - .55 PEI - Porcelain Enamel Institute, P.O. Box 158541, 4004 Hillsboro Pike, Suite 224-B Nashville, TN, U.S.A. 37215 URL <http://www.porecelainenamel.com>
 - .56 QPL - Qualification Program List, c/o Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, Quebec K1A 1G6 URL <http://www.pwgsc.gc.ca/cgsb>
 - .57 RAIC Royal Architectural Institute of Canada, 55 Murray Street, Suite 330, Ottawa, Ontario, K1N 5M3 URL <http://www.raic.org>
 - .58 sCC - Standards Council of Canada, 200 Albert Street, Suite 2000, Ottawa, Ontario K1P 6N7 URL <http://www.scc.ca>
 - .59 SSPC - The Society for Protective Coatings, 40 24th Street, Pittsburgh, Pennsylvania 15222-4656 URL <http://www.sspc.org>
 - .60 TPI - Truss Plate Institute, 583 D'Onofrio Drive, Suite 200, Madison, WI, U.S.A. 53719 URL <http://www.tpinst.org>
 - .61 TTMAC - Terrazzo, Tile and Marble Association of Canada, 30 Capston Gate, Unit 5 Concord, Ontario L4K 3E8 URL <http://www.ttmac.com>
 - .62 UL - Underwriters' Laboratories, 333 Pfingsten Road, Northbrook, Illinois, U.S.A. 60062 URL <http://www.ul.com>
 - .63 ULC - Underwriters' Laboratories of Canada, 7 Crouse Road, Toronto, Ontario M1R 3A9 URL <http://www.ulc.ca>
- .2 Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
- .1 NBCC – National Building Code of Canada
 - .2 NFCC – National Fire Code of Canada
 - .3 NFPA 101 - National Fire protection Association Life Safety Code

PART 2 **PRODUCTS (NOT USED)**

PART 3 **EXECUTION (NOT USED)**

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Requirements for temporary utilities.
 - .1 Sewers and Drainage.
 - .2 Water Service.
 - .3 Sanitary Facilities.
 - .4 Heating.
 - .5 Ventilation and Humidity Control.
 - .6 Electric Power Service.
 - .7 Lighting.
 - .8 Telephone Service.
 - .9 Electronic Communication Service.
 - .10 Computer Service.
 - .2 Types of items you will not find described in this Section:
 - .1 Temporary field offices and sheds.
 - .2 Work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- .1 General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Price unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's Representative, occupants of Project, testing agencies, and authorities having jurisdiction.
- .2 Sewer Service: If Contractor provides his own sewer hook-up, pay usage by all entities for construction operations.
- .3 Water Service: If Contractor provides his own water service hook-up, pay use charges for water used by all entities for construction operations.
- .4 Electric Power Service: If Contractor provides his own electric power service hook-up, pay electric power service use charges for electricity used by all entities for construction operations.

1.3 SUBMITTALS

- .1 Site Plan: For projects requiring onsite trailers or temporary utility hook-ups, show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.4 QUALITY ASSURANCE

- .1 Electric Service: Comply with National Electrical Code of Canada, CSA, and ULC standards and regulations for temporary electric service. Install service to comply with National Electrical Code of Canada.
- .2 Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- .1 Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS

2.1 EQUIPMENT

- .1 HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - .1 Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - .2 Heating Units: Listed and labelled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - .3 Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each re-turn-air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section *Closeout Procedures*.
- .2 Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- .1 Locate facilities to limit site disturbance as specified in Division 01 Section Summary.
- .2 Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- .1 General: Install temporary service or connect to existing service.
 - .1 Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- .2 Sewers and Drainage:
 - .1 Provide service of size and capacity needed for construction to remove effluent lawfully.
- .3 Water Service: Install water distribution piping in sizes and pressures adequate for construction.
 - .1 Provide water service of size and pressures adequate for construction.
- .4 Sanitary Facilities:
 - .1 Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- .5 Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- .6 Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for

protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

- .1 Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- .7 Electric Power Service: Provide electric power distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - .1 Provide electric power service of sufficient size, capacity, and power characteristics required for construction operations.
 - .1 Install electric power service overhead, unless otherwise indicated.
 - .8 Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - .1 Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- .9 Telephone Service:
 - .1 Provide all field office staff and superintendent with cellular telephone for use.
- .10 Electronic Communication Service:
 - .1 If Common-Use Site Office is provided, provide at least one computer work-station, with not less than the following:
 - .1 Processor: Latest high performance laptop or desktop computer.
 - .2 Memory: Not less than 8GB.
 - .3 Disk Storage: Not less than 500 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
 - .4 Display: 22" LCD monitor.
 - .5 Full-size keyboard and mouse.
 - .6 Internet access: High speed internet access or 3G turbo stick, or equivalent.

- .7 Operating System: Microsoft Windows Microsoft Windows Vista or 7 Business.
- .8 Productivity Software:
 - .1 Microsoft Office Professional, 2010 or higher, including Word, Excel, and Outlook.
 - .2 Adobe Reader 11.0 or higher.
 - .3 WinZip 17.0 or higher.
- .9 Printer: colour laser printer cable of printing 11 x 17" sheet size.
- .10 Scanner: desktop scanner cable of scanning letter size paper.
- .11 Internet Service: provide hardwired or wireless high-speed internet access, where available.

3.3 SUPPORT FACILITIES INSTALLATION

- .1 General: Comply with the following:
 - .1 Maintain support facilities until Owner's Representative schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- .2 Waste Disposal Facilities: Comply with requirements specified in Division 01 Section Construction Waste Management and Disposal.

3.4 OPERATION, TERMINATION, AND REMOVAL

- .1 Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- .2 Maintenance: Maintain facilities in good operating condition until removal.
 - 1 Maintain operation of temporary heating, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- .3 Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by

authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

- .1 Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
- .2 At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section Closeout Procedures.

END OF SECTION

PART 1 **GENERAL**

1.1 **SUMMARY**

- .1 Types of items described in this Section:
 - .1 Requirements for temporary field offices and sheds.
- .2 Types of items you will not find described in this Section:
 - .1 Temporary utilities.

1.2 **USAGE**

- .1 Make meeting room available to Owner's Representative when not immediately in use by Contractor.

1.3 **SUBMITTALS**

- .1 Site Plan: show temporary field offices and sheds, with other temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

PART 2 **PRODUCTS**

2.1 **TEMPORARY FACILITIES**

- .1 Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- .2 Common-Use Field Office; for all projects involving the construction of new buildings, and when otherwise required by the Contractor, provide common-use Field Office of sufficient size to accommodate needs of construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - .1 Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - .2 Conference room of sufficient size to accommodate meetings of 20 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 1.2-m- square tack and marker boards.
 - .3 Drinking water.
 - .4 Heating equipment necessary to maintain indoor temperature of 20 to 22 deg C.
 - .5 Lighting fixtures capable of maintaining average illumination of 215 lx at desk height.

6 Storage and Fabrication Sheds: for all projects involving the construction of new buildings and when required by the Contractor provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

- .1 Store combustible materials apart from building.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Locate field offices and sheds where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - .1 Locate field offices and sheds to limit site disturbance as specified in Division 01 Section *Summary*.
- .2 Provide field offices and sheds within ten days of Notice to Proceed. Do not remove until field offices and sheds are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SUPPORT FACILITIES INSTALLATION

- .1 General: Comply with the following:
 - .1 Provide field offices and sheds within construction area or within 9 m of building lines.
 - .2 Maintain field offices and sheds until Owner's Representative schedules Substantial Completion inspection. Remove before Substantial Completion.

Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

3.3 OPERATION, TERMINATION, AND REMOVAL

- .1 Maintenance: Maintain facilities in good operating condition until removal.
- .2 Termination and Removal: Remove each field office and shed when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with field offices and sheds. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - .1 At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section *Closeout Procedures*.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes requirements for:
 - .1 Lifts and Hoists
 - .2 Temporary Stairs
- .2 Types of items you will not find described in this Section:
 - .1 *Selective Demolition*: Chutes for construction waste.

1.2 PROJECT CONDITIONS

- .1 Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- .2 Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SUPPORT FACILITIES INSTALLATION

- .1 Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
- .2 Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

3.3 OPERATION, TERMINATION, AND REMOVAL

- .1 Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
- .1 Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
- 2 At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section Closeout Procedures.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes requirements for:
 - .1 Temporary Roads and Paved Areas.
 - .2 Temporary Use of Permanent Roads and Paved Areas.
 - .3 Traffic Controls.
 - .4 Parking.
- .2 Related Requirements:
 - .1 Division 32 Section *Asphalt Paving* for construction and maintenance of asphalt pavement for temporary roads and paved areas.
 - .2 Division 31 Section *Earth Moving*.

1.2 INFORMATIONAL SUBMITTALS

- .1 Site Plan: Show parking areas for construction personnel.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - .1 Locate facilities to limit site disturbance as specified in Division 01 Section *Summary*.
 - .2 Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SUPPORT FACILITIES INSTALLATION

- .1 General: Comply with the following:
 - .1 Maintain support facilities until Owner's Representative schedules Substantial Completion inspection. Remove before Substantial Completion.

Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

- 2 Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated and within construction limits indicated on Drawings.
 - .1 Provide dust-control treatment that is non-polluting and non-tracking. Reapply treatment as required to minimize dust.
- .3 Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 - .1 Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - .2 Prepare sub grade and install sub base and base for temporary roads and paved areas according to Division 31 Section *Earth Moving*.
 - .3 Recondition base after temporary use, including removing contaminated material, regrading, proof rolling, compacting, and testing.
 - .4 Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 31 Section *Asphalt Paving*.
- .4 Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - .1 Protect existing site improvements to remain including curbs, pavement, and utilities.
 - .2 Maintain access for fire-fighting equipment and access to fire hydrants.
- .5 Parking: Provide temporary as required.

3.3 OPERATION, TERMINATION, AND REMOVAL

- .1 Maintenance: Maintain facilities in good operating condition until removal.
- .2 Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by

authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

- .1 Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
- .2 Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
- .3 At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section Closeout Procedures.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes requirements for:
 - .1 Isolation of Work Areas in Occupied Facilities
 - .2 Protection of Existing Facilities
 - .3 Site Enclosure Fence
 - .4 Security Enclosure and Lockup
 - .5 Barricades, Warning Signs, and Lights
 - .6 Temporary Egress
 - .7 Covered Walkway
 - .8 Temporary Enclosures
 - .9 Temporary Partitions

1.2 INFORMATIONAL SUBMITTALS

- .1 Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - .1 Locations of dust-control partitions at each phase of work.
 - .2 HVAC system isolation schematic drawing.
 - .3 Location of proposed air-filtration system discharge.
 - .4 Waste handling procedures.
 - .5 Other dust-control measures.

1.3 QUALITY ASSURANCE

- .1 Accessible Temporary Egress: Provide barrier free accessible egress routes acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Chain-Link Fencing: Minimum 50-mm, 3.8 mm thick, galvanized-steel, chain-link fabric fencing; minimum 1.8 m high with

- galvanized-steel pipe posts; minimum 60 mm OD line posts and 73 mm OD corner and pull posts.
- .2 Portable Chain-Link Fencing: Minimum 50-mm, 3.8 mm thick, galvanized-steel, chain-link fabric fencing; minimum 1.8 m high with galvanized-steel pipe posts; minimum 60 mm OD line posts and 73 mm OD corner and pull posts, with 42 mm OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.
 - .3 Wood Enclosure Fence: Plywood, 2.4 m high, framed with four 50-by-100-mm rails, with wood posts spaced not more than 2.4 m apart.
 - .4 Polyethylene Sheet: Reinforced, fire-resistive sheet, 0.25 mm minimum thickness, to NFPA 701-99 Test 1.
 - .5 Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 914 by 1200 mm.
 - .6 Insulation: Unfaced mineral-fibre blanket, manufactured from slag wool, or rock wool;

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- .2 Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- .1 Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - .1 Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - .1 Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - .2 Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

- .2 Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
- .3 Perform daily construction cleanup and final cleanup using approved, HEPA- filter-equipped vacuum equipment.

.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- .1 It is not the intent of this article to prescribe specific measures. It is the contractor's responsibility to comply with all municipal, provincial and federal codes and regulations pertaining to the safety and security of the construction site, the construction personnel, and the public.
- .2 Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- .3 Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - .1 Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - .2 Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
 - .3 Construction: Construct enclosure fence from one of the following, unless otherwise noted.
 - .1 Chain link fence.
 - .2 Portable chain link fence.
 - .3 Wood enclosure fence.
 - .4 Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
 - .5 Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

- .6 Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- .7 Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
 - .1 Construct covered walkways using scaffold or shoring framing.
 - .2 Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 - .3 Paint and maintain appearance of walkway for duration of the Work.
 - .4 Locations: As required and in other locations that may be shown on drawings.
- 8 Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.
 - .1 Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- .9 Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
 - .1 Construct dustproof partitions in one of the following manners, unless otherwise indicated:
 - .1 With gypsum wallboard with joints taped.
 - .2 With two layers of 0.14-mm polyethylene sheet on each side. Cover floor with two layers of 0.14-mm polyethylene sheet, extending sheets 460 mm up the sidewalls. Overlap and tape full length of joints.
 - .2 Construct vestibule and airlock at each entrance through temporary partition with not less than 1219 mm between doors, if and where indicated.
 - .3 Where fire-resistance-rated temporary partitions are indicated or are required by authorities having

jurisdiction, construct partitions according to the rated assemblies.

- .4 Insulate partitions to control noise transmission to occupied areas.
- .5 Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
- .6 Protect air-handling equipment.
- .7 Provide walk-off mats at each entrance through temporary partition.

3.4 OPERATION, TERMINATION, AND REMOVAL

- .1 Maintenance: Maintain facilities in good operating condition until removal.
- .2 Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- .3 Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - .1 Materials and facilities that constitute temporary facilities are property of Contractor.
 - .2 At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section Closeout Procedures.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
 - .1 Dewatering Facilities and Drains
 - .2 Protection of Existing Facilities
 - .3 Environmental Protection
 - .4 Temporary Erosion and Sedimentation Control
 - .5 Stormwater Control
 - .6 Pest Control
 - .7 Temporary Fire Protection
 - .8 Moisture and Mould Control

1.2 INFORMATIONAL SUBMITTALS

- .1 Erosion- and Sedimentation-Control Plan: Show compliance with requirements of general building permit or authorities having jurisdiction, whichever is more stringent.
- .2 Fire-Safety Program: Show compliance with requirements of the National Fire Code of Canada and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- .3 Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - .1 Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - .2 Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - .3 Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

PART 2 PRODUCTS

2.1 EQUIPMENT

- .1 Fire Extinguishers: Portable, ULc rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - .1 Locate facilities to limit site disturbance as specified in Division 01 Section Summary.
- .2 Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SUPPORT FACILITIES INSTALLATION

- .1 General: Comply with the following:
 - .1 Maintain support facilities until Owner Representative's schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- .2 Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - .1 Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - .2 Remove snow and ice as required to minimize accumulations.

3.3 PROTECTION FACILITIES INSTALLATION

- .1 Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- .2 Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - .1 Comply with work restrictions specified in Division 01 Section Summary.
- .3 Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and

airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, if provided, and requirements of general building permit or authorities having jurisdiction, whichever is more stringent.

- .1 Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
- .2 Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- .3 Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
- .4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal
- . 4 Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and sub-grade construction to prevent flooding by runoff of stormwater from heavy rains.
- .5 Pest Control: Engage an experienced, licensed exterminator to:
 - .1 Recommend practices to minimize attraction and harbouring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
 - .2 Make final inspection and rid Project of rodents, insects, and other pests if pest problems are suspected by the Owner's Representative. Prepare a report.
- .6 Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with National Fire Code of Canada.
 - .1 Prohibit smoking on construction site.
 - .2 Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - .3 Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - .4 Provide temporary standpipes and hoses for fire protection as required. Hang hoses with a warning sign stating that hoses are for

fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.4 MOISTURE AND MOULD CONTROL

- .1 Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mould that may appear during construction.
- .2 Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mould spores, protect as follows:
 - .1 Protect porous materials from water damage.
 - .2 Protect stored and installed material from flowing or standing water.
 - .3 Keep porous and organic materials from coming into prolonged contact with concrete.
 - .4 Remove standing water from decks.
 - .5 Keep deck openings covered or dammed.
- .3 Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mould spores, protect as follows:
 - .1 Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - .2 Keep interior spaces reasonably clean and protected from water damage.
 - .3 Periodically collect and remove waste containing cellulose or other organic matter.
 - .4 Discard or replace water-damaged material.
 - .5 Do not install material that is wet.
 - .6 Discard, replace, or clean stored or installed material that begins to grow mould.
 - .7 Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- .4 Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

- .1 Control moisture and humidity inside building by maintaining effective dry-in conditions.
- .2 Use permanent HVAC system to control humidity.
- .3 Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - .1 Hygroscopic materials that may support mould growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - .2 Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - .3 Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 This Section includes administrative and procedural requirements for selection of products for use in Project, including:
 - .1 Compatibility of Options.
 - .2 Delivery and handling.
 - .3 Storage.
 - .4 Product warranties.
 - .5 Comparable products.
 - .6 Fasteners.
- .2 Types of items you will not find described in this Section:
 - .1 Products selected under an allowance.
 - .2 Procedures for requests for substitutions.
 - .3 Applicable industry standards for products specified.

1.2 DEFINITIONS

- .1 Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term product includes the terms material, equipment, system, and terms of similar intent.
 - .1 Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - .2 New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - .3 Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- .2 Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words basis-of-design product, including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating

comparable products of additional manufacturers named in the specification.

1.3 SUBMITTALS

- .1 Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - .1 Include data to indicate compliance with the requirements specified in Comparable Products Article.
 - .2 Owner's Representative's Action: If necessary, Owner's Representative will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Owner's Representative will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - .1 Form of Approval: As specified in Division 01 Section Submittal Procedures.
 - .2 Use product specified if Owner's Representative does not issue a decision on use of a comparable product request within time allocated.
 - .2 Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section Submittal Procedures. Show compliance with requirements.

1.4 QUALITY ASSURANCE

- .1 Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- .2 Delivery and Handling:
 - .1 Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

- .2 Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - .3 Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - .4 Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- .3 Storage:
- 1 Store products to allow for inspection and measurement of quantity or counting of units.
 - .2 Store materials in a manner that will not endanger Project structure.
 - .3 Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
 - .4 Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - .5 Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - .6 Protect stored products from damage and liquids from freezing.
 - .7 Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

- .1 Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - .1 Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - .2 Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- .2 Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

- .1 Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - .2 Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - .3 Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.
- .3 Submittal Time: Comply with requirements in Division 01 Section Closeout Procedures.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- .1 General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - .1 Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2 Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - .3 Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - .4 Where products are accompanied by the term as selected, Owner's Representative will make selection.
 - .5 Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - .6 Or Equal: For products specified by name and accompanied by the term or equal, equivalent, approved equivalent, or approved equal, or approved, comply with requirements in Comparable Products Article to obtain approval for use of an unnamed product.
- .2 Product Selection Procedures:
 - .1 Product: Where Specifications name a single manufacturer and product, provide the named product that complies with

- requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
- .2 Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
- .3 Products:
- .1 Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience may be considered at the sole discretion of the Owner's Representative.
- .2 Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in Comparable Products Article for consideration of an unnamed product.
- .4 Manufacturers:
- .1 Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience may be considered at the sole discretion of the Owner's Representative.
- .2 Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in Comparable Products Article for consideration of an unnamed manufacturer's product.
- 5 Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in Comparable Products Article for

consideration of an unnamed product by one of the other named manufacturers.

- .3 Visual Matching Specification: Where Specifications require match Owner's Representative's sample, provide a product that complies with requirements and matches Owner's Representative's sample. Owner's Representative's decision will be final on whether a proposed product matches.
 - .1 If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section Substitution Procedures for proposal of product.
- .4 Visual Selection Specification: Where Specifications include the phrase as selected by Owner's Representative from manufacturer's full range or similar phrase, select a product that complies with requirements. Owner's Representative will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- .1 Conditions for Consideration: Owner's Representative will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Owner's Representative may return requests without action, except to record noncompliance with these requirements:
 - .1 Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - .2 Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - .3 Evidence that proposed product provides specified warranty.
 - .4 List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - .5 Samples, if requested.

2.3 FASTENERS - GENERAL

- .1 Provide metal fasteners and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

- .2 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- 3 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

2.4 FASTENERS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers fabricated from stainless steel.

PART 3 EXECUTION

3.1 FASTENINGS

- .1 Prevent electrolytic action between dissimilar metals and materials.
- .2 Space fasteners within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .3 Keep exposed fasteners to a minimum, space evenly and install neatly.
- .4 Equipment fasteners: Bolts may not project more than one diameter beyond nuts.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 General administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - .1 Construction layout.
 - .2 Field engineering and surveying.
 - .2 Types of items you will not find described in this Section:
 - .1 Procedures for submitting surveys.
 - .2 Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 SUBMITTALS

- .1 For projects involving site work submit
 - .1 Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
 - .2 Certified Surveys: Submit three copies signed by land surveyor.
 - .3 Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

- .1 Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 CONSTRUCTION LAYOUT

- .1 Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey

and existing benchmarks. If discrepancies are discovered, notify Owner's Representative promptly.

- .2 General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1 Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - .2 Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - .3 Inform installers of lines and levels to which they must comply.
 - .4 Check the location, level and plumb, of every major element as the Work progresses.
 - .5 Notify Owner's Representative when deviations from required lines and levels exceed allowable tolerances.
 - .6 Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- .3 Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- .4 Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- .5 Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Owner's Representative.

3.2

FIELD ENGINEERING

- .1 Identification: Owner will identify existing benchmarks, control points, and property corners.
- .2 Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - .1 Do not change or relocate existing benchmarks or control points without prior written approval of Owner's Representative. Report lost or destroyed permanent benchmarks or control points promptly.

- Report the need to relocate permanent benchmarks or control points to Owner's Representative before proceeding.
- .2 Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
 - .3 Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - .1 Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - .2 Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work
 - 3 Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
 - .4 Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.
 - .5 Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metres, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - .1 Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 General administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - .1 Installation of the Work.
 - .2 Coordination of Owner-installed products.
 - .3 Protection of installed construction.
 - .4 Correction of the Work.

1.2 QUALITY ASSURANCE

- .1 Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.3 WARRANTY

- .1 Existing Warranties: repair materials and surfaces cut or damaged during installation by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - .1 Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - .2 Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- .2 Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and

conditions, with Installer or Applicator pre- sent where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

- .1 Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- .2 Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
- .3 Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
- .4 Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- .1 Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- .2 Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- .3 Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- .4 Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Owner's Representative according to requirements in Division 01 Section Project Management and Coordination.

3.3 INSTALLATION

- .1 General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - .1 Make vertical work plumb and make horizontal work level.
 - .2 Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

- .3 Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- .4 Maintain minimum headroom clearance of 2440 mm in occupied spaces and 2300 mm in unoccupied spaces, unless otherwise indicated.
- .2 Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- .3 Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion
- 4 Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- .5 Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- .6 Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- .7 Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - .1 Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner's Representative.
 - .2 Allow for building movement, including thermal expansion and contraction.
 - .3 Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- .8 Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- .9 Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 OWNER-INSTALLED PRODUCTS

- .1 Site Access: Provide access to Project site for Owner's construction personnel.
- .2 Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - .1 Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - .2 Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- .1 Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- .2 Comply with manufacturer's written instructions for temperature and relative humidity.

3.6 CORRECTION OF THE WORK

- .1 Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - .1 Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- .2 Restore permanent facilities used during construction to their specified condition.
- .3 Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- .4 Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- .5 Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes general administrative and procedural requirements governing cutting and patching.
- .2 This Section does not include:
 - .1 Patching penetrations in fire-rated construction.

1.2 DEFINITIONS

- .1 Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- .2 Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 INFORMATIONAL SUBMITTALS

- .1 Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - .1 Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - .2 Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - .3 Products: List products to be used for patching and firms or entities that will perform patching work.
 - .4 Dates: Indicate when cutting and patching will be performed.
 - .5 Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - .1 Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.4 QUALITY ASSURANCE

- .1 Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

- .1 Structural Elements: When cutting and patching structural elements, notify Owner's Representative of locations and details of cutting and await directions from Owner's Representative before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
- .2 Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - .1 Primary operational systems and equipment.
 - .2 Fire separation assemblies.
 - .3 Air or smoke barriers.
 - .4 Fire-suppression systems.
 - .5 Mechanical systems piping and ducts.
 - .6 Control systems.
 - .7 Communication systems.
 - .8 Fire-detection and -alarm systems.
 - .9 Conveying systems.
 - .10 Electrical wiring systems.
 - .11 Operating systems of special construction.
- .3 Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - .1 Water, moisture, or vapour barriers.
 - .2 Membranes and flashings.
 - .3 Exterior curtain-wall construction.
 - .4 Sprayed fire-resistive material.
 - .5 Equipment supports.

- .6 Piping, ductwork, vessels, and equipment.
- .7 Noise- and vibration-control elements and systems.
- .4 Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Owner's Representative's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- .2 Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- .3 Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 General: Comply with requirements specified in other Sections.
- .2 In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - .1 If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Owner's Representative for the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

- .1 Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - .1 Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- .2 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching

- operations, by methods and with materials so as not to void existing warranties.
- .3 Temporary Support: Provide temporary support of work to be cut.
 - .4 Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
 - .5 Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section Summary.
 - .6 Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
 - .7 Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1 In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - .2 Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - .3 Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - .4 Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - .5 Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - .6 Proceed with patching after construction operations requiring cutting are complete.
 - .8 Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide

materials and comply with installation requirements specified in other Sections, where applicable.

- .1 Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
- .2 Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - .1 Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - .2 Restore damaged pipe covering to its original condition.
- .3 Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, colour, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.
 - .1 Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
- .4 Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- .5 Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- .9 Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces

3.2 PROTECTION OF INSTALLED CONSTRUCTION

- .1 Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- .2 Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 This Section includes requirements for progress cleaning of the Project site.
- .2 Types of items you will not find described in this Section:
 - .1 Final cleaning.
 - .2 Construction waste management and disposal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 PROGRESS CLEANING

- .1 General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - .1 Comply with requirements in National Building Code of Canada for removal of combustible waste materials and debris.
 - .2 Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 27 deg C.
 - .3 Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - .1 Utilize containers intended for holding waste materials of type to be stored.
 - .4 Coordinate progress cleaning for joint-use areas where more than one installer has worked.
- .2 Site: Maintain Project site free of waste materials and debris.
- .3 Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - .1 Remove liquid spills promptly.
 - .2 Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- .4 Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of

- product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- 5 Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
 - .6 Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
 - .7 Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section Construction Waste Management and Disposal.
 - .8 During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
 - .9 Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
 - .10 Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Requirement to carry out work placing maximum emphasis on the areas of:
 - .1 Waste reduction;
 - .2 Diversion of waste from landfill; and
 - .3 Material Recycling.
 - .2 Types of items you will not find described in this Section:
 - .1 Environment Procedures.

1.2 WASTE MANAGEMENT PLAN

- .1 Prior to commencement of work, prepare Waste Management Workplan.
- .2 Workplan to include:
 - .1 Waste audit.
 - .2 Waste reduction practices.
 - .3 Material source separation process.
 - .4 Procedures for sending recyclables to recycling facilities.
 - .5 Procedures for sending non-salvageable items and waste to approved waste processing facility or landfill site.
 - .6 Training and supervising workforce on waste management at site.
- .3 Workplan to incorporate waste management requirements specified herein and in other sections of the Specifications.
- .4 Develop Workplan in collaboration with all subcontractors to ensure all waste management issues and opportunities are addressed.
- .5 Implement and manage all aspects of Waste Management Workplan for duration of work.
- .6 Revise Plan as work progresses addressing new opportunities for diversion of waste from landfill.

1.3 WASTE AUDIT

- .1 At project start-up, conduct waste audit of:

- .1 Site conditions identifying salvageable and non-salvageable items and waste resulting from demolition and removal work.
- 2 Projected waste resulting from product packaging and from material leftover after installation work.
- .2 Develop written list. Record type, composition, and quantity of various salvageable items and waste anticipated reasons for waste generation and operational factors which contribute to waste.

1.4 WASTE REDUCTION

- .1 Based on waste audit, develop waste reduction program.
- .2 Structure program to prioritize actions, with waste reduction as first priority, followed by salvage and recycling effort, then disposal as solid waste.
- .3 Identify materials and equipment to be:
 - .1 Protected and turned over to Owner's Representative when indicated.
 - .2 Salvaged for resale by Contractor.
 - .3 Sent to recycling facility.
 - .4 Sent to waste processing/landfill site for their recycling effort
 - .5 Disposed of in approved landfill site.
- .4 Reduce construction waste during installation work. Undertake practices which will minimize waste and optimize full use of new materials on site, such as:
 - .1 Use of a central cutting area to allow for easy access to off-cuts;
 - .2 Use of off-cuts for blocking and bridging elsewhere.
 - .3 Use of effective and strategically placed facilities on site for storage and staging of left-over or partially cut materials (such as gypsum board, plywood, ceiling tiles, insulation etc...) to allow for easy incorporation into work whenever possible avoiding unnecessary waste.
- .5 Develop other strategies and innovative procedures to reduce waste such as minimizing the extent of packaging used for delivery of materials to site etc...

1.5 MATERIAL SOURCE SEPARATION PROCESS

- .1 Develop and implement material source separation process at commencement of work as part of mobilization and waste management at site.

- .2 Provide on-site facilities to collect, handle and store anticipated quantities of reusable, salvageable, and recyclable materials.
 - .1 Use suitable containers for individual collection of items based on intended purpose.
 - .2 Locate to facilitate deposit but without hindering daily operations of existing building tenants.
 - .3 Clearly mark containers and stockpiles as to purpose and use
- 3 Perform demolition and removal of existing building components and equipment following a systematic deconstruction process.
 - .1 Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:
 - .1 Reinstallation into the work where indicated.
 - .2 Salvaging reusable items not needed in project which Contractor may sell to other parties. Sale of such items not permitted on site.
 - .3 Sending as many items as possible to locally available recycling facility.
 - .4 Segregating remaining waste and debris into various individual waste categories for disposal in a non-mixed state as recommended by waste processing/landfill sites.
 - .4 Isolate product packaging and delivery containers from general waste stream. Send to recycling facility or return to supplier/manufacturer.
 - .5 Send leftover material resulting from installation work for recycling whenever possible.
 - .6 Establish methods whereby hazardous and toxic waste materials, and their containers, encountered or used in the course work are properly isolated, stored on site and disposed in accordance with applicable laws and regulations from authorities having jurisdiction.
 - .7 Isolate and store existing materials and equipment identified for re-incorporation into the Work. Protect against damage.

1.6

WORKER TRAINING AND SUPERVISION

- .1 Provide adequate training to workforce, through meetings and demonstrations, to emphasize purpose and worker responsibilities in carrying out the Waste Management Plan.
- .2 Waste Management Coordinator: designate full-time person on site, experienced in waste management and having knowledge of the purpose and content of Waste Management Plan to:
 - .1 Oversee and supervise waste management during work.
 - .2 Provide instructions and directions to all workers and subcontractors on waste reduction, source separation and disposal practices.
- .3 Post a copy of Plan in a prominent location on site for review by workers.

1.7 CERTIFICATION OF MATERIAL DIVERSION

- .1 Submit to Owner's Representative, copies of certified weigh bills from authorized waste processing sites and sale receipts from recycling/reuse facilities confirming receipt of building materials and quantity of waste diverted from landfill.
- .2 Submit data at pre-determined project milestones as determined by Owner's Representative.
- .3 Compare actual quantities diverted from landfill with projections made during waste audit.

1.8 DISPOSAL REQUIREMENTS

- .1 Burying or burning of rubbish and waste materials is prohibited.
- .2 Disposal of waste, volatile materials, mineral spirits, oil, or paint thinner into waterways, storm, or sanitary sewers is prohibited.
- .3 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.
- .4 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such banned materials at site of work and dispose in strict accordance with provincial and municipal regulations.
- .5 Transport waste intended for landfill in separated condition, following rules and recommendations of Landfill Operator in support of their effort to divert, recycle and reduce amount of solid waste placed in landfill.
- .6 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.

- .7 Sale of salvaged items by Contractor to other parties not permitted on site.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes administrative and procedural requirements for final cleaning.
- .2 Types of items you will not find described in this Section:
 - .1 Construction waste management and disposal.
 - .2 Progress cleaning of project site.
 - .3 Closeout procedures.
 - .4 Pest control.

1.2 SUBSTANTIAL COMPLETION

- .1 Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete final cleaning requirements.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - .1 Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 EXECUTION

3.1 FINAL CLEANING

- .1 General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- .2 Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

- .1 Complete the following cleaning operations, as applicable to the project, before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - 1 Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - .2 Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - .3 Rake grounds that are neither planted nor paved to a smooth, even- textured surface.
 - .4 Remove tools, construction equipment, machinery, and surplus material from Project site.
 - .5 Remove snow and ice to provide safe access to building.
 - .6 Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - .7 Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - .8 Sweep concrete floors broom clean in unoccupied spaces.
 - .9 Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - .10 Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision- obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - .11 Remove labels that are not permanent.
 - .12 Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

- .1 Do not paint over ULC and other required labels and identification, including mechanical and electrical nameplates.
- .13 Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- .14 Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
- .15 Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- .16 Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- .17 Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
 - . 1 Clean HVAC system in compliance with NADCA Standard ACR 2006. Provide written report upon completion of cleaning upon request.
- .18 Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- .19 Leave Project clean and ready for occupancy.
- .3 Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section Construction Waste Management and Disposal.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes administrative and procedural requirements for starting and adjusting equipment installed under the Contract.

1.2 QUALITY ASSURANCE

- .1 Manufacturer's Start-up Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for starting and adjusting equipment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 STARTING AND ADJUSTING

- .1 Coordinate start-up and adjusting of equipment and operating components with requirements in Division 01 Section General Commissioning Requirements.
- .2 Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- .3 Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- .4 Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- .5 Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section Quality Requirements.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - .1 Substantial Completion procedures.
 - .2 Final Completion procedures.
 - .3 Warranties.
 - .4 Repair of the Work.
 - .2 Types of items you will not find described in this Section:
 - .1 Requirement to switch out Superintendent at Substantial Completion.
 - .2 Final cleaning.
 - .3 Operation and maintenance manual requirements.
 - .4 Spare parts, maintenance materials, and special tools.
 - .5 Submitting record drawings, record specifications, and record product data.
 - .6 Requirements for instructing Owner's personnel.
 - .7 Divisions 02 through 49 sections for specific closeout and special cleaning requirements for the work in those Sections.
 - .8 Pest control.

1.2 SUBSTANTIAL COMPLETION

- .1 Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
 - .1 Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - .1 The Quality Manager shall sign the list certifying that the Quality Manager has personally reviewed the work, agrees the list is comprehensive, and is in agreement with the list.

- .2 Advise Owner of pending insurance changeover requirements.
- .3 Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
- .4 Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- .5 Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
- .6 Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
- .7 Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
- .8 Complete start-up testing of systems.
- .9 Submit test/adjust/balance records.
- .10 Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
- 11 Advise Owner of changeover in heat and other utilities.
- .12 Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- .13 Complete final cleaning requirements, including touchup painting.
- .14 Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- .15 Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

.16 Complete commissioning.

.2 Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner's Representative will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Owner's Representative that must be completed or corrected before certificate will be issued.

.1 Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

.2 Results of completed inspection will form the basis of requirements for final completion.

1.3 FINAL COMPLETION

.1 Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

.1 Submit a final Application for Payment according to Division 01 Section Payment Procedures.

.2 Submit certified copy of Owner's Representative's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner's Representative. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

.1 Have Quality Manager provide certification.

.2 Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner's Representative will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

.1 Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

.1 Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

- .1 Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
- .2 Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
- 3 Include the following information at the top of each page:
 - .1 Project name.
 - .2 Date.
 - .3 Name of Owner's Representative.
 - .4 Name of Contractor.
 - .5 Page number.
- .4 Submit list of incomplete items in the following format:
 - .1 MS Excel electronic file. Owner's Representative will return annotated file.

1.5 WARRANTIES

- .1 Submittal Time: Submit written warranties on request of Owner's Representative for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- .2 Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - .1 Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch 215-by-280-mm paper.
 - .2 Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - .3 Identify each binder on the front and spine with the typed or printed title WARRANTIES, Project name, and name of Contractor.
- .3 Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 REPAIR OF THE WORK

- .1 Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- .2 Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - .1 Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - .2 Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
 - 1 Do not paint over "ULc" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
- .3 Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
- .4 Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapour fixtures to comply with requirements for new fixtures.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 71 00 - Examination and Preparation.
- .4 Section 01 71 23 - Field Engineering
- .5 Section 01 77 00 - Closeout Procedures
- .6 Section 01 78 23 - Operation and Maintenance Data
- .7 Section 01 78 39 - Project Record Documents
- .8 Section 01 78 43 - Spare Parts, Maintenance Materials & Special Tools
- .9 Section 01 91 13 - General Commissioning (Cx) Requirements.

1.2 **SUBMISSIONS, FORMAT AND CONTENT**

- .1 Refer to the following specification sections for information related to closeout submissions:
 - .1 Section 01 77 00 – Closeout Procedures
 - .2 Section 01 78 23 - Operation and Maintenance Data
 - .3 Section 01 78 39 - Project Record Documents
 - .4 Section 01 78 43 - Spare Parts, Maintenance Materials & Special Tools

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - .1 Operation and maintenance documentation directory.
 - .2 Operation manuals for systems, subsystems, and equipment.
 - .3 Product maintenance manuals.
 - .4 Systems and equipment maintenance manuals.
- .2 This Section does not include:
 - .1 Procedures for submitting copies of submittals for operation and maintenance manuals.
 - .2 General commissioning requirements for verification and compilation of data in- to operation and maintenance manuals.

1.2 DEFINITIONS

- .1 System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- .2 Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

- .1 Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit re- viewed manual content formatted and organized as required by this Section.
 - .1 Owner's Representative will comment on whether content of operations and maintenance submittals are acceptable.
 - .2 Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- .2 Format: Submit operations and maintenance manuals in the following format:
 - .1 PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Owner's Representative.
 - .1 Name each indexed document file in composite electronic index with applicable item name. Include a

complete electronically linked operation and maintenance directory.

- .2 Enable inserted reviewer comments on draft submittals.
- .2 Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Owner's Representative will return two copies.
- 3 Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Owner's Representative will comment on whether general scope and content of manual are acceptable.
- .4 Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Owner's Representative will return copy with comments.
 - .1 Correct or revise each manual to comply with Owner's Representative's comments. Submit copies of each corrected manual within 15 days of receipt of Owner's Representative's comments and prior to commencing demonstration and training.

PART 2 PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- .1 Directory: Prepare a single, comprehensive directory of operation and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - .1 List of documents.
 - .2 List of systems.
 - .3 List of equipment.
 - .4 Table of contents.
- .2 List of Systems and Subsystems: List systems by specification section. Include references to operation and maintenance manuals that contain information about each system.
- .3 List of Equipment: List equipment for each system, organized by specification section. For pieces of equipment not part of system, list by specification section in separate list.

- .4 Tables of Contents: Include a table of contents for each operation and maintenance manual.
- .5 Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, Preparation of Operating and Maintenance Documentation for Building Systems.

2.2 MANUALS

REQUIREMENTS FOR OPERATION AND MAINTENANCE

- .1 Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - .1 Title page.
 - .2 Table of contents.
 - .3 Manual contents.
- .2 Title Page: Include the following information:
 - .1 Subject matter included in manual.
 - .2 Name and address of Project.
 - .3 Name and address of Owner.
 - .4 Date of submittal.
 - .5 Name and contact information for Contractor.
 - .6 Name and contact information for Owner's Representative.
 - .7 Name and contact information for Architect.
 - .8 Name and contact information for Commissioning Authority.
 - .9 Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - .10 Cross-reference to related systems in other operation and maintenance manuals.
- .3 Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - .1 If operation or maintenance documentation requires more than one volume to accommodate data, include

comprehensive table of contents for all volumes in each volume of the set.

- .4 Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for sub-systems, equipment, and components of one system into a single binder.
- .5 Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - .1 Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - .2 File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- .6 Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 - .1 Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch 215-by-280 mm paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - .1 If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - .2 Identify each binder on front and spine, with printed title OPERATION AND MAINTENANCE MANUAL, Project title or name, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

- .2 Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
- .3 Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
- .4 Supplementary Text: Prepared on 8-1/2-by-11-inch 215-by-280 mm white bond paper.
- .5 Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - .1 If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - .2 If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

- .1 Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - .1 System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - .2 Performance and design criteria if Contractor has delegated design responsibility.
 - .3 Operating standards.
 - .4 Operating procedures.
 - .5 Operating logs.
 - .6 Wiring diagrams.

- .7 Control diagrams.
- .8 Piped system diagrams.
- .9 Precautions against improper use.
- .10 License requirements including inspection and renewal dates.
- .2 Descriptions: Include the following:
 - 1 Product name and model number. Use designations for products indicated on Contract Documents.
 - .2 Manufacturer's name.
 - .3 Equipment identification with serial number of each component.
 - .4 Equipment function.
 - .5 Operating characteristics.
 - .6 Limiting conditions.
 - .7 Performance curves.
 - .8 Engineering data and tests.
 - .9 Complete nomenclature and number of replacement parts.
- .3 Operating Procedures: Include the following, as applicable:
 - .1 Startup procedures.
 - .2 Equipment or system break-in procedures.
 - .3 Routine and normal operating instructions.
 - .4 Regulation and control procedures.
 - .5 Instructions on stopping.
 - .6 Normal shutdown instructions.
 - .7 Seasonal and weekend operating instructions.
 - .8 Required sequences for electric or electronic systems.
 - .9 Special operating instructions and procedures.
- .4 Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- .5 Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

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

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

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

- .2 Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- .6 Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- .7 Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- .8 Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
- .1 Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION

3.1 MANUAL PREPARATION

- .1 Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to operation, and maintenance manuals.
- .2 Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- .3 Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - .1 Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - .2 Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- .4 Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

- .1 Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- .5 Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - .1 Do not use original project record documents as part of operation and maintenance manuals.
 - .2 Comply with requirements of newly prepared record Drawings in Division 01 Section Project Record Documents.
- .6 Comply with Division 01 Section Closeout Procedures for schedule for submitting operation and maintenance documentation.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section includes administrative and procedural requirements for project record documents, including the following:
 - .1 Record Drawings.
 - .2 Record Specifications.
 - .3 Record Product Data.
 - .4 Miscellaneous record submittals.
- .2 This Section does not include:
 - .1 Final property survey.
 - .2 General closeout procedures.
 - .3 Operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- .1 Record Drawings: Comply with the following:
 - .1 Number of Copies: Submit copies of record Drawings as follows:
 - .1 Initial Submittal:
 - .1 Submit PDF electronic files of scanned record prints and one of file prints.
 - .2 Owner's Representative will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - .2 Final Submittal:
 - .1 Submit PDF electronic files of scanned record prints and three set(s) of prints.
 - .2 Print each drawing, whether or not changes and additional in-formation were recorded.
 - .2 Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
 - .3 Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

- .1 Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- .4 Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

ART 2 PRODUCTS

2.1 RECORD DRAWINGS

- .1 Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - .1 Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - .1 Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - .2 Accurately record information in an acceptable drawing technique.
 - .3 Record data as soon as possible after obtaining it.
 - .4 Record and check the markup before enclosing concealed installations.
 - .5 Cross-reference record prints to corresponding archive photographic documentation.
 - .2 Content: Types of items requiring marking include, but are not limited to, the following:
 - .1 Dimensional changes to Drawings.

- .2 Revisions to details shown on Drawings.
- .3 Depths of foundations below first floor.
- .4 Locations and depths of underground utilities.
- .5 Revisions to routing of piping and conduits.
- .6 Revisions to electrical circuitry.
- .7 Actual equipment locations.
- .8 Duct size and routing.
- .9 Locations of concealed internal utilities.
- .10 Changes made by Change Order or directive.
- .11 Changes made following Owner's Representative's written orders.
- .12 Details not on the original Contract Drawings.
- .13 Field records for variable and concealed conditions.
- .14 Record information on the Work that is shown only schematically.
- .3 Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
- .4 Mark record sets with erasable, red-colour pencil. Use other colours to distinguish between changes for different categories of the Work at same location.
- .5 Mark important additional information that was either shown schematically or omitted from original Drawings.
- .6 Note Change Order numbers, and similar identification, where applicable.

2.2

RECORD SPECIFICATIONS

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

2.3 RECORD PRODUCT DATA

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

2.4 MISCELLANEOUS RECORD SUBMITTALS

- .1 Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 EXECUTION

3.1 RECORDING AND MAINTENANCE

- .1 Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- .2 Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Owner's Representative's reference during normal working hours.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 This Section describes administrative and procedural requirements for spare parts, maintenance materials, and special tools.
- .2 Types of items you will not find described in this Section:
 - .1 Operation and maintenance data.

1.2 QUALITY ASSURANCE

- .1 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .2 Furnish evidence, if requested, for type, source and quality of products provided.
- .3 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

1.3 STORAGE, HANDLING AND PROTECTION

- .1 Deliver to location as directed; place and store.
- .2 Receive and catalogue items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.
- .3 Obtain receipt for delivered items and submit prior to final payment.
- .4 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .5 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .6 Store components subject to damage from weather in weatherproof enclosures.
- .7 Store paints and freezable materials in a heated and ventilated room.
- .8 Remove and replace damaged products at own expense and to satisfaction of Owner's Representative.

PART 2 PRODUCTS

2.1 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.

2.2 MAINTENANCE 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.

2.3 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Administrative and procedural requirements for instructing Owner's personnel, including the following:
 - .1 Demonstration of operation of systems, subsystems, and equipment.
 - .2 Training in operation and maintenance of systems, subsystems, and equipment.
 - .2 Types of items you will not find described in this Section:
 - .1 Demonstration and training video recordings.
 - .2 Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

- .1 Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- .2 Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 QUALITY ASSURANCE

- .1 Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section Quality Requirements, experienced in operation and maintenance procedures and training.
- .2 Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section Project Management and Coordination. Review methods and procedures

related to demonstration and training including, but not limited to, the following:

- .1 Inspect and discuss locations and other facilities required for instruction.
- .2 Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
- 3 Review required content of instruction.
- .4 For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- .1 Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- .2 Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- .3 Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Owner's Representative.

PART 2 PRODUCTS

2.1 INSTRUCTION PROGRAM

- .1 Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- .2 Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - .1 Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - .1 System, subsystem, and equipment descriptions.

- .2 Performance and design criteria if Contractor is delegated design responsibility.
- .3 Operating standards.
- .4 Regulatory requirements.
- .5 Equipment function.
- .6 Operating characteristics.
- .7 Limiting conditions.
- .8 Performance curves.
- .2 Documentation: Review the following items in detail:
 - .1 Emergency manuals.
 - .2 Operations manuals.
 - .3 Maintenance manuals.
 - .4 Project record documents.
 - .5 Identification systems.
 - .6 Warranties and bonds.
 - .7 Maintenance service agreements and similar continuing commitments.
- .3 Emergencies: Include the following, as applicable:
 - .1 Instructions on meaning of warnings, trouble indications, and error messages.
 - .2 Instructions on stopping.
 - .3 Shutdown instructions for each type of emergency.
 - .4 Operating instructions for conditions outside of normal operating limits.
 - .5 Sequences for electric or electronic systems.
 - .6 Special operating instructions and procedures.
- .4 Operations: Include the following, as applicable:
 - .1 Startup procedures.

- .2 Equipment or system break-in procedures.
- .3 Routine and normal operating instructions.
- .4 Regulation and control procedures.
- .5 Control sequences.
- .6 Safety procedures.
- .7 Instructions on stopping.
- .8 Normal shutdown instructions.
- .9 Operating procedures for emergencies.
- .10 Operating procedures for system, subsystem, or equipment failure.
- .11 Seasonal and weekend operating instructions.
- .12 Required sequences for electric or electronic systems.
- .13 Special operating instructions and procedures.
- .5 Adjustments: Include the following:
 - .1 Alignments.
 - .2 Checking adjustments.
 - .3 Noise and vibration adjustments.
 - .4 Economy and efficiency adjustments.
- .6 Troubleshooting: Include the following:
 - .1 Diagnostic instructions.
 - .2 Test and inspection procedures.
- .7 Maintenance: Include the following:
 - .1 Inspection procedures.
 - .2 Types of cleaning agents to be used and methods of cleaning.
 - .3 List of cleaning agents and methods of cleaning detrimental to product.

- .4 Procedures for routine cleaning
- .5 Procedures for preventive maintenance.
- 6 Procedures for routine maintenance.
- .7 Instruction on use of special tools.
- .8 Repairs: Include the following:
 - .1 Diagnosis instructions.
 - .2 Repair instructions.
 - .3 Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - .4 Instructions for identifying parts and components.
 - .5 Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.1 PREPARATION

- .1 Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section Operations and Maintenance Data.
- .2 Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- .1 Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - .1 Owner will furnish Contractor with names and positions of participants.
- .2 Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - .1 Schedule training with Owner, through Owner's Representative, with at least seven days' advance notice.

- .3 Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

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

1.2 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed by the Contractor 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 O&M Manual.
 - .3 Effectively train O&M staff.

- .2 Contractor leads the Cx process, operating equipment and systems, troubleshooting and making adjustments as required. Documented Record of Commissioning and issues to be reported to Consultant and Owner.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be operated interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 COMMISSIONING (CX) OVERVIEW

- .1 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.
- .2 The General Contractor is to provide a qualified Site Commissioning Coordinator to direct, execute, coordinate and document all Commissioning Activities as indicated. General Contractor may hire a 3rd party Commissioning Agent if they wish, however this is not required.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 Cx is conducted in concert with activities performed during each 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 include transfer of critical knowledge to facility operational personnel.
- .6 Consultant will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Consultant and Owner.
 - .2 Equipment, components and systems have been commissioned by Contractor.

- .3 O&M training has been completed by Contractor.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by Consultant or Owner, 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 Consultant.
 - .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.
 - .2 Develop and maintain Cx Schedule and Cx Plan.
- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, and systems are 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 Consultant and/or Owner.
- .7 Have Cx schedules up-to-date.
- .8 Ensure systems have been cleaned thoroughly. Ensure all Consultant's deficiencies and punchlists have been signed-off and verified by Consultant.
- .9 Complete TAB procedures on systems; submit TAB reports to Consultant and/or Owner for review and approval.
- .10 Ensure "As-Built" system schematics are available.
- .11 Ensure O&M manuals are complete and available on-site.
- .4 Inform Consultant and/or Owner in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

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

1.7 SUBMITTALS

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

- .3 The Consultant or Owner may request further documentation necessary for the commissioning process.
- .4 This data request may be made prior to normal submittals.
- .5 Much of this information is contained in the regular O&M manual submittals normally submitted in the project. Typically, this information is required prior to the regular formal O&M manual submittals.

1.8 COMMISSIONING DOCUMENTATION

- .1 Refer to Section 01 91 31 - Commissioning Plan for requirements and instructions for use.
- .2 Contractor to review, evaluate Cx documentation provided in the Cx Plan (Section 01 91 31).
- .3 Provide completed and evaluated Cx documentation to Consultant and Owner after completion.
- .4 Provide final Cx Report containing all completed Cx documentation.

1.9 COMMISSIONING SCHEDULE

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

1.10 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings: 01 91 31 - Commissioning Plan and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed. 0% construction completion stage. Contractor 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.
- .4 At 60% construction completion stage. Contractor 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 performance testing period.
- .6 Meetings will be scheduled and chaired by Contractor, who will record and distribute minutes.
- .7 The General Contractors to 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 individually to all parties attending.
- .2 Consultant and/or Owner may witness start-up and testing.

1.13 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by Consultant and/or Owner.

- .3 Arrange for Consultant and/or Owner to witness tests.
- .4 Obtain written approval of test results and documentation from Consultant and/or Owner 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 Consultant and Owner.
 - .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.
 - .4 Factory trained and authorized by the manufacturer to complete the intended work.

1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up, testing and Cx in following distinct phases:
 - .1 Included in delivery and installation:

- .1 Verification of conformity to specification, approved shop drawings.
- .2 Visual inspection of quality of installation.
- .2 Start-up: follow accepted start-up procedures, which includes and is not limited to the following:
 - .1 Plumbing systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 Complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .2 HVAC equipment and systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 At this time, complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .4 Perform TAB on systems. TAB reports to be approved by Consultant.
 - .3 Pre-Cx activities - LIFE SAFETY SYSTEMS
 - .1 Include equipment and systems identified in the commissioning plan.
 - .2 Reports of test results to be witnessed and certified by authority having jurisdiction or local authority having jurisdiction before verification.
 - .4 Pre-Cx activities - ELECTRICAL:
 - .1 Low voltage distribution systems under 750 V:
 - .2 Requires independent testing agency to perform pre- energization and post-energization tests.

- .3 Emergency power generation systems
 - .4 Transfer switches: test by simulating loss of power. Verify availability of power at equipment requiring same.
 - .5 Uninterruptible power systems: test under full and partial load conditions.
 - .6 Lighting systems: to be tested and verification report to be produced by contractor or manufactured representative
 - .7 Emergency lighting systems: tests to include verification of lighting levels and coverage, initially by disrupting normal power.
- .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 Consultant after distinct phases have been completed and before commencing next phase.
 - .4 Document required tests on approved PV forms. These forms can be obtained from the equipment manufactures or from Contractor supplied templates.
 - .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Consultant. 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 Consultant and/or Owner.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Consultant and/or Owner.
 - .3 If evaluation report concludes that major damage has occurred, Consultant shall reject equipment.
 - .1 Rejected equipment to be removed from site and replaced with new.

- .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

- .1 General Contractors Site Cx Coordinator shall assemble, and ensure completeness of, start-up documentation, and submit to Consultant and Owner for approval before commencement of commissioning.
- .2 Start-up documentation to include:
 - .1 O&M Manuals (to Section 01 78 00 - Closeout Submittals, 01 91 31 - Commissioning Plan and details below)
 - .2 Factory and on-site test certificates for specified equipment.
 - .3 Pre-start-up inspection reports.
 - .4 Signed installation/start-up check lists.
 - .5 Start-up reports; and
 - .6 Step-by-step description of complete start-up procedures, to permit Consultant or Owner to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE MANUALS

- .1 The contractor shall compile O&M manuals for every piece of equipment and building operating or electrical system with the following format.
 - .1 Quantity: 4 Copies
 - .2 Format: 8 ½" x 11" loose leaf binders. Each binder shall be clearly labeled on the spine. Use as many as required. Do not overload binders. There shall be dividers with permanently marked tabs of card stock separating each section and sub section. Tab labels shall not be handwritten.
 - .3 There shall be a title page and table of contents in the front of each binder for each binder's contents. In each binder, there shall be a main tab for each specification section. Behind the section number tab there shall be the equipment ID tag sub-tab for each piece of major equipment (or group, if small or numerous). These sub-tabs shall be similar to the specification number tabs but of a different color. Behind each equipment name tab shall be the following sections, in

the given order, divided by a double weight colored sheet labeled with the title of the section.

- .1 Contractor. The first page behind the equipment tab shall contain the name, address and telephone number of the manufacturer and installing contractor and the 24-hour number for emergency service for all equipment in this section, identified by equipment.
- .2 Submittal and Product Data. This section shall include all approved submittal data, cut sheets and appropriate shop drawings. If submittal was not required for approval, descriptive product data shall be included.
- 3 Operation and Maintenance Instructions. These shall be the written manufacturer's data with the model and features of this installation clearly marked and edited to omit reference to products or data not applicable to this installation. This section shall include data on the following:
 - .1 Installation, startup and break-in instructions
 - .2 All starting, normal shutdown, emergency shutdown, manual operation, seasonal changeover and normal operating procedures and data, including any special limitations.
 - .3 O&M and installation instructions that were shipped with the unit.
 - .4 Preventative maintenance and service procedures and schedules.
 - .5 Troubleshooting procedures.
 - .6 Recommended schedule of maintenance requirements and frequency.
 - .7 System single-line diagrams.
 - .8 A parts list, edited to omit reference to items which do not apply to this installation.

- .9 A list of any special tools required to service or maintains the equipment.
- .10 Performance data, ratings and curves.
- .11 Operating instruction for integrated building systems.
- .12 Recommended schedule for calibrating sensors and actuators.
- .13 Warranty, which clearly lists conditions to be maintained to keep warranty in effect and conditions that would affect the validity of the warranty.
- .14 Any service contracts issued.
- .4 Supplemental Data. Prepare written text and/or special drawings to provide necessary information, where manufacturer's standard printed data is not available and information is necessary for a proper understanding and operation and maintenance of equipment or systems, or where it is necessary to provide additional information to supplement data included in the manual or project documents.
- .5 Control Drawings. Include as-built control shop drawings, point verification, and finalized control graphics.
- 6 Test and Balance (TAB) Reports. Include TAB reports created for a particular system or piece of equipment and its components. This section will be provided by the TAB contractor.

1.17 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit to Consultant for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.

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

1.18 TEST RESULTS

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.19 START OF PERFORMANCE VERIFICATION

- .1 Notify Consultant and Owner 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.

1.20 INSTRUMENTS / EQUIPMENT

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

1.21 COMMISSIONING PERFORMANCE VERIFICATION

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

1.22 WITNESSING COMMISSIONING

- .1 Consultant and/or Owner to witness activities and verify results.

1.23 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures 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 Consultant and Owner within 5 days of test. Contractor will include copies in Final Cx Report.

1.24 COMMISSIONING CONSTRAINTS

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

1.25 EXTRAPOLATION OF RESULTS

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

1.26 EXTENT OF VERIFICATION

- .1 All energy consuming equipment and related systems including other systems identified by client:
 - .1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.
 - .2 Number and location to be at discretion of Consultant or Owner.
 - 3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.

- .4 Review and repeat commissioning of systems if inconsistencies found in more than 10% of reported results.
- .5 Perform additional commissioning until results are acceptable to Consultant and Owner.

1.27 REPEAT VERIFICATIONS

- .1 Assume costs incurred by Consultant and/or Owner for premature site visits, third and subsequent verifications where:
 - .1 Verification of reported results fail to receive Consultant or Owner's approval.
 - .2 Repetition of second verification again fails to receive approval.
 - .3 Consultant or Owner deems Contractor's request for verification or site visit was premature.

1.28 SUNDRY CHECKS AND ADJUSTMENTS

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

1.29 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Consultant and Owner.
- .2 Report problems, faults or defects affecting Cx to Consultant and Owner in writing. Stop Cx until problems are rectified. Proceed with written approval from Consultant or Owner.

1.30 COMPLETION OF COMMISSIONING

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

1.31 ACTIVITIES DURING WARRANTY PERIOD

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Fine tuning of HVAC systems.
 - 2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.
 - .3 Full-scale emergency evacuation exercises.

1.32 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.

1.33 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.34 OCCUPANCY

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

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

1.36 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.

1.37 OWNER'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by Consultant or Owner will not relieve Contractor from compliance with specified start-up and testing procedures.

1.38 FINAL SETTINGS

- .1 Upon completion of Cx to satisfaction of Consultant and Owner lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

PART 2 PRODUCTS 2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION 3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 The contractor shall cooperate in commissioning materials and equipment..
The Contractor shall prepare a Commissioning plan that will serve as a living document and will be updated during the Commissioning procedure.
- .2 The General Contractor is to provide a qualified Site Commissioning Coordinator to direct, execute, coordinate and document all Commissioning Activities as indicated. General Contractor may hire a 3rd party Commissioning Agent if they wish, however this is not required.

PART 2 PRODUCTS 2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION 3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 This Section specifies roles and responsibilities of Commissioning Training provided by the Contractor.
- .2 Related Requirements
 - .1 Section 01 91 13 – Commissioning Requirements
 - .2 Section 01 91 31 – Commissioning Plan

1.2 TRAINEES

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

1.3 INSTRUCTORS

- .1 Consultant will provide:
 - .1 Descriptions of systems.
 - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
 - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
 - .4 Provide Training Plan prior to commencement of training to Owner for review.

- .5 Contractor to fully document each training session: topics covered, attendees, date, duration etc. Documentation to be provided to Consultant and Owner.
- .3 Contractor and equipment manufacturer to provide instruction on:
 - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.4 TRAINING OBJECTIVES

- .1 Training to be detailed and duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
 - .4 Ability to update documentation.
 - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.
- .2 Training Materials
 - .1 Instructors to be responsible for content and quality.
 - .2 Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.
 - .4 Systems Manual.
 - .5 TAB and PV Reports.

- .3 Training materials shall be provided in an electronic format that permits future training procedures to same degree of detail.
- .4 Supplemental training materials may include:
 - .1 Multimedia presentations.
 - .2 Manufacturer's training videos.
 - .3 Equipment models.
- .5 Scheduling
 - .1 Include a detailed training schedule within the Commissioning Schedule.
 - .2 Deliver system level training for commissioned equipment during regular working hours. Training sessions to be 3 (three) hours in length.
 - .3 Training to be completed prior to acceptance of facility.
- .6 Responsibilities
 - .1 Be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
- .7 Training Content
 - .1 Training to include demonstrations by Instructors using the installed equipment and systems.
 - .2 Content includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.

- .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
- .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
- .7 Maintenance and servicing.
- .8 Trouble-shooting diagnosis.
- .9 Inter-Action among systems during integrated operation.
- .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.
- .4 All training documentation to be reviewed and signed off by Owner's Representative prior to Training Program acceptance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 - GENERAL

- 1.1 WORK INCLUDED .1 This section specifies the requirements for removing and relocations of select site materials.
- 1.2 RELATED WORK .1 Earthwork: Section 31 20 00.
- 1.3 EXISTING CONDITIONS .1 Items to be demolished or removed are to be based on their condition on date that Tender is accepted.
- 1.4 PROTECTION .1 Prevent movement, settlement or damage of adjacent structures and services. Provide bracing, shoring as required. Repair damage caused by demolition as directed by Engineer.
- .2 Confirm demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Fires and burning of waste or materials is not permitted on site.
- .4 Do not bury waste or materials on site.
- .5 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .6 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all roads.
-

- . 7 Protect trees, plants and foliage on site and adjacent properties where indicated.

1.5 REGULATORY REQUIREMENTS

- . 1 Perform Work in compliance with applicable Federal, Provincial and Municipal Regulations.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Inspect site with Engineer and verify extent and location of items designated for removal, disposal, recycling, salvage, turn over to Owner and items to remain.
- . 2 Engineer will create a Record of Existing Conditions.
- . 3 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

3.2 ENVIRONMENTAL PROTECTION

- . 1 Dispose of all materials in accordance with the Nova Scotia Environment Act. Pay all costs and fees associated with the disposal.

3.3 SAFETY CODE

- .1 Observe construction safety measures of Provincial Government, including but not limited to the Occupational Health and Safety Act, Chapter 7; Workers' Compensation Board and Municipal authority provided that in any case of conflict or discrepancy the more stringent requirement shall apply.
- . 2 Store volatile waste in closed containers and remove from premises daily.
- . 3 WHMIS: .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 and Health and Welfare Canada.

- . 4 Exercise pollution and environmental control of construction activities as specified and as required during the Work.
- . 5 Submit to Engineer prior to commencement of Work, printed information detailing means and methods so the following will be carried out:
 - . 1 To ensure that health and safety of persons at or near the Work.
 - . 2 To ensure the measures and procedures of the regulatory agencies specified are carried out.
 - . 3 To ensure every employee, self-employed person and employer performing Work under this Contract complies with the regulatory agencies specified.

3.4 PIPE REMOVAL

- .1 Remove all pipework indicated and excavate to undisturbed soil beneath all.
- .2 Backfill as specified in Section 31 20 00.
- .3 Dispose of pipe off-site.

3.5 ASPHALT AND
CONCRETE PAVEMENT

- .1 Saw cut to lines indicated.
- .2 Remove existing asphalt and concrete pavement where indicated.
- .3 Dispose of asphalt offsite in accordance with provincial requirements for the disposal of asphaltic materials.

3.6 ITEMS TO TURN OVER

- .1 Take care not to damage items scheduled for turn over to Owner.
- .2 Store and protect items on Site until the Owner can remove them. Any damage due to improper storage will be the responsibility of the Contractor.

- 3.7 RESTORATION .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas or as indicated on drawings.
- 3.8 CLEANUP .1 Upon completion of work, remove debris, trim surfaces and leave work site clean.

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA A23.1-19 /A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA O86-19, Engineering Design in Wood.
 - .3 CSA O121-17, Douglas Fir Plywood.
 - .4 CSA O151-17, Canadian Softwood Plywood.
 - .5 CSA O153-19, Poplar Plywood.
 - .6 CAN/CSA O325.0-16, Construction Sheathing.
 - .7 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.
 - .8 CSA S269.1-16, Falsework and Formwork.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 11 00 – General Requirements: Project Meetings, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel including, site supervisor, speciality contractor (finishing, forming, etc.), Consultant, testing laboratories representative, Departmental Representative, and concrete producer attend.
 - .1 Verify project requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in formwork liners and coatings and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 34 43 - Environmental Procedures and 01 11 00 – General Requirements: Health and Safety.
- .3 Submit shop drawings for formwork and falsework.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia, Canada.
 - .2 Prepare Shop Drawings in accordance with CSA S269.1 for formwork and falsework.
 - .3 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
 - .4 Indicate sequence of erection and removal of formwork/falsework as directed by Consultant.

- .5 When slip forms are used, submit details of equipment and procedures for review by Consultant.
- .6 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.
- .7 Indicate sequence of erection and removal of formwork and falsework.
- .8 Include the following information on falsework Shop Drawings:
 - .1 Longitudinal, lateral, vertical, dead, live and impact loads used in design.
 - .2 Safe bearing capacity of soil underneath mud sills.
 - .3 Maximum column, post and support loads.
 - .4 Deflection diagrams for beams with deflection of 10 mm or more.
 - .5 Deflection diagrams indicating initial and final elevation of deck surfaces, roofs and soffits.
 - .6 Grade of structural steel.
 - .7 Indicate steel posts, girders, beams, connections, bracing and welding, providing sufficient detail for safe performance of falsework.
 - .8 Fully detailed steel frame shoring.
 - .9 Species, grades and sizes of wood.
 - .10 Type and weight of equipment (moving or stationary) supported by falsework.
 - .11 Sequence, methods and rate of concrete placement.
 - .12 Proprietary equipment adequately identified for checking purposes.
 - .13 Full details and locations of splices.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Reduction Workplan and Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating 50% of construction wastes recycled or salvaged.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
 - .3 Low-Emitting Materials:
 - .1 Submit listing of for release agents used in building, comply with VOC and chemical component limits or restriction requirements.

1.4 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 11 00 – General Requirements: Quality Control.
- .2 Retain a professional engineer registered or licensed in Nova Scotia, Canada, with experience in formwork and falsework design of comparable complexity and scope, to perform following services as part of Work of this Section:
 - .1 Design of formwork and falsework:
 - .1 Review, stamp, and sign fabrication and erection Shop Drawings, design calculations and amendments.

- .2 Conduct on-site inspections and prepare and submit inspection reports verifying this part of Work is in accordance with Contract Documents and reviewed Shop Drawings. Perform inspections a minimum of once per month.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store, and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect formwork from damages.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan and Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse of pallets, crates, padding, packaging materials as specified in Waste Reduction Workplan Construction Waste Management Plan in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Materials and resources in accordance with Section 01 34 43 – Environmental Procedures.
- .2 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA O86.
 - .2 For concrete with special architectural features, use formwork materials to CSA A23.1/A23.2.
 - .3 Rigid insulation board: to CAN/ULC-S701.
- .3 Pan forms: removable, free of bends, dents, and residual concrete; having a high potential for reuse as indicated.
- .4 Tubular column forms: round, internally treated with release material.
 - .1 Spiral pattern not to show in hardened concrete.
- .5 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.
- .6 Form liner:
 - .1 Plywood: Canadian Softwood Plywood to CSA O15, medium density overlay, square edge

- .2 Waferboard: to CAN/CSA O325.0
- .7 Form release agent: Proprietary, non-volatile material not to stain concrete or impair subsequent application of finishes or coatings to surface of concrete, derived from agricultural sources, non-petroleum containing, biodegradable, non-toxic.
- .8 Falsework materials: to CSA S269.1.
- .9 Sealant: to Section 07 92 00- Joint Sealants.

Part 3 Execution

3.1 FABRICATION AND ERECTION

- .1 Verify lines, levels, and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Consultant's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .6 Do not place shores and mud sills on frozen ground.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .8 Fabricate and erect formwork in accordance with CAN/CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.
- .9 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .10 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.
- .11 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, joints, unless specified otherwise.
- .12 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .13 Construct forms for architectural concrete, and place ties as directed.
 - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .14 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .15 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.
- .16 When slip forming are used, submit details as indicated in PART 1 - SUBMITTALS.

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 2 days for walls and sides of beams.

- .2 2 days for columns.
- .3 5 days for beam soffits, slabs, decks and other structural members, or 3 days when replaced immediately with adequate shoring to standard specified for falsework.
- .4 2 days for footings and abutments.
- .2 Remove formwork when concrete has reached 70 % of its 28 day design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2.

3.3

CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International (ASTM)
 - .1 ASTM A123/A123M — 15 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A143/A143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .3 ASTM A641/A641M-09a (2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .4 ASTM A775/A775M-17, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .5 ASTM A884/A884M-14 Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
 - .6 ASTM A1064/A1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 CSA Group (CSA)
 - .1 CSA A23.1-19 /A23.2-19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA A23.3-19, Design of Concrete Structures.
 - .3 CSA G30.18-09(R2019), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA G40.20/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 11 00 – General Requirements: Project Meetings, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel including, site supervisor, speciality contractor (finishing, forming, etc.), Consultant, testing laboratories representative, Departmental Representative, and concrete producer attend.
 - .1 Verify project requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives, and include product characteristics, performance criteria, physical size, finish, and limitations.
- .2 When Chromate solution used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Consultant prior to its use.
- .3 Submit 2 copies of WHMIS Safety Data Sheet (SDS) in accordance with Section 01 11 00 – General Requirements: Health and Safety and 01 34 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia, Canada.
 - .1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
 - .2 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Consultant, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
 - .3 Detail lap lengths and bar development lengths to CAN/CSA A23.3, unless otherwise indicated.
 - .1 Provide type B.
 - .4 Indicate position and size of openings in slabs and walls. Coordinate with trades requiring openings.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan and Waste Reduction Workplan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating 50 % of construction wastes recycled or salvaged.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
- .5 Quality Assurance Submittals:
 - .1 Submit in accordance with Section 01 11 00 – General Requirements: Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Mill Test Report: submit to Consultant certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .3 Upon request, submit in writing to Consultant proposed source of reinforcement material.
 - .4 Submit to Consultant epoxy coating applicator certificates identified in Quality Assurance.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Handle, transport, store and install epoxy coated reinforcing steel bars to prevent damage to coating. Prevent bar-to-bar abrasion and excessive sagging. Do not drop or drag bars. Store on suitable non-metallic supports. For lifting use nylon lifting slings, padded slings, separators or other means recommended by epoxy coated reinforcing steel supplier.
- .5 Develop Waste Reduction Workplan and Construction Waste Management Plan related to Work of this Section.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Consultant.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA G30.18.
- .4 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.
- .5 Deformed steel wire for concrete reinforcement: to ASTM A1064/A1064M.
- .6 Welded steel wire fabric:
 - .1 Plain in accordance ASTM A1064/A1064M, fabricated from as drawn steel wire into flat sheets; sizes as indicated on Drawings.
 - .2 Finish:
 - .1 Galvanized: Fabricated from galvanized wire having Class A coating in accordance with ASTM A641/A641M.
 - .2 Epoxy Coated: Epoxy coated after welding in accordance with ASTM A884/A884M, Class A coated <175 µm, Type 1 intended for use in concrete or masonry, colour contrasting with rust.
 - .3 Provide in flat sheets only.
- .7 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.
- .8 Galvanizing of non-prestressed reinforcement: to ASTM A123/A123M, Coating Grade 85, minimum zinc coating 610 g/m².
 - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
 - .2 If chromate treatment carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.

- .1 Temperature of solution minimum 32 degrees and galvanized steels immersed for minimum 20 seconds.
- .3 If galvanized steels at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
 - .1 No restriction applies to temperature of solution.
- .4 Chromate solution sold for this purpose may replace solution described above, provided if of equivalent effectiveness.
 - .1 Provide product description as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .9 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.
- .10 Tie wire: 1.5 mm diameter annealed wire.
- .11 Mechanical splices: subject to approval of Consultant.
- .12 Plain round bars: to CSA G40.20/G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada and CSA A23.1/A23.2.
- .2 Obtain Consultant's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Consultant, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Inform Consultant of proposed source of supplied material.

Part 3 Execution

3.1 PREPARATION

- .1 Galvanizing to include chromate treatment.
 - .1 Duration of treatment 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

3.2 FIELD BENDING

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

3.3 PLACING REINFORCEMENT

- .1 Cutting or puncturing vapour retarder is not permitted; repair damage and reseal vapour retarder before placing concrete.

- .2 Place reinforcing steel as indicated on placing drawings in accordance with CSA A23.1/A23.2.
- .3 Use plain round bars as slip dowels in concrete.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 Apply thick even film of mineral lubricating grease when paint is dry.
- .4 Prior to placing concrete, obtain Consultant's approval of reinforcing material and placement.
- .5 Maintain cover to reinforcement during concrete pour.
- .6 Protect coated portions of bars with covering during transportation and handling.

3.4 FIELD TOUCH-UP

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

3.5 FIELD QUALITY CONTROL

- .1 Inspection and testing of reinforcing and reinforcing materials carried out by testing laboratory for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory certified to CSA A283.
- .2 Ensure test results distributed for discussion at pre-pouring concrete meeting between testing laboratory and Consultant.
- .3 Contractor will be responsible to pay for costs of tests as specified in Section 01 11 00 – General Requirements: Payment Procedures for Testing.
- .4 Inspection or testing by Consultant not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM C260/C260M-10a(2016) , Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-19, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C 881/C881M-15, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - .5 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .6 ASTM C C1059/C1059M-13, Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete.
 - .7 ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .8 ASTM D624-2012, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .9 ASTM D1751-18, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .10 ASTM D1752-18, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 CSA Group (CSA)
 - .1 CSA A23.1/A23.2-19, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-19, Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000-18, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005),

1.2 ABBREVIATIONS AND ACRONYMS

- .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement types:
 - .1 GU, GUb and GUL - General use cement.
 - .2 MS and MSb - Moderate sulphate-resistant cement.
 - .3 MH, MHb and MHL - Moderate heat of hydration cement.
 - .4 HE, HEb and HEL - High early-strength cement.
 - .5 LH, LHb and LHL - Low heat of hydration cement.
 - .6 HS and HSb - High sulphate-resistant cement.

- .2 Fly ash types:
 - .1 F - with CaO content maximum 8%.
 - .2 CI - with CaO content 15 to 20%.
 - .3 CH - with CaO minimum 20%.
- .3 GGBFS - Ground, granulated blast-furnace slag.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 11 00 – General Requirements: Project Meetings, convene pre-installation meeting one week prior to beginning concrete works.
 - .1 Ensure key personnel including, site supervisor, speciality contractor (finishing, forming, etc.), Consultant, testing laboratories representative, Departmental Representative, and concrete producer attend.
 - .1 Verify project requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 11 00 – General Requirements: Health and Safety and 01 34 43 - Environmental Procedures.
- .3 Site Quality Control Submittals:
 - .1 Provide testing results for review by Consultant and do not proceed without written approval when deviations from mix design or parameters found.
 - .2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
 - .3 Concrete hauling time: provide for review by Consultant deviations exceeding maximum allowable time of 120 minutes for concrete delivered to site of Work and discharged after batching.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan and Waste Reduction Workplan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating 50 % of construction wastes recycled or salvaged.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
 - .2 When Supplementary Cementing Materials (SCMs) used, provide evidence to certify reduction in cement from Base Mix to Actual SCMs Mix, as percentage.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 11 00 – General Requirements: Quality Control.
- .2 Departmental Representative will approve Contractor’s plan for testing of materials and placement of concrete materials using a testing agency approved by the Departmental Representative. Testing and sampling shall be to CSA A23.1/A23.2 guidelines.
- .3 Provide Consultant minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture meet specified requirements.
- .4 At least 4 weeks prior to beginning Work, inform Consultant of source of fly ash.
 - .1 Changing source of fly ash without written approval of Consultant is prohibited.
- .5 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Consultant on following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.
- .6 Quality Control Plan: provide written report Consultant verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- .7 Mock-Ups:
 - .1 Provide site mock-up for architectural finished concrete indicating forming methods and materials, and procedures proposed to achieve architectural finish in accordance with Section 01 11 00 – General Requirements: Quality Control, and to comply with following requirements, using materials indicated for completed work:
 - .1 Build mock-ups in location and of size as directed by Consultant.
 - .2 Obtain Consultant's acceptance of mock-ups before starting construction; mock-up used throughout construction period and used as standard of acceptance for subsequent architectural concrete work.
 - .3 Mock-up may form part of permanent structure when accepted by Consultant; repair or replace unacceptable mock-ups at no additional cost to Owner.
 - .4 In presence of Consultant, damage part of exposed face for each finish, colour, and texture, and demonstrate materials and techniques proposed for repairs to match adjacent undamaged surfaces.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
- .2 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

- .1 Modifying maximum time limit without receipt of prior written agreement from Consultant, laboratory representative, and concrete producer as described in CSA A23.1/A23.2. is prohibited.
 - .2 Deviations submitted for review by Consultant.
 - .3 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .3 Packaging Waste Management: remove for reuse of crates, pallets, padding, packaging materials in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

1.7 SITE CONDITIONS

- .1 Placing concrete during rain or weather events that could damage concrete is prohibited.
- .2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.
- .3 Cold weather protection:
 - .1 Maintain protection equipment, in readiness on Site.
 - .2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.
 - .3 Placing concrete upon or against surface at temperature below 5°C is prohibited.
- .4 Hot weather protection:
 - .1 Protect concrete from direct sunlight when ambient temperature above 27°C.
 - .2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.
- .5 Protect from drying.

Part 2 Products

2.1 MATERIALS

- .1 Portland Cement and Supplementary cementing materials: to CSA A3000 and CSA A23.1.
- .2 Water: to CSA A23.1.
- .3 Aggregates: to CSA A23.1/A23.2.
- .4 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C494. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .5 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
 - .1 Compressive strength: 50 MPa at 28 days.
 - .2 Consistency:
 - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30 s.
 - .2 Flowable: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portion) 125 to 145%.
 - .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portions) 100 to 125%.

- .3 Acceptable products: SikaGrout 212 as manufactured by Sika Canada Inc., Masterflow 928 as manufactured by BASF Corporation, NS Grout by Euclid Chemical, or approved alternate.
- .6 Curing compound: to CSA A23.1/A23.2 or ASTM C309, Type I-D with fugitive dye.
- .7 Sub-slab vapour barrier: polyethylene, 15 mil thick; to
 - .1 Water vapour permeance: < 4.00 mg/s to ASTM E96.
 - .2 Puncture resistance: > 3200 g, to ASTM D1709 Method B.
 - .3 Tensile Strength: 12.5 kN/m to ASTM E154 Section 9.

2.2 MIXES

- .1 General: Where practically possible, concrete supplier to maximize the amount Portland cement replaced with fly ash or another approved cementitious recycled material while maintaining the characteristics listed for each concrete mix listed as well as the workability of each mix. Concrete supplier to provide written confirmation of the percent replacement of Portland cement for fly ash/supplementary cementing materials for all mix designs.
- .2 Proportion normal density concrete in accordance with CSA-A23.1, Alternative 1 to give the following properties for all concrete:
 - .1 Cement: Type GU.
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Class of exposure: C-1.
 - .4 Nominal size of coarse aggregate: 20 mm.
 - .5 Slump at time and point of discharge: 80 mm ±30 mm.
 - .6 Air content: 5 to 8%.
 - .7 Chemical admixtures: type as approved, and in accordance with ASTM C494.
 - .8 A concrete mix design shall be provided by the Contractor based on trial mixes that have been designed and tested by a qualified Professional engineer registered or licensed to practice in the Province of Nova Scotia and submitted for approval to Consultant.
 - .9 Air-void network parameters in the hardened concrete shall be demonstrated to meet CSA A23.1 Clause 4.3.3.4 after pumping. Test results shall be submitted for samples obtained after pumping, using the same equipment and heights expected for concrete placement on site.
 - .10 Concrete shall be prequalified by testing in accordance with CSA A23.2-21C, except that drying in air at 50% RH shall commence after a total of 7 days of wet curing, and the initial comparator reading (zero-day reading) shall be taken at the end of the wet curing period immediately before the commencement of drying. Concrete shrinkage after 28 days of drying (at the concrete age of 35 days) shall not exceed 0.035% when tested using a prism with a cross section of 100 x 100 mm.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Consultant's written approval before placing concrete.
 - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:

- .1 Development of cold joints not allowed.
- .2 Ensure concrete delivery and handling facilitate placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete permitted only after approval of equipment and mix.
- .5 Disturbing reinforcement and inserts during concrete placement is prohibited.
- .6 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, workability, air content, temperature and test samples taken.
- .10 In locations where new concrete dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Consultant.

3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Consultant.
 - .2 Where approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated reviewed by Consultant.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Consultant before placing of concrete.
 - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
 - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts:
 - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
 - .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Consultant.
 - .1 Formed holes: 100 mm minimum diameter.
 - .2 Drilled holes: to manufacturers' recommendations 25 mm minimum diameter larger than bolts used.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with epoxy grout.
 - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Drainage holes and weep holes:

- .1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms used, remove them after concrete has set.
- .2 Install weep hole tubes and drains as indicated.
- .5 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- .6 Finishing and curing:
 - .1 Finish concrete to CSA A23.1/A23.2.
 - .2 Use procedures as reviewed by Consultant or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface not damaged.
 - .3 Use curing compounds compatible with applied finish on concrete surfaces.
 - .4 Finish concrete floor to CSA A23.1/A23.2.
 - .5 Provide screed finish where floor tile or bonded topping applied. Provide depression bonded topping or floor tiles.
 - .6 Provide float finish unless otherwise indicated.
 - .7 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
- .7 Sub-slab vapour barrier:
 - .1 Install vapour barrier membrane on top of sub-slab insulation and under concrete slab on grade inside building.
 - .2 Lap membrane minimum 150mm at joints and seal.
 - .3 Seal punctures in membrane before placing concrete. Use patching material at least 150mm larger than puncture and seal.
 - .4 Seal all pipe and conduit penetrations through the membrane.
 - .5 Seal to inside of concrete foundation walls.

3.3 SURFACE TOLERANCE

- .1 Concrete tolerance to CSA A23.1 Straightedge Method. Finish surfaces to within 3 mm in 1m as measured with a 1m straight edge placed on surface.

3.4 FIELD QUALITY CONTROL

- .1 Notify testing agency to conduct testing and inspection of concrete placement and materials; proceed with subsequent work only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection and testing.
- .2 Site tests: conduct tests as follows in accordance with Section 01 11 00 – General Requirements: Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS. A minimum of 3 test cylinders to be provided as follows:
 - .1 Each day's pour.
 - .2 Each change of supplier.
 - .3 Each 50m³ or fraction thereof.
 - .4 Additional test cylinders at the request of Consultant.
 - .5 If Contractor wants to strip formwork early, request additional cylinders to be cast and pay for additional cylinders and testing of the additional cylinders.
 - .6 Field testing shall consist of the following parameters as a minimum:
 - .1 Slump.

- .2 Air content.
- .3 Compressive strength at 7 and 28 days.
- .4 Air and concrete temperature.
- .3 Inspection and testing of concrete and concrete materials carried out by testing laboratory for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory certified to CSA A283.
- .4 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Consultant.
- .5 Contractor will pay for costs of tests as specified in Section 01 11 00 – General Requirements: Payment Procedures for Testing.
- .6 Contractor will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .7 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .8 Provide certification report from testing agency for all test results. Report to be certified by Professional Engineer (licensed to practice in Nova Scotia) that all work was completed in accordance with specifications.
- .9 Inspection or testing by Consultant not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

3.5

CLEANING

- .1 Clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Construction and Demolition Waste Management Divert 50% from landfill in accordance with Construction Waste Management plan.
 - .2 Divert unused concrete materials from landfill to local facility after receipt of written approval from Consultant.
 - .3 Provide appropriate area on job site where concrete trucks and be safely washed.
 - .4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Consultant.
 - .5 Disposal of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location to pose health or environmental hazard is prohibited.
 - .6 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .7 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
 - .8 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 03 30 00 - Cast-in-place Concrete.
- .2 Section 04 20 00.08 - Masonry for Minor Works.

1.2 REFERENCE STANDARDS

- .1 Brick Industry Association (BIA).
 - .1 Technical Note No. 20-2018, Cleaning Brick Masonry.
- .2 CSA Group
 - .1 CSA A82-14 (R2018), Fired Masonry Brick Made from Clay or Shale.
 - .2 CAN/CSA-A179-14, Mortar and Grout for Unit Masonry.
 - .3 CSA A370-14 (R2018), Connectors for Masonry.
 - .4 CAN/CSA-A371-14, Masonry Construction for Buildings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for masonry and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
 - .2 Submit shop drawings detailing temporary bracing required, designed to resist wind pressure and lateral forces during installation.
- .3 Samples:
 - .1 Provide samples as follows:
 - .1 6 of each type of brick masonry unit specified.

- .2 Cured, coloured samples of mortar, illustrating mortar colour and colour range, supplemented with specific requirements in Section 04 20 00.08 - Masonry for Minor Works.
 - .3 1 of each type of masonry accessory and flashing specified, supplemented by specific requirements in Section 04 20 00.08 - Masonry for Minor Works.
 - .4 1 of each type of masonry anchorage, reinforcement and connector proposed for use, supplemented by specific requirements in Section 04 20 00.08 - Masonry for Minor Works.
 - .5 Samples: used for testing and when accepted become standard for material used.
- .4 Certificates: submit manufacturer's product certificates certifying materials comply with specified requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit manufacturer's instructions for care, cleaning and maintenance of prefaced masonry units for incorporation into Operations and Maintenance manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect material packages from nicks, scratches, and blemishes.
 - .3 Keep materials dry until use except where wetting of bricks is specified.
 - .4 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
 - .5 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

- .1 Ambient Conditions: assemble and erect components when temperatures are above 4 degrees C.

- .2 Weather Requirements: to CAN/CSA-A371.
- .3 Spray mortar surface at intervals and keep moist for 3 days after installation.
- .4 Cold weather requirements:
 - .1 To CAN/CSA-A371 with following requirements.
 - .1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stale.
 - .2 Maintain ambient temperature of masonry work and it's constituent materials between 5 degrees C and 50 degrees C and protect site from windchill.
 - .3 Maintain temperature of masonry above 0 degrees C for minimum of 7 days, after mortar is installed.
 - .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10 degrees C, before applying mortar.
- .5 Hot weather requirements:
 - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Masonry materials are specified elsewhere in related Sections:
 - .1 Section 04 20 00.08 - Masonry for Minor Works.

PART 3 EXECUTION

3.1 INSTALLERS

- .1 Experienced and qualified masons to carry out erection, assembly and installation of masonry work.

3.2 EXAMINATION

- .1 Examine conditions, substrates and work to receive work of this Section.

- .2 Examine openings to receive masonry units. Verify opening size, location, and that opening is square and plumb, and ready to receive work of this Section.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation after unacceptable conditions have been remedied.
- .3 Verification of Conditions:
 - .1 Verify that:
 - .1 Substrate conditions which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of brick.
 - .2 Site conditions are acceptable and are ready to receive work.
 - .3 Built-in items are in proper location, and ready for roughing into masonry work.
 - .2 Commencing installation means acceptance of existing substrates.

3.3 PREPARATION

- .1 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations and co-ordinate with Section 01 71 00 - Examination and Preparation.
- .2 Establish and protect lines, levels, and coursing.
- .3 Protect adjacent materials from damage and disfiguration.

3.4 INSTALLATION

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment, respecting construction tolerances permitted by CAN/CSA-A371.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.5 CONSTRUCTION

- .1 Exposed masonry:

- .1 Remove chipped, cracked, and otherwise damaged units in exposed masonry, and replace with undamaged units.
- .2 Jointing:
 - .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
 - .2 Allow joints to set just enough to remove excess water, then rake joints uniformly to 6 mm depth and compress with square tool to provide smooth, compressed, raked joints of uniform depth where raked joints are indicated.
 - .3 Strike flush joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.
- .3 Cutting:
 - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
 - .2 Make cuts straight, clean, and free from uneven edges.
- .4 Building-In:
 - .1 Build in items required built into masonry.
 - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Wetting of bricks:
 - .1 Except in cold weather, wet bricks having initial rate of absorption exceeding 1 g/minute/1000 mm²: wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.
 - .2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.

3.6 SITE TOLERANCES

- .1 Tolerances in notes to CAN/CSA-A371 apply.

3.7 SITE QUALITY CONTROL

- .1 Site Tests, Inspection:
 - .1 Inspectors: Owner may engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
 - .2 Take representative samples of mortar for testing consistency of strength and colour according to CSA A179.

3.8 REPAIRING, POINTING, CLEANING

- .1 Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- .2 Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- .3 In-progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- .4 Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - .1 Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - .2 Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Departmental Representative's approval of sample cleaning before proceeding with cleaning of masonry.
 - .3 Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - .4 Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - .5 Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.9 PROTECTION

- .1 Temporary Bracing:
 - .1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
 - .2 Bracing approved by Departmental Representative.
 - .3 Brace masonry walls as necessary to resist wind pressure and lateral forces during construction.
- .2 Moisture Protection:
 - .1 Keep masonry dry using waterproof, non staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until completed and protected by flashing or other permanent construction.
 - .2 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.
 - .3 Air Temperature Protection: protect completed masonry as recommended in 1.8, SITE CONDITIONS.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 04 05 00 - Common work results for masonry.
- .2 Section 07 62 00 - Sheet Metal Flashing and Trim: Exposed flashings.
- .3 Section 07 92 10 - Joint Sealants: Sealant products and application.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A1064/A1064M-17 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .2 ASTM C73-14 Standard Specification for Calcium Silicate Face Brick (Sand-Lime Brick).
- .2 CSA Group (CSA)
 - .1 CAN/CSA-A82-14, Fired Masonry Brick Made From Clay or Shale.
 - .2 CAN/CSA-A165 SERIES-04 (R2014), CSA Standards on Concrete Masonry Units (Consists of A165.1-04 Concrete Block Masonry Units, A165.2 Concrete Brick Masonry Units, A165.3 Prefaced Concrete Masonry Units).
 - .3 CAN/CSA-A179-04 (R2014), Mortar and Grout for Unit Masonry.
 - .4 CAN/CSA-A370-14, Connectors for Masonry.
 - .5 CAN/CSA A371-04 (R2014) 04 (R2014), Masonry Construction for Buildings.
 - .6 CSA G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .7 CSA S304-14 - Design of masonry structures.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).

PART 2 PRODUCTS

2.1 MASONRY UNITS

- .1 Burned clay brick: to CAN/CSA-A82.
 - .1 Type: S.
 - .2 Grade: EG.
 - .3 Body: Cored.
 - .4 Dimensions: 90 mm width x 57 mm height x 190 mm length
 - .5 Texture(s): smooth.
 - .6 Colour and texture: to match approved sample.

2.2 REINFORCEMENT AND CONNECTORS

- .1 Bar reinforcement: to CAN/CSA-A371 and CSA G30.18, Grade 400.
- .2 Wire reinforcement: plain wire to CAN/CSA-A371, truss type.
- .3 Connectors: to CAN/CSA-A370.
 - .1 Corrosion resistance: to CAN/CSA-A370
 - .1 Exterior: Level III.
 - .2 Ties:
 - .1 Adjustable Unit Ties: to CAN/CSA A370: proprietary type ties, fabricated from stainless steel, with a series of 8 holes for attachment of wire tie. Size to suit application, in accordance with manufacturer's recommendations.
 - .1 Straight Ties: at steel studs. Fasten to web of stud with 4 screws. Tie to extend to full depth of studs.
 - .2 Reinforcement Ties: to CAN/CSA A370:
 - .1 Unless noted on structural drawings: heavy duty design, 4.76 mm diameter side wires with 3.66 mm (9 ga.) diameter cross rods, welded steel rod, hot dipped galvanized to ASTM A641 after fabrication, truss design, with prefabricated inside and outside corners and tees.

2.3 MORTAR AND GROUT

- .1 Mortar: to CAN/CSA-A179.
 - .1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
 - .2 Colour: ground coloured natural aggregates or metallic oxide pigments, as selected by ???.
- .2 Mortar Type:
 - .1 Exterior non-loadbearing walls and parapet walls: S based on proportion specifications.
- .3 Following applies regardless of mortar types and uses specified above:
 - .1 Mortar for grouted reinforced masonry: type N based on proportion specifications.
- .4 Grout: to CAN/CSA-A179, Table 3.
- .5 Parging mortar: type N to CAN/CSA-A179.

2.4 ACCESSORIES

- .1 Weep hole vents: purpose-made UV-stablized, polypropylene co-polymer cellular strips.
- .2 Cavity screening: three dimensional random weave plastic mesh, thickness to match cavity, minimum height 3 brick masonry courses.
- .3 Anchor Bolts: 12 mm diameter x 150 mm long with embedded ends bent 50 mm at 90 degrees, exposed ends threaded with washer and nut.
- .4 Embedded Flexible Flashings: Self-adhering sheet 1.0 mm thick consisting of rubberized asphalt compound banded to high density cross laminated polyethylene film, complete with manufacturer's recommended primer.
- .5 Loose steel lintels: in accordance with Section 05 50 00 - Metal Fabrications.

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 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .2 Proceed with installation only after unacceptable conditions have been remedied .

3.2 INSTALLATION

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.
 - .1 Bond: running stretcher bond with vertical joints in perpendicular alignment and centred on adjacent stretchers above and below.
 - .2 Coursing height: 200 mm for three bricks and three joints.
 - .3 Jointing: tool where exposed or where paint or other finish coating is specified to provide smooth compressed concave surface.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.3 CONSTRUCTION

- .1 Exposed masonry:
 - .1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.
 - .2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.
- .2 Building-in:
 - .1 Install masonry connectors and reinforcement where indicated on drawings.
 - .2 Build in items required to be built into masonry.
 - .3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .4 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
 - .5 Install loose steel lintels centered over openings where indicated, with minimum 200 end bearing.
- .3 Provision for movement:

- .1 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
- .2 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .4 Interface with other work:
- .5 Build in flashings in masonry in accordance with CAN/CSA-A371.
 - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated. Seal laps, penetrations and terminations to resist water penetration.
 - .2 In cavity walls and veneered walls, carry flashings from front edge of masonry, under outer wythe, then up backing not less than 150 mm, and as follows:
 - .1 For self-adhesive flashing, apply primer and firmly press sheet against backing. Lap under air-barrier membrane. Seal penetrations with recommended sealant or mastic. Installation shall be free of wrinkles, fish-mouths and punctures.
 - .2 Provided turned up end dams minimum 50 mm high at ends of all flashings.
 - .3 For wood frame backing, staple flashing to walls behind air barrier membrane. Ensure positive laps.
 - .3 Lap joints 150 mm and seal with adhesive or mastic.
- .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 center.
- .7 Place drainage mesh in cavity as construction progresses.

3.4 REINFORCING AND CONNECTING

- .1 Install masonry connectors and reinforcement in accordance with CAN/CSA-A370, CAN/CSA-A371 and CSA S304.1 unless indicated otherwise.

3.5 BONDING AND TYING

- .1 Tie masonry veneer to backing in accordance with National Building Code of Canada (NBC) 2015, CAN/CSA-A371, CSA S304.1 and as indicated.

3.6 ANCHORS

- .1 Supply and install metal anchors as indicated.

3.7 LATERAL SUPPORT AND ANCHORAGE

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

3.8 SITE TOLERANCES

- .1 Tolerances of CAN/CSA-A371 apply.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A36/A36M-19, Standard Specification for Carbon Structural Steel.
 - .2 ASTM A193/A193M-19, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications.
 - .3 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM A325-14, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .5 ASTM A325M-14, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
 - .6 ASTM A490M-14a, Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints Metric.
- .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(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16-19, Limit States Design of Steel Structures.
 - .4 CAN/CSA-S136-16, North American Specifications for the Design of Cold Formed Steel Structural Members.
 - .5 CSA W47.1-19, 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), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .8 CSA W59-13, 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.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit drawings for all structural steel, stamped and signed by professional engineer registered or licensed in Nova Scotia, 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 Nova Scotia, Canada.
- .5 Source Quality Control Submittals:
 - .1 Submit 4 weeks prior to fabrication of structural steel.
 - .1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
 - .2 Provide mill test reports certified by metallurgists qualified to practise in New Brunswick.
- .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.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements.
- .2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.
- .3 Packaging Waste Management: remove for recycling of padding, pallets, packaging materials, crates in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16 to resist forces, moments, shears and allow for movements indicated.
- .2 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 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.
- .4 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in Nova Scotia, Canada for non standard connections.

2.2 MATERIALS

- .1 Structural steel: to CSA-G40.20/G40.21, 300W.
- .2 Anchor bolts: to CSA-G40.20/G40.21, Grade 300W or ASTM A36/A36M.
- .3 High strength anchor bolts: to ASTM A193/A193M
- .4 Bolts, nuts and washers: to ASTM A325 or ASTM A325M.
- .5 Welding materials: to CSA W48 Series or CSA W59 and certified by Canadian Welding Bureau.
- .6 Shop paint primer: to CISC/CPMA2-75 solvent reducible alkyd, grey.
- .7 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m².
- .8 Shear studs: to CSA W59, Appendix H.
- .9 Tension Rods: to CSA-G40.20/G40.21, 300W, complete with threaded ends and forged steel clevis with double locking nuts. Entire assembly to be hot dipped galvanized.

2.3 FABRICATION

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with approved shop drawings.
- .2 Continuously seal members by continuous welds.
- .3 Provide holes in flanges for attachment of wood nailers.

2.4 SHOP PAINTING

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S136 and/or CAN/CSA-S16.
- .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
 - .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.

Part 3 Execution

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 GENERAL

- .1 Structural steel work: in accordance with CAN/CSA-S16, CAN/CSA-S136.
- .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 Consultant 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 CAN/CSA-S16 and in accordance with approved erection drawings.
- .2 Field cutting or altering structural members: to approval Consultant.
- .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.

3.6 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship will be carried out by testing laboratory.
- .2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Consultant.
- .3 Submit test reports to Consultant within 2 weeks.
- .4 Contractor will pay costs of tests as specified in Section 01 11 00 – General Requirements: Payment Procedures for Testing.
- .5 Test shear studs in accordance with CSA W59.

3.7 FIELD PAINTING

- .1 Paint in accordance with Section 09 91 00 - Painting.
 - .1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

3.8 CLEANING

- .1 Clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 06 40 00 - Architectural woodwork: crimping insert nuts.

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA Group (CSA)
 - .1 CSA G40.20-13 /G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles, Includes Update No. 1 (2020)
 - .3 CSA S16-14, Design of Steel Structures.
 - .4 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 Bolts and anchor bolts: to ASTM A307.
- .5 Galvanizing: by hot dip method, to CAN/CSA G164.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Where possible, fit and shop assemble work, ready for erection.
- .3 Exposed welds continuous for length of each joint. File or grind exposed welds smooth and flush.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION - GENERAL

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16, or weld.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.3 VANITY BRACKETS

- .1 Angle framing: 50 × 50 × 6 mm: notch ends of angles to ensure top surfaces of angles to receive vanity are all flush. Drill holes at 200 mm o.c. for attachment of vanity and front apron by Section 06 40 00. Size holes to receive crimping insert nuts by Section 06 40 00. Hot dipped galvanized after fabrication.

3.4 BENCH BRACKETS

- .1 Angle framing: 50 × 50 × 6 mm: notch ends of angles to ensure top surfaces of angles to receive bench are flush. Drill holes 95 mm o.c. for attachment of bench slats. Hot dipped galvanized after fabrication.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute/National Particleboard Association (ANSI/NPA)
 - .1 ANSI/NPA A208.1-2009 Particleboard.
- .2 ASTM International
 - .1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A153/A153M-16a Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .3 ASTM A307-14e1 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
 - .4 ASTM A653/A653M-19a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM D 5055-19e1, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
 - .6 ASTM D 5456-19, Standard Specification for Evaluation of Structural Composite Lumber Products.
 - .7 ASTM F1667-18a 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 2017 Edition
 - .2 Engineering Guide for Wood Frame Construction 2014 (R2018)
- .5 CSA Group (CSA)
 - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O86-14 Engineered Design in Wood
 - .3 CSA O112.9-10 (R2019), Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
 - .4 CSA O121-08(R2013), Douglas Fir Plywood.
 - .5 CSA O141-05(R2019), Softwood Lumber.
 - .6 CSA O151-17, Canadian Softwood Plywood.
 - .7 CSA O153-19, Poplar Plywood.
 - .8 CSA O325-16, Construction Sheathing.
 - .9 CAN/CSA-S406-16, Construction of Preserved Wood Foundations.
 - .10 CAN/CSA-Z809-16, 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.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: 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 roof joist and truss 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, submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia, 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.

1.3 SUSTAINABLE DESIGN SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures to confirm that products and procedures conform to specified sustainability requirements.
- .2 Submit evidence that:
 - .1 Engineered wood products contain specified percentage of recycled content.

- .3 Submit vendor's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.
- .4 Low-Emitting Materials:
 - .1 Submit listing of adhesives and sealants used in building, showing compliance with VOC and chemical component limits or restriction requirements.
 - .2 Submit listing of composite wood products used in building, stating that they contain no added urea-formaldehyde resins, laminating adhesives used in building, stating that they contain no urea-formaldehyde.
 - .3 Include SDS sheets indicating resin type for structural composite lumber and agrifibre materials.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: 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, 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 SUSTAINABILITY CHARACTERISTICS

- .1 Provide wood framing products as specified and with the following sustainability characteristics.
- .2 Lumber, Finger Jointed Lumber, I-Joists, structural composite lumber (SCL): to be CAN/CSA-Z809 or FSC or SFI certified.
- .3 OSB, Plywood, Particleboard: urea-formaldehyde free and certified to, CAN/CSA-Z809 or FSC or SFI.
- .4 Adhesives: limit 120 g/L maximum to GS-36.
- .5 Provide engineered wood products with no added formaldehyde and low VOC emissions when tested in accordance with ASTM D6330.
- .6 Provide fiberboard with minimum 50 % recycled content.

2.2 MATERIALS

- .1 .1 Western Red Cedar Lumber, Furring and Blocking:

- .1 Western Red Cedar: solid wood lumber, graded to meet NLGA Grading Standards and WRCLA, S4S.
 - .2 Grade: WRCLA Custom Clear.
 - .3 Texture: finely machined.
 - .4 Moisture Content: seasoned.
- .2 Lumber: kiln dried, Structural Light Framing and Structural Joists and Planks, and Studs to CAN/CSA O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:
- .1 Moisture Content: maximum 8% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 8%.
 - .3 Grade: No. 1./ No. 2, unless otherwise noted, or better, and having the following minimum properties:
 - .1 Sizes: 38 mm or 89 mm wide by depth as indicated on drawings.
 - .2 Bending at extreme fibre (Fb): 11.8 MPa.
 - .3 Longitudinal shear (Fv): 1.0 MPa.
 - .4 Compression parallel to grain (Fc): 11.5 MPa.
 - .5 Compression perpendicular to grain (Fcp): 5.3 MPa.
 - .6 Tension parallel to grain (Ft): 5.5 MPa.
 - .7 Modulus of elasticity (E/ EO5): 9500/6500.
- .3 Lumber: kiln dried, Post and Timber Grades to CAN/CSA O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:
- .1 Moisture Content: maximum 8% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 8%.
 - .3 Grade: Select Structural or better, and having the following minimum properties:
 - .1 Sizes: as indicated on drawings.
 - .2 Bending at extreme fibre (Fb): 12.7 MPa.
 - .3 Longitudinal shear (Fv): 0.9 MPa.
 - .4 Compression parallel to grain (Fc): 9.9 MPa.
 - .5 Compression perpendicular to grain (Fcp): 5.3 MPa.
 - .6 Tension parallel to grain (Ft): 7.4 MPa.
 - .7 Modulus of elasticity (E/ EO5): 8500/6000
- .4 Lumber: kiln dried, Beams and Stringers Grades to CAN/CSA O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:
- .1 Moisture Content: maximum 8% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 8%.
 - .3 Grade: Select Structural or better, and having the following minimum properties:
 - .1 Sizes: as indicated on drawings.
 - .2 Bending at extreme fibre (Fb): 13.6 MPa.
 - .3 Longitudinal shear (Fv): 0.7 MPa.
 - .4 Compression parallel to grain (Fc): 9.5 MPa.
 - .5 Compression perpendicular to grain (Fcp): 5.3 MPa.
 - .6 Tension parallel to grain (Ft): 7.0 MPa.

- .7 Modulus of elasticity (E/ EO5): 8500/6000
- .5 Plant fabricated structural wood
 - .1 Moisture Content: maximum 8% at time of installation.
 - .2 Proprietary prefabricated I-joist of solid, laminated veneer lumber glue laminated lumber flanges and oriented strandboard panel web.
 - .3 Depth of joist: as indicated on drawings
 - .4 Maximum deflection: L/360
 - .5 Engineered rim board, bracing, anchorage and other accessories: to manufacturer's specifications
 - .6 Fastenings: to CSA O86
- .6 Sheathing for structural shear wall and diaphragms:
 - .1 Douglas Fir (DFP) Exterior Grade plywood to CSA O121, 3/4-inch thick.
- .7 Roof sheathing:
 - .1 Douglas Fir (DFP) Exterior Grade plywood to CSA O121, tongue and groove system, 5/8-inch thick.
- .8 Wall sheathing:
 - .1 Douglas Fir (DFP) Exterior Grade plywood to CSA O121, 5/8-inch thick.
- .9 Interior Mechanical Room Walls and Ceiling:
 - .1 Douglas Fir (DFP) Exterior Grade plywood to CSA O121, 1/2 inch thick.
- .10 Panels shall have no added urea formaldehyde.

2.3 MISCELLANEOUS LUMBER

- .1 Provide lumber for support or attachment of other construction, including furring, blocking, nailing strips, ground, rough bucks, cants, curbs, fascia, backing sleepers, and similar members.
- .2 Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on drawings.
- .3 Moisture Content: 19% maximum for lumber items not specified to receive wood preservative treatment.
- .4 Grade: for dimension lumber sizes provide No. 2 or Standard grade lumber per NLGA. For board-sized lumber, provide sheathing grade, S2S.

2.4 WOOD PRESSURE TREATMENTS

- .1 Where lumber or plywood is indicated as preservative treated or is specified to be treated, treat in accordance with CAN/CSA O80.9M and AWPA.
- .2 Wood preservatives containing arsenic or chromium are not permitted.
- .3 Pressure treat above ground items with Copper Azole (CA-B) preservative to a minimum AWPA retention of 1.6 kg/m³. After treatment, kiln-dry lumber and plywood to maximum moisture content of 19% and 15% respectively. Treat indicated items and the following:
 - .1 Wood cants, nailing strips, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapour barriers, and waterproofing.
 - .2 Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry and concrete.

- .3 Wood framing members less than 200 mm above grade.
- .4 Wood floor plates installed over concrete slabs directly in contact with earth.
- .4 Pressure treat wood members in contact with ground or freshwater with Copper Azole (CA-B) preservative to a minimum AWWA retention of 3.4 kg/m³
- .5 Fire Rated Plywood Panels: to CAN/SCA O80.9M, CAN/CSA O80.20M and CAN/CSA O80.27M, pressure impregnated, and as follows:
 - .1 Flame Spread Classification: FSC 25 maximum.
 - .2 Smoke developed of not more than: 75.
 - .3 Acceptable materials:
 - .1 Dricon FRT, by Lonza.
 - .2 D-Blaze Fire Retardant Treated Wood, by Viance.
 - .3 Pyro-Guard, by Hoover Treated Wood Products, Inc.
- .6 Complete fabrication of treated items before treatment where possible. If cut after treatment apply field treatment to cut surfaces.
- .7 Wood Preservatives: Maximum allowable VOC limit 350 g/L in accordance with SCAQMD Rule #1113 - Architectural Coatings.

2.5 FRAMING CONNECTORS AND HANGERS

- .1 Fabricated zinc-coated steel products tested or designed in accordance with CSA O86.1 and CSA S16.1, and as required to construct framing as required. Anchors to be designed to resist all forces noted on drawing, including uplift forces.
- .2 Acceptable Materials:
 - .1 Simpson Strong Tie Company Inc., or similar with same or better material properties and performance characteristics.

2.6 ACCESSORIES

- .1 General purpose adhesive: to CSA O112 Series.
- .2 Nails, spikes, and staples: to ASTM F1667, stainless steel for exterior work, in contact with cedar, and pressure preservative and fire retardant treated materials; hot dipped galvanized for all other purposes.
- .3 Screws for Fastening to Cold-Formed Metal Framing: to ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened; double hot dipped galvanized.
- .4 Rough Hardware (bolts, nuts, washers, etc.): double hot dip galvanized in conformity to CSA G164 or Grade A low carbon steel, conforming to ASTM A307.
- .5 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.
- .6 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Consultant.
- .7 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, fibre, formed to prevent dishing; hot dip galvanized. Bell or cup shapes not acceptable.
- .8 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead plugs, recommended for purpose by manufacturer; hot dip galvanized.
- .9 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Consultant.

- .10 Shear wall hold down connectors:
 - .1 Galvanized
 - .2 Minimum factored tensile resistance: 9 kN (2033 lbs)
 - .3 Minimum height: to accommodate 2-16mm diameter bolts.
 - .4 Width to accommodate 1-16mm diameter anchors
- .11 Column anchors:
 - .1 Plates: to CSA G40.20/G40.21
 - .2 Anchors: to CSAG30.18 weldable low alloy steel deformed bars to CSAG30.18
 - .3 Anchor bolts: to ASTM F1554, grade A36

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.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 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 Select exposed framing for appearance. Install materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .6 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .7 Countersink bolts where necessary to provide clearance for other work.
- .8 Install specified panel product for each application.
- .9 Install combined subfloor and underlay with panel end-joints located on solid bearing, staggered at least 800 mm.

- .1 In addition to mechanical fasteners, floor panels secure floor subflooring to floor joists using screws. Place continuous adhesive bead in accordance with manufacturer's instructions, single-bead on each joist and double-bead on joists where panel ends butt.

3.4 CONSTRUCTION OF TREATED WOOD FOUNDATIONS

- .1 Construct preserved wood foundation in accordance with CAN/CSA-S406.
- .2 Place cut ends up where studs cut to length.
- .3 Treat cuts and holes.

3.5 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 fasteners.
- .5 Install sleepers as indicated.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.. 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 11 00 – General Requirements: Cleaning.

3.7 WASTE MANAGEMENT

- .1 Separate waste materials for recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.
- .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.

3.8 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 CSA Group (CSA)
 - .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA O80 Series-15, Wood Preservation.
 - .3 CSA O86 Consolidation-19, Engineering Design in Wood.
 - .4 CAN/CSA-Z809-16, Sustainable Forest Management.
- .3 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .4 Green Seal Environmental Standards (GS)
 - .1 GS-36-11, Commercial Adhesives.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .6 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.
- .7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2011, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .8 Sustainable Forestry Initiative (SFI)
 - .1 SFI-2010-2014 Standard.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood decking and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 11 00 – General Requirements: Health and Safety and 01 34 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia, Canada.
- .4 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

- .5 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
 - .3 Wood Certification: submit vendor's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.
 - .4 Low-Emitting Materials:
 - .1 Submit listing of adhesives and sealants, paints and coatings used in building, comply with VOC and chemical component limits or restriction requirements.
 - .2 Submit listing of composite wood products used in building, stating that they contain no added urea-formaldehyde resins, laminate adhesives used in building, stating that they contain no urea-formaldehyde.

1.3 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .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.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wood 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 of crates, pallets, packaging materials padding, as specified in Construction Waste Management Plan in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Wood decking: to NLGA standard Grading Rules for Canadian Lumber select grade Western Red Cedar x tongue and groove and "Veed" one side. Kiln dry decking to 15% maximum moisture content.
 - .1 CAN/CSA-Z809 or FSC or SFI certified.
- .2 Decking lengths: 1.8 to 6 m or longer with a minimum of 90% planks exceeding 3 m. Square end trimmed. For single spans shorter than 3 m use decking of same length as span.
- .3 Nails: to CSA B111, hot dipped galvanized finish; sizes to ASTM 653/653M and CSA O86. Supply 200 mm spiral spikes for lateral nailing.
- .4 Splines: galvanized metal, as recommended by decking manufacturer
- .5 Wood preservative: odourless chemical type to CSA O80 for natural finish.
- .6 Wood preservative: water borne type to CSA O80 for natural finish,
- .7 Adhesive and Sealants: in accordance with Section 07 92 00- Joint Sealants.
 - .1 Adhesives and Sealants: VOC limit 30 g/L maximum to GS-36.
 - .2 Coatings: VOC limit 350 g/L maximum to SCAQMD Rule 1113

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood decking installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

- .1 Do wood deck work to CSA O86 except where specified otherwise.
- .2 Install decking to CSA O86, continuous over two span pattern.
- .3 Supply minimum of 1 bearing support for each plank except extend cantilevers over two supports. Install sloping deck with tongues up. Join butt ends with splines to assure tight square fit.
- .4 Stagger end joints in adjacent planks minimum of 0.5 m.
 - .1 Separate joints in same area by at least 2 intervening courses.
 - .2 Avoid joints in first fifth of end spans.
 - .3 Minimize joints in middle third of span.
- .5 Apply preservative to end cuts of pressure treated lumber.

3.3 FIELD QUALITY CONTROL

- .1 Testing:

- .1 Contractor will pay for costs of testing in accordance with Section 01 11 00 – General Requirements: Payment Procedures for Testing.
- .2 Testing moisture content of delivered material will be by moisture metre with adjustments for species and temperature.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
 - .3 Waste Management: separate waste materials for recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA O80 Series-15, Wood Preservation.
 - .2 CSA O86 Consolidation-19, Engineering Design in Wood.
 - .3 CSA O141-05(R2019), Softwood Lumber.
 - .4 CSA S307-M1980(R2006), Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
 - .5 CSA S347-14(R2018), Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
 - .6 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel.
 - .7 CAN/CSA-Z809-16, 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 - 2014, 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.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: 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 Nova Scotia, 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 Indicate arrangement of webs or other members to accommodate ducts and other specialties.
 - .7 Show location of lateral bracing for compression members.
 - .8 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.
 - .9 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .10 Instructions: submit manufacturer's installation instructions.
- .4 Sustainable Design Submittals:
- .1 Construction Waste Management:
 - .1 Submit project Waste Reduction Workplan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50 % of construction wastes were recycled or salvaged.
 - .3 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages of recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.
 - .4 Wood Certification: submit manufacturer's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.

1.3 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.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 11 00 – General Requirements: Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:

- .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect 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.
- 4 Develop Construction Waste Management Plan related to Work of this Section.
 - 5 Packaging Waste Management: remove for reuse of crates, pallets, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

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 loads indicated and minimum uniform and minimum concentrated loadings stipulated in NBC commentary.
- .4 Limit live load deflection to 1/360th of span where gypsum board ceilings are hung directly from trusses.
- .5 Limit total service load deflections to 1/180th of span unless otherwise specified or indicated.
- .6 Limit snow load deflections to 1/240th of span unless otherwise specified or indicated.
- .7 Provide camber for trusses as indicated.

2.2 MATERIALS

- .1 Lumber: SPF No. 1/2, with maximum moisture content of 8 % 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.

2.3 FABRICATION

- .1 Fabricate wood trusses in accordance with approved shop drawings.
- .2 Provide for design camber and roof slopes when positioning truss members.
- .3 Connect members using metal connector plates.

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 preservative or fire-retardant 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.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 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 as indicated and in accordance with approved shop drawings.
- .2 Handling, installation, erection, bracing and lifting in accordance with manufacturers 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 approved shop drawings, prior to application of loads to trusses.
- .7 Do not cut or remove any truss material without approval of Consultant.
- .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 During progress of work at 75% complete.
- .2 Upon completion of work, after cleaning is carried out.
- .3 Provide certification report from manufacturer. Report to be certified by Professional Engineer (licensed to practice in NB) that all work was completed in accordance with specifications.
- .4 Obtain reports within 5 days of review and submit immediately to Consultant.

3.5

CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 05 50 00 - Metal Fabrications.
- .2 Section 06 10 00 - Rough Carpentry.
- .3 Section 07 92 00 - Joint Sealants: Sealant materials and application.
- .4 Section 09 91 00.08 - Painting for Minor Works: finishing materials and application.
- .5 Division 22: templates for plumbing fixtures.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/ASME 18.6.1 1981 (R2012) Wood Screws (Inch Series).
 - .2 ANSI/BHMA A156.9-2010, Cabinet Hardware.
 - .3 ANSI/BHMA A156.11-2014, Cabinet Locks.
 - .4 ANSI/BHMA A156.16-2013, Auxiliary Hardware.
 - .5 ANSI/BHMA A156.18-2012, Materials and Finishes.
 - .6 ANSI/BHMA A156.20-2006, Strap and Tee Hinges and Hasps.
 - .7 ANSI A208.1-09, Particleboard.
 - .8 ANSI A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
 - .9 ANSI/HPVA HP-1-09, Standard for Hardwood and Decorative Plywood.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 North American Architectural Woodwork Standards (NAAWS) 4.0, including errata through 12/01/2021.
- .3 ASTM International
 - .1 ASTM A 153/A 153M-16, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

- .2 ASTM E 1333-14, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
- .3 ASTM F1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
 - .2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
 - .3 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable.
- .5 CSA Group (CSA)
 - .1 CSA O112-M Series 1977 (R2006) Standards for Wood Adhesives.
 - .2 CSA O121-08 (R2013), Douglas Fir Plywood.
 - .3 CSA O141-05 (R2014), Softwood Lumber.
 - .4 CSA O151-14, Canadian Softwood Plywood.
 - .5 CSA O153-M1980 (R2014), Poplar Plywood.
 - .6 CAN/CSA-Z809-08 (R2013), Sustainable Forest Management.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .7 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Prepare and submit material list in accordance with AWMAC AWS, cross-referenced to specifications.
 - .2 Include manufacturer's instructions, printed product literature, data sheets and catalogue pages for all materials and products to be incorporated into architectural wood casework and include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.

- .3 Submit WHMIS SDS.
- .2 Hardware List:
 - .1 Submit hardware list cross-referenced to specifications.
 - .2 Include manufacturer's specification sheets indicating name, model, material, function, finish, BHMA designations and other pertinent information.
- .3 Shop Drawings:
 - .1 Prepare and submit shop drawings in accordance with AWMAC AWS and as follows.
 - .2 Submit shop drawings for initial review in accordance with requirements of Division 01.
 - .3 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .1 Scales: profiles full size, details half full size.
 - .4 Indicate materials, thicknesses, finishes and hardware.
 - .5 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
 - .6 Show location on casework elevations of backing required in supporting structure for attachment of casework.
 - .7 Indicate AWMAC AWS quality grade where different from predominant grade specified.
 - .8 Include color schedule of all casework items, including all countertop, exposed, and semi-exposed cabinet finishes, finish material manufacturer, pattern, and color.
- .4 Samples:
 - .1 Prepare and submit samples in accordance with NAAWS and as follows.
 - .2 Apply sample finishes to specified substrate or core material minimum 300 x 300 mm. For veneers with transparent finish submit three samples to illustrate range and colour of grain expected.
 - .3 Shop applied coatings:

- .1 For transparent finish, submit duplicate samples of each species and cut of wood to be used, finished as specified.
- .2 For opaque finish, submit duplicate samples for each colour selection, finished as specified.
- .4 Submit duplicate samples of laminated plastic for each specified colour selection.
- .5 Submit duplicate samples of laminated plastic joints, edging, cutouts and post-formed profiles.
- .6 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .7 Submit statement of experience and qualifications of architectural wood casework fabricator.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver wood casework only when area of work is enclosed, plaster and concrete work is dry, and area is broom clean and site environmental conditions are acceptable for installation.
- .2 Protect millwork against dampness and damage during and after delivery.
- .3 Store millwork in ventilated areas, protected from extreme changes of temperature and humidity, and within range recommended by NAAWS for location of project.

PART 2 PRODUCTS

2.1 PANEL MATERIALS

- .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .3 Poplar plywood (PP): to CSA O153, standard construction.

2.2 LAMINATED PLASTIC MATERIALS

- .1 Laminated plastic for flatwork: to NEMA LD3.
 - .1 Solid phenolic plastic laminate: to NEMA LD 3 and SEFA 8, decorative, homogeneous, solid core phenolic composite panels, self-supporting, finished 1-side only, backs sanded.

- .1 Type: Self-supporting (SS).
- .2 Size: 19 mm.
- .3 Colour: black core, coloured face.
- .4 Pattern: printed pattern.
- .5 Finish: fine beaded surface texture.
- .6 Acceptable material:
 - .1 Arborite Solid Compact Laminate.
 - .2 Formica Compact Structural Laminate.
 - .3 Wilsonart Compact Laminate.

2.3 LAMINATED PLASTIC VANITY FABRICATION

- .1 Do laminated plastic fabrication in compliance with NEMA LD3, Annex A and specified AWMAC AWS quality grade.
- .2 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .3 Finish edges smooth.
- .4 Counter and backsplash: join backsplash to counter with fasteners and adhesive recommended by manufacturer. Adhere counter to plywood backing. Adhere backsplash to wall.
- .5 Apron and gables:
 - .1 Support bracket internally threaded fastener: crimping insert nut.
 - .2 Apron screw into internally threaded fastener (installed to steel support brackets) with stainless steel 10 mm - 16 flat head socket cap screw, countersink flush.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied
.....

3.2 INSTALLATION

- .1 Install architectural wood casework in accordance with NAAWS grade for respective items.
- .2 Install prefinished millwork at locations shown on drawings.
 - .1 Position accurately, level, plumb straight.
- .3 Fasten and anchor millwork securely.
 - .1 Supply and install heavy duty fixture attachments for wall mounted cabinets.
- .4 Countersink mechanical fasteners at exposed and semi-exposed surfaces, excluding installation attachment screws and screws securing cabinets end to end.
- .5 Use draw bolts in countertop joints.
- .6 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.
- .7 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants.
- .8 Apply moisture barrier between wood framing members and masonry or cementitious construction.
- .9 Fit hardware accurately and securely in accordance with manufacturer's written instructions.
- .10 Make cutouts for inset equipment and fixtures using templates provided.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 09 21 16 - Gypsum Board Assemblies.
- .2 Section 06 10 53 - Miscellaneous Rough Carpentry.

1.2 REFERENCE STANDARDS

- .1 Underwriters Laboratories of Canada (ULC)
 - .1 ULC 702.1, Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification (CAN/ULC-S702.1:2014-AMD1)
 - .2 ULC 702.2, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines (ULC S702.2-15)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

PART 2 PRODUCTS

2.1 INSULATION

- .1 Batt and blanket mineral fibre: to CAN/ULC-S702.1.
 - .1 Type: 1.
 - .2 Thickness: to suit partition thickness; equal to full depth of stud cavity.
 - .3 Noise Reduction Coefficient (NRC), to ASTM C423:

- .1 75 mm thickness: 1.05.
- .2 100 mm thickness: 1.10.
- .2 Acoustic Insulation: batt and blanket insulation to CAN/ULC-S702.1.
- .3 Thermal Insulation: batt and blanket insulation to CAN/ULC-S702.1.
 - .1 Type: 1.
 - .2 Thickness: to suit partition thickness; equal to full depth of stud cavity.
 - .3 Minimum RSI/mm: 0.02318 (m²·K)/W.

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 blanket insulation application in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied
.....

3.2 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ULC 702.2.
- .2 Install insulation in exterior walls and interior partitions to meet acoustic and thermal insulation requirements of building elements and spaces.
- .3 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .4 Do not compress insulation to fit into spaces.
- .5 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 09 21 16 - Gypsum board assemblies: Air and vapour control (AVC) membrane specified in this section.

1.2 ABBREVIATIONS

- .1 AVC: Air and Vapour Control.

1.3 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C518-17, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .2 ASTM C1015-17. Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.
 - .3 ASTM E970-17. Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102.2-10, Standard Methods for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
 - .2 CAN/ULC-S129-15. Standard Method of Test for Smoulder Resistance of Insulation (Basket Method).
 - .3 CAN/ULC-S703-09-R2015, Standard for Cellulose Fibre Insulation (CFI) for Buildings.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS)

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation meetings:

- .1 Convene a pre-installation meeting two (2) weeks before beginning work of this Section or on-site preparation or installations. Installation contractor and Departmental Representative to verify the following:
 - .1 Project requirements.
 - .2 Submission of technical literature and Test reports.
 - .3 Preparation and installation procedures.
 - .4 Coordination with other building subtrades.
 - .5 Manufacturer's installation instructions.
 - .6 On-site testing and inspections.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria and limitations. Submit product data to confirm that insulation used in Project will meet or exceed specified performance requirements.
- .2 Submit product certificates signed by Manufacturer certifying materials compliance with specified performance characteristics and criteria and physical requirements.
- .3 Submit manufacturer's installation instructions. Include recommendations for preparation, special storage and handling. Include installation and cleaning procedures.
- .4 Submit manufacturers' recommendations for density testing of installed insulation. Submit standard test report form. Submit a copy of Manufacturers Certificate of Coverage.
- .5 Submit WHMIS Safety Data Sheet (SDS).
- .6 Submit evaluation report, test reports and listing from an independent recognized evaluation service or testing laboratory, indicating compliance with specifications for specified performance characteristics and physical properties.

1.6 QUALITY ASSURANCE

- .1 Installer: company specializing in pneumatic application of cellulose insulation with documented experience in closed (dense pack) applications. Submit copies of documents confirming experience to Departmental Representative for each installer to be employed on the project.

1.7 SITE CONDITIONS

- .1 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hours after application to maintain non-toxic, unpolluted and safe working conditions.
- .2 Provide temporary enclosures to prevent contaminating air beyond application area.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Loose fill cellulose insulation for open and closed blown application: to ASTM C739 and CAN/ULC-S703 (Type 1 - no adhesive additives). Wood based pure cellulose fibres, chemically impregnated to reduce corrosiveness, resist mould and mildew and provide fire resistant properties. Loose fill, unbonded fibres designed specifically for pneumatic application. Properties as follows:
 - .1 Thermal resistivity: design thermal resistance RSI value as indicated when tested in accordance with ASTM C518.
 - .1 Roof: RSI 7.28 m²·K/W
 - .2 Surface burning characteristics: to CAN/ULC-S102.2 ASTM E970.
 - .1 Flame spread:< 150
 - .2 Smoke developed: <50
 - .3 Smoulder resistance: to CAN/ULC-S129. 15 %.
 - .4 Design density: Closed (dense pack) applications: 56 kg per cubic meter calculated in accordance with CAN/ULC-S703.
 - .5 Settlement - open spaces: minimum 20 %

2.2 ACCESSORIES

- .1 Retention and AVC membrane: woven or non woven, reinforced, tear resistant and light weight translucent fabric. Designed for installation to interior face of wall or floor assembly to permanently retain insulation in place.
 - .1 Install according manufacturer instructions.
 - .2 Include manufacturer-recommended sealing tapes and other accessories.
 - .3 Acceptable material:

- .1 Intello Plus by Pro Clima.
- .2 Clima Control Net 145 by Rotho Blaas.
- .3 Majrex by Siga.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Comply with manufacturer's written installation instructions, including datasheets and technical bulletins. Comply with storage and handling instructions
- .2 Carry out all work relating to the application of insulation in accordance with ASTM C1015.

3.2 EXAMINATION

- .1 Verify that conditions of substrate are acceptable for insulation application in accordance with manufacturer's written instructions.
 - .1 Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.3 INSTALLATION - GENERAL

- .1 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .2 Apply products only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
- .3 Apply insulation when surfaces and ambient temperatures are within manufacturers' prescribed limits.
- .4 Apply insulation to clean dry surfaces only.
- .5 Apply insulation in thickness and as specified to obtain designed RSI value and as indicated.

- .6 Apply insulation to maintain continuity of thermal protection to building elements and spaces.
- .7 Apply blown insulation closely around electrical boxes, pipes, ducts, frames and other objects inside or passing through insulation.
- .8 Keep insulation at a minimum of 75 mm from heat emitting devices such as recessed light fixtures, and at a minimum of 50 mm from sidewalls of chimney and furnace vents.
- .9 Do not enclose insulation until it has been inspected and approved by Departmental Representative.
- .10 Protect installed products and accessories from damage during construction.

3.4 CLOSED CAVITY INSTALLATION

- .1 Preparation: Prepare the assembly before applying the insulation in closed cavities, such as a wall stud space or enclosed floor spaces.
- .2 Cut holes in AVC membrane on interior of building to receive blowing machine hose nozzle. Limit quantity of holes to the number required to install cellulose to specified density.
- .3 Insert the blowing machine hose nozzle through the air barrier and fill the cavity with the volume of insulation specified to obtain the desired RSI value at the specified density.
- .4 Seal holes with material recommended by manufacturer of Retention and AVC membrane.
- .5 Test the density of the installed insulation. Conduct a minimum of five (5) tests per surface for each room or area. Record the results in accordance with Manufacturers recommendations. Submit copies of Certificate of Coverage and test reports to Departmental Representative at end of each work day.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 07 62 00 - Sheet Metal Flashing and Trim
- .2 07 92 00 - Joint Sealants

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM E96/E96M-21, Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
 - .2 ASTM F1667-21, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .2 CSA Group (CSA)
 - .1 CSA O121-17), Douglas Fir Plywood.
 - .2 CSA O151-17, Canadian Softwood Plywood.
- .3 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001 V5-2-2015, FSC Principles and Criteria for Forest Stewardship.
- .4 National Lumber Grading Authority (NLGA)
 - .1 NLGA Standard Grading Rules for Canadian Lumber 2017.
- .5 ULC Standards (ULC)
 - .1 CAN/ULC-S706-09, Standard for Wood Fibre Insulating Boards for Buildings.
 - .2 CAN/ULC-S741 08, Standard for Air Barrier Materials - Specification.

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 siding and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate dimensions, siding and soffit profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, furring, and related work.
- .4 Samples:
 - .1 Submit duplicate samples of siding, soffit, and trim.
- .5 Sustainable Design Submittals:
 - .1 Wood Certification: submit vendor's Chain-of-Custody Certificate number for FSC-certified wood.

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 installed products for incorporation into manual.
- .3 Warranty Documentation: submit warranty documents specified.

1.5 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wood siding from nicks, scratches, and blemishes.

- .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: as specified in Section 07 74 19 - Waste Management and Disposal.

1.7 SITE CONDITIONS

- .1 Execute work of this Section within environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer.

1.8 WARRANTY

- .1 Warranty Period: to commence at time of Substantial Completion.
 - .1 15 years against cracking, peeling, blistering, chalking, loss of coating adhesion, yellowing with age, damage from rinse cleaning surface dirt.
 - .2 55 years against rot.
 - .3 60 years against stainless steel nail corrosion.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Lumber siding: to NLGA Standard Grading Rules for Canadian Lumber.
 - .1 Boards and battens: Natural Murray pine or Eastern spruce species, select structural grade, 16 mm thickness, 229 mm board width, 64 mm batten width.
 - .2 FSC certified.
- .2 Accessories: exposed trim, closures, and cap pieces of manufacturer's standard,
- .3 Strapping: Softwood lumber, kiln dried, treated with brush applied wood preservative.
- .4 AB-WRB: Self-adhesive permeable air barrier and water-resistive barrier: vapour-permeable, watertight, polymer mebrane sandwiched between layers of spun-bonded polypropylene fabric. Adhesive is factory applied to the bottom layer of polypropylene and protected with release paper.
 - .1 Water vapor transmission:
 - .1 Between 200 and 220 g/m²/24 h to ASTM E96/E96M, Proc. A.
 - .2 Between 320 and 350 g/m²/24 h to ASTM E96/E96M, Proc. B.

- .5 AB-WRB Flashings: Self-adhesive membrane or liquid applied material, compatible with AB-WRB.
 - .1 For vertical surfaces and inverted surfaces: vapour permeable.
 - .2 For sills and other horizontal surfaces: vapour impermeable.
- .6 Fasteners: nails to ASTM F1667, sized as required, smooth shank type.
 - .1 Exposed: stainless steel, oval head.
 - .2 Concealed: galvanized by hot dip method, flat head.
- .7 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

2.2 FINISH

- .1 Pre-finish colour: thermoplastic acrylic latex emulsion, factory coated under controlled environment conditions by a modified vacuum coat method, one prime coat and one finish coat, applied to all board surfaces, minimum 0.15 mm dry film thickness.
 - .1 Consultant to select colour from manufacturer's standard range of colours.
 - .2 Touch-up paint: thermoplastic acrylic latex emulsion, same type and colour as siding.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts acceptable in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions are remedied.

3.2 PREPARATION

- .1 Clean surfaces thoroughly prior to installation.
- .2 Repair substrate flaws or defects before applying siding or soffits.
- .3 Fur surfaces to even plane and free from obstructions.

- .4 Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under project conditions.

3.3 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.

3.4 INSTALLATION

- .1 Install AB-WRB lapping edges per manufacturer instructions. Lap to direct water down and out.
 - .1 Seal openings and penetrations with AB-WRB flashing material.
- .2 Install siding to manufacturers' written instructions.
- .3 Install sill flashings, wood starter strips, inside corner flashings, edgings and flashings over openings.
- .4 Fasten wood siding in straight, aligned lengths to strapping at nails at each fixing location. Cut butt joints at 45 degrees. Paint cut surfaces.

3.5 PROTECTION

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 07 62 00 - Sheet Metal Flashing and Trim.

1.2 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 DAF-45-R03, Designation System for Aluminum Finishes - 9th Edition.
 - .2 ASM-35-October 2000, Specifications for Aluminum Sheet Metal Work in Building Construction, Section 5.
- .2 ASTM International
 - .1 ASTM A167-99 (2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A240/A240M-11a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .3 ASTM A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .4 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
 - .5 ASTM B32-08, Standard Specification for Solder Metal.
 - .6 ASTM B370-11, Standard Specification for Copper Sheet and Strip for Building Construction.
 - .7 ASTM D523-89 (2008), Standard Test Method for Specular Gloss.
 - .8 ASTM D822-01 (R2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 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.
- .4 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .4 CSA Group (CSA)
 - .1 CSA A123.3-05 (2010), Asphalt Saturated Organic Roofing Felt.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (SDS).
- .6 National Building Code of Canada 2015 (NBC).
 - .1 CCMC- Registry of Product Evaluations.
- .7 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for sheet metal roofing and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Proof of manufacturer's CCMC listing and listing number.
 - .3 Submit WHMIS SDS.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
- .3 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of each sheet metal material.
- .4 Sustainable Design Submittals:

PART 2 PRODUCTS

2.1 SHEET METAL MATERIALS

- .1 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 37 with AZ180 coating, regular spangle surface prefinish, chemically treated (passivated) for unpainted finish, 24 ga base metal thickness.

2.2 SHEET STEEL PANS

- .1 Aluminum-zinc alloy coated steel sheet: preformed in pans for standing seam roofing.
 - .1 Pan width: between 305 and 356 mm.
 - .2 No stiffening flutes.
 - .3 Concealed hold-down clips

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB-37.5.
- .3 Underlay: vapour permeable (1716 ng/Pa•s•m², +/- 15%) self-adhering roofing underlayment for high-temperature applications, spun-bonded polyester fabric laminated to modified rubberized asphalt backing with split release silicone liner.
- .4 Sealant: Type 1, per Section 07 92 00.
- .5 Sealant tape: Butyl tape as recommended by manufacturer.
- .6 Cleats: of same material, and temper as sheet metal: 50 mm minimum wide.
- .7 Fasteners: concealed.
- .8 Touch-up paint: as recommended by sheet metal roofing manufacturer.
- .9 Snow Guard: Pre-engineered two-rail sliding snow guard system; mounted to standing seam ribs without penetration of sheet metal roofing.
 - .1 Rails: Ø9.5 mm stainless steel rod, with couplings as required.
 - .2 Posts: Stainless steel, threaded for fastening to mounting clamps, pre-drilled for rails.

- .3 Mounting clamps: aluminum, purpose-made, approved by manufacturer for use on standing seam profile.
 - .1 Slotted to receive roof seam and with two set screws to clamp to roof seam.
 - .2 Threaded hole to receive posts.

2.4 FABRICATION

- .1 Form individual pieces in single lengths extending from ridge to eaves. Make allowances for expansion at joints.
- .2 Hem exposed edges on underside 12 mm, mitre and seal.
- .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 dissimilar metals against oxidization by backpainting with isolation coating where indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sheet metal roofing installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Use concealed fastenings except where approved in writing by Departmental Representative before installation.
- .2 Install self-adhering underlay per manufacturer's instructions.
- .3 Install sheet metal roof panels using cleats spaced at 600 mm maximum on centre.

- .4 Secure cleats with 2 fasteners each and cover with cleat tabs.
- .5 Flash roof penetrations with material matching roof panels, and make watertight.
- .6 Flash roof penetrations with purpose-made accessories recommended by manufacturer, matching roof panels, and make watertight.
- .7 Form seams in direction of water-flow and make watertight.

3.3 STANDING SEAM ROOFING

- .1 Fold lower end of each pan under 20 mm.
 - .1 Slit fold 25 mm away from corner to form tab where pan turns up to make standing seam.
 - .2 Fold upper end of each pan over 50 mm.
 - .3 Hook 20 mm fold on lower end of upper pan into 50 mm fold on upper end of underlying pan.
- .2 Apply sheet metal roofing beginning at eaves. Loose lock pans to valley flashing and edge strips at eaves and gable rakes.
- .3 Finish standing seams 38 mm high with 90 degree seam.
 - .1 Install butyl tape along full length of seams.
 - .2 Fold lower ends of seams at eaves over at 45 degrees angle.
 - .3 Terminate standing seams at ridge and hips by turning down in tapered fold.
- .4 Form valleys of sheets not exceeding 3 m in length. Lap joints 150 mm in direction of flow.
 - .1 Extend valley sheet minimum 150 mm under roofing sheets.
 - .2 At valley line, double fold valley and roofing sheets and secure with cleats spaced 450 mm on centre.
- .5 Install continuous snow guard along lower eave.
 - .1 Follow manufacturer's instructions and recommendations.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 07 61 00 - Sheet Metal Roofing: Roof system trim.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A 792/A 792M-10 (2015), Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .2 ASTM F1667-21 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .2 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI Sheet Steel Facts #12 2003 Fastener Guide for Sheet Steel Building Products.
- .3 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA)
 - .1 Architectural Sheet Metal Manual (2012)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature including product specifications and technical data sheets for sheet metal flashing fasteners and accessory materials. Include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS SDS - Material Safety Data Sheets.
- .2 Shop Drawings:
 - .1 Submit shop drawings indicating dimensions, profiles, and attachment methods.
 - .2 Indicate sheet thickness, flashing dimensions and fastenings. Include anchorage, expansion joints and other provisions for thermal movement.
 - .3 Provide details of flashing joints and laps.

- .4 Provide details of flashing connection to wall cladding and roof membranes.
- .5 Submit manufacturer's catalogue cut sheets for manufactured items.
- .3 Samples:
 - .1 Submit duplicate 50 × 50 mm samples of each type of sheet metal material, finishes and colour.

PART 2 PRODUCTS

2.1 BASE SHEET METAL MATERIALS

- .1 Provide sheet metal in base metal thickness specified. Where no thickness specified, provide base sheet metal in thickness recommended in SMACNA Architectural Sheet Metal Manual for type of item being fabricated, but not less than the thickness required by the authority having jurisdiction.
- .2 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 37 with AZ180 coating, regular spangle surface, not chemically treated for paint finish, 0.91 mm base metal thickness.

2.2 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Pourable sealer: proprietary two-part polyurethane pourable sealer designed for sealing penetration pockets.
- .3 Self-adhesive membrane underlay and tie-in membrane for metal flashings: To CSA A123.22 or ASTM D1970, minimum 1.5 mm thickness.
- .4 Sealants: Type 1 in accordance with Section 07 92 00, in colour to match flashing finish colour.
- .5 Cleats and hook strips: of same material, and temper as sheet metal, minimum 50 mm wide and continuous where indicated. Thickness 1 gauge heavier than sheet metal being secured.
- .6 Screws, hidden: of same material as sheet metal, suitable for substrate and material being fastened, to CSSBI S8 and ASTM F1667.
- .7 Screws, exposed: stainless steel, suitable for substrate and material being fastened, coloured head, neoprene washer, to CSSBI S8 and ASTM F1667.

2.3 FABRICATION

- .1 Fabricate sheet steel flashings and other sheet steel work in accordance with applicable CRCA 'FL' series details.
- .2 Form pieces in 2400 mm maximum lengths.
 - .1 Make allowance for expansion at joints.
- .3 Hem exposed edges on underside 12 mm.
 - .1 Mitre and seal corners with sealant.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.4 METAL FLASHINGS

- .1 Form flashings, copings and fascias of steel sheet, matching roof material, to profiles indicated.

2.5 EAVES TROUGHS AND DOWNPIPES

- .1 Form eavestroughs from steel sheet matching roof material.
- .2 Sizes and profiles as indicated.
- .3 Trough Supports: continuous aluminum with a perforated aluminum cover that covers the complete trough to prevent debris from entering the trough and downpipe.
- .4 Provide outlets, goosenecks, downpipes, strainer baskets and necessary fastenings.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install sheet metal work CRCA FL series details.

- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal.
 - .1 Adhere in place and lap joints 100 mm. Tie into adjacent assemblies.
- .4 Lock end joints and caulk with sealant.
- .5 Where flashing installed with mechanical fasteners, install fasteners in slots or oversize holes to allow expansion and contraction of flashings.
- .6 Provide isolation coating or impervious self-adhesive membrane to separate aluminum items from concrete and masonry.

3.3 EAVESTROUGHS AND DOWNPIPES

- .1 Install eavestroughs and secure to building at 750 mm on centre.
 - .1 Install trough supports/debris catchers to provide a continuous slope to drain all water from the trough to downpipes.
 - .2 Install the trough and snap in to the supports (no exposed screws or nails permitted).
 - .3 Seal joints watertight.
- .2 Install downpipes and provide goosenecks back to wall.
 - .1 Secure downpipes to wall with straps at 760 mm on centre; minimum three straps per downpipe.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 04 05 00 - Common Work Results for Masonry
- .2 Section 06 44 00 - Architectural Woodwork

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM C919-18, Standard Practice for Use of Sealants in Acoustical Applications.
 - .2 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
- .3 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-A2017 A2017, Adhesives and Sealants Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Manufacturer's product to describe:

- .1 Caulking compound.
- .2 Primers.
- .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Submit WHMIS SDS.
- .2 Samples:
 - .1 Submit 2 samples of each type of material and colour.
 - .2 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .3 Manufacturer's Instructions:
 - .1 Submit instructions to include installation instructions for each product used.
- .4 Sustainable Design Submittals:

1.4 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

1.5 QUALITY ASSURANCE

- .1 Submit validation certificate issued by Sealant Waterproofing & Restoration Institute (SWRI) for products indicated.

1.6 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Proceed with installation of joint sealants only when:
 - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
 - .2 Joint substrates are dry.
 - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

- .2 Joint-Width Conditions:
 - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 ENVIRONMENTAL 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 Safety Data Sheets (SDS) acceptable to Health Canada.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Type 1 - Silicones one part.
 - .1 Non-sag.
 - .2 100% silicone, SWRI validated, room temperature vulcanizing (RTV), neutral cure.
 - .3 Classification, to ASTM C920: Type S, Grade NS, Class 50, Use NT, G, M, A, O.
 - .4 Movement capability, to ASTM C719: -50% to +50% movement.
 - .5 VOC Content: less than 90 g/l.

- .6 Colours: to be selected from manufacturer's complete range.
- .2 Type 2 - Silicones one part.
 - .1 Self-levelling.
 - .2 100% silicone, room temperature vulcanizing (RTV), neutral cure.
 - .3 Classification, to ASTM C920: Type S, Grade P, Class 100/50 , Use NT.
 - .4 Movement capability, to ASTM C719: -50% to +100% movement.
 - .5 VOC Content: less than 30 g/l.
 - .6 Colours: to be selected from manufacturer's complete range.
- .3 Type 3 - Silicones one part.
 - .1 Non-sag, mildew-resistant.
 - .2 100% silicone, room temperature vulcanizing (RTV), neutral cure.
- .4 Type 4 - Acrylic latex one part: to CAN/CGSB-19.17
 - .1 Acceptable material:
 - .1 Tremco 100 latex.
 - .2 Sonneborn Sonolac.
 - .3 GE Acryseal.
- .5 Type 5 - Acoustical sealant: to ASTM C919
 - .1 Acceptable material:
 - .1 Tremco Spectrem 2.
 - .2 Dow 795.
 - .3 OSI Draft & Acoustical.
- .6 Preformed compressible and non-compressible back-up materials:
 - .1 Polyethylene, urethane, neoprene or vinyl foam:
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30 to 50 %.

- .2 Polychloroprene ("Neoprene") or Butyl Rubber:
 - .1 Round solid rod, Shore A hardness 70.
- .3 High density foam:
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
- .4 Bond breaker tape:
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

- .1 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block, precast masonry): sealant type: 1.
- .2 Expansion and control joints in exterior surfaces of poured-in-place concrete walls: sealant type: 1.
- .3 Coping joints and coping-to facade joints: sealant type: 1.
- .4 Exterior joints in horizontal wearing surfaces: sealant type: 2.
- .5 Interior perimeters of exterior openings as detailed on drawings: sealant type: 1.
- .6 Perimeters of interior frames: sealant type: 4.
- .7 Control and expansion joints on the interior of exterior poured-in place concrete walls: sealant type: 1.
- .8 Interior control and expansion joints in floor surfaces: sealant type: 2.
- .9 Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, water closets, basins, vanities): sealant type: 3.
- .10 Exposed interior control joints in drywall: sealant type: 4.
- .11 Concealed joints in vapour barrier and between other components comprising vapour barrier of building envelope where concealed: sealant type: 5.

2.4 JOINT CLEANER

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.

- .2 Primer: in accordance with sealant manufacturer's written recommendations.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- .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.
- .6 Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

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 Sealant:
 - .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.
- .2 Curing:
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.

3.7 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
 - .2 Clean adjacent surfaces immediately.
 - .3 Remove excess and droppings, using recommended cleaners as work progresses.
 - .4 Remove masking tape after initial set of sealant.

3.8 PROTECTION

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

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 07 92 00 - Joint Sealing.
- .2 Section 08 71 10 - Door Hardware.
- .3 Section 09 91 00.08 - Painting for Minor Works: paint for steel doors and frames
- .4 Division 23: Door Grilles.

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-20, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
 - .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .3 CSA Group (CSA)
 - .1 CSA G40.20-13/G40.21-13 (R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014)
 - .2 CSA W59-18, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2006.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 2009.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-22, Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-22, Standard Methods of Fire Tests of Door Assemblies.

- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 ULC 104, Standard Method for Fire Tests of Door Assemblies (CAN/ULC S104-15).
 - .2 ULC 105, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104 (CAN/ULC-S105:2016).
 - .3 ULC 701.1, Standard for Thermal Insulation, Polystyrene Boards (2017)
 - .4 ULC 702.1, Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification (CAN/ULC-S702.1:2014-AMD1)
 - .5 ULC 704.1, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced (2017)

1.3 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.
 - .2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide shop drawings:
 - .1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, arrangement of hardware fire rating and finishes.
 - .2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.
 - .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
 - .4 Submit test and engineering data, and installation instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A 653M, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts. All interior doors and frames to have coating designation to ZF75 (wipe coat). All exterior doors and frames to have coating designation to Z275 (G-90).
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M, ZF75.

2.2 DOOR CORE MATERIALS

- .1 Stiffened: face sheets laminated and welded, insulated core..
- .2 Fibreglass: to ULC 702.1, semi-rigid, density 24 kg/m³.
- .3 Polyurethane: to ULC 704 rigid, modified poly/isocyanurate, closed cell board. Density 32 kg/m³.
- .4 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250 degrees C at 60 minutes. Core to be tested as part of a complete door assembly, in accordance with CAN4-S104, or NFPA 252, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.

2.3 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .2 Polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.
- .3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.4 PRIMER

- .1 Touch-up prime CAN/CGSB-1.181.
 - .1 Maximum VOC limit 50 g/L to GC-03.

2.5 PAINT

- .1 Shop painting of steel doors and frames by this section, as specified in Section 09 91 00.08 - Painting for minor works.

2.6 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Exterior and interior caps: steel.
- .3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .4 Door bottom seal: refer to Section 08 71 00.
- .5 Metallic paste filler: to manufacturer's standard.
- .6 Sealant: per Section 07 92 00.

2.7 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: 1.6 mm welded, thermally broken type construction.
- .4 Blank, reinforce, drill and tap frames for mortised, templated hardware, electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .5 Protect mortised cutouts with steel guard boxes.
- .6 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .7 Manufacturer's nameplates on frames and screens are not permitted.
- .8 Conceal fastenings except where exposed fastenings are indicated.
- .9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .10 Insulate exterior frame components with polyurethane insulation.

2.8 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jamb and intermediate at 660 mm on centre maximum.

2.9 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
- .7 Insulate exterior frame components with polyurethane insulation.

2.10 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Exterior doors: hollow steel construction.
- .3 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .4 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.
- .5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

- .6 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .8 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with ULC 104 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.
- .9 Manufacturer's nameplates on doors are not permitted.

2.11 HOLLOW STEEL CONSTRUCTION

- .1 Form face sheets for exterior doors from 1.6 mm sheet steel.
- .2 Form face sheets for interior doors from 1.2 sheet steel.
- .3 Reinforce doors with vertical stiffeners, securely welded to face sheets at 150 mm on centre maximum.
- .4 Fill voids between stiffeners of exterior doors with polyurethane core.

2.12 THERMALLY BROKEN DOORS AND FRAMES

- .1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.
- .2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Apply insulation.

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 GENERAL

- .1 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .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 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.
- .5 Caulk perimeter of frames between frame and adjacent material.
- .6 Maintain continuity of air and vapour control control membranes.

3.4 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Doors Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.
 - .3 Finished floor, and thresholds: 13 mm.
- .3 Adjust operable parts for correct function.
- .4 Install louvres.

3.5 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 08 80 00 – Glazing.

1.2 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 AAMA/WDMA/CSA 101/I.S.2/A440-11 (R2016), NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.
 - .2 CSA A440S1-09, Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.
 - .3 CAN/CSA-A440.4-07 (R2016), Window, Door, and Skylight Installation

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 windows and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate materials and details in full size scale for head, jamb and sill, profiles of components, interior and exterior trim elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes fasteners, and caulking. Indicate location of manufacturer's nameplates.
 - .2 Indicate locations, dimensions, openings and requirements of related work.
- .4 Test and Evaluation Reports:
 - .1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications.
 - .2 All test reports that reference the NAFS must include, on the first page, a summary of the results including, at minimum:

- .1 The product manufacturer.
- .2 The type of product.
- .3 The model number/series number.
- .4 The primary product designation.
- .5 The secondary product designation.
 - .1 Positive design pressure.
 - .2 Negative design pressure.
 - .3 Water penetration resistance test pressure.
 - .4 Canadian air infiltration and exfiltration levels.
- .6 The test completion date.
- .3 The report will also contain the following information:
 - .1 Test dates.
 - .2 Report preparation dates.
 - .3 Test information retention period.
 - .4 Location of testing facilities.
 - .5 Full description of test samples, including:
 - .1 Condensation resistance.
 - .2 Safety drop - vertical sliding windows only.
 - .3 Block operation - sliding windows only.
 - .4 Forced entry resistance.
 - .6 Complete description of amendments, as applicable.
 - .7 Conclusion.
 - .8 Drawings signed by the testing laboratory, if provided.

1.4 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for windows for incorporation into manual.

1.5 WARRANTY

- .1 Provide a written warranty for work under this section from manufacturer for failure due to defective materials and from contractor for failure due to defective installation and workmanship, for five (5) years respectively from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Materials: to AAMA/WDMA/CSA 101/I.S.2/A440 supplemented as follows:
 - .2 Windows by same manufacturer.
 - .3 Main frame: vinyl.
 - .4 Glass: Type G1, in accordance with Section 08 80 50 - Glazing.

2.2 WINDOW TYPE AND CLASSIFICATION

- .1 Product types :
 - .1 FW- Fixed window.
 - .1 Acceptable material:
 - .1 Kohler Supreme.
 - .2 Atlantic Designer Series.
 - .3 Jeld-Wen Premium Vinyl.
 - .2 Classification rating: to AAMA/WDMA/CSA 101/I.S.2/A440.
 - .1 Surface condensation control: compliant with standard CAN/CSA-A440.2/A440.3.
 - .2 Air tightness: fixed.
 - .3 Water tightness: B7.

- .4 Forced Entry: F1.

2.3 FABRICATION

- .1 Fabricate in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 supplemented as follows:
- .2 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less, and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.
- .3 Face dimensions detailed maximum permissible sizes.
- .4 Brace frames to maintain squareness and rigidity during shipment and installation.
- .5 Finish steel clips and reinforcement with 380 g/m² zinc coating to ASTM A123/A123M.

2.4 VINYL FINISHES

- .1 Vinyl finishes: in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, including appendices, supplemented as follows:
 - .1 Custom foil or paint colour to later selection by Departmental Representative from manufacturer's complete range.

2.5 GLAZING

- .1 Glaze windows in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Window installation:
 - .1 Install in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - .2 Arrange components to prevent abrupt variation in colour.
- .2 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 window units except where exposed use is permitted by Departmental Representative.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK

- .1 Section 08 11 00 - Metal Doors & Frames
- .2 Division 26: Electrical wiring for and hook-up of all electrical hardware specified in this section.

1.2 REFERENCE STANDARDS

- .1 Standard hardware location dimensions in accordance with the Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers Association.
- .2 ANSI/BHMA A156.1–2016, Butts and Hinges.
- .3 ANSI/BHMA A156.2–2017, Bored and Preassembled Locks and Latches.
- .4 ANSI/BHMA A156.3–2014, Exit Devices.
- .5 ANSI/BHMA A156.4–2019, Door Control-Closers.
- .6 ANSI/BHMA A156.5-2020, Cylinders and Input Devices for Locks.
- .7 ANSI/BHMA A156.6-2015, Architectural Door Trim.
- .8 ANSI/BHMA A156.7-2016, Template Hinge Dimensions
- .9 ANSI/BHMA A156.8-2015, Door Control-Overhead Stops and Holders.
- .10 ANSI/BHMA A156.13-2017, Mortise Locks and Latches.
- .11 ANSI/BHMA A156.15-2015, Release Device-Closer Holder Electromagnetic.
- .12 ANSI/BHMA A156.16-2018, Auxiliary Hardware.
- .13 ANSI/BHMA A156.18-2016, Materials and Finishes.
- .14 ANSI/BHMA A156.19-2019, Power Assist and Low Energy Power Operated Doors.
- .15 ANSI/BHMA A156.26-2017, Continuous Hinges.
- .16 ANSI/BHMA A156.21-2019, Thresholds.
- .17 ANSI/BHMA A156.22-2017, Door Gasketing.
- .18 ANSI/BHMA A156.25-2018, Electrified Locking Devices.
- .19 ANSI/BHMA A156.31-2013, Electric Strikes and Frame Mounted Actuators.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Hardware for doors in fire separations and exit doors to be certified by ULI / ULC, a Canadian Certification Organization accredited by Standards Council of Canada.

1.4 SAMPLES

- .1 When requested, submit samples of hardware items in accordance with Section 01 33 00 - Shop Drawings, Product Data, Samples and Mock-ups.
- .2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
- .3 After approval, samples will be returned for incorporation in the Work.

1.5 HARDWARE SCHEDULE

- .1 Submit finish hardware schedule using the standard DHI format for finish hardware schedules.
- .2 Clearly indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

1.6 MAINTENANCE DATA

- .1 Provide operation and maintenance data for door closers, locksets, door holders and fire exit devices for incorporation into manual specified in Section 01 77 00 – Operation and Maintenance Manual.
- .2 Brief maintenance staff regarding proper care, cleaning and general maintenance of door hardware items.

1.7 MAINTENANCE MATERIALS

- .1 Provide maintenance materials.
- .2 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

1.8 DELIVERY AND STORAGE

- .1 Store finishing hardware in locked, clean and dry area.
- .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

PART 2 – PRODUCTS

2.1 HARDWARE ITEMS

- .1 Use one manufacturer's products only for all similar product groups.
- .2 The product model numbers listed in the finish hardware schedule are to be used as the basis of design, and standard of acceptance for all items, and are from the following group of manufacturers:

<u>Listed Acceptable Products</u>		<u>Acceptable Alternate Products</u>
Mortise/Butt Hinges	Ives	Stanley; McKinney
Locksets, Latchsets	Schlage	Sargent; Best
Door Closers	LCN	Sargent; Dorma
Auto Door Operators	LCN	Besam; Horton
B/F Actuator Buttons	LCN	Besam; Horton
Electric Strikes	Von Duprin	HES, Folger-Adam
Power Supplies	Von Duprin	Securitron; Dorma
Overhead Door Stops	Glynn-Johnson	Rixson; ABH
Floor/Wall Stops	Ives	Gallery; CBH
Flush Bolts	Ives Hardware	Gallery; CBH
Push Plates/Kickplates	Ives Hardware	Gallery; CBH
Thresholds	DraftSeal	Pemko, KN Crowder
Door Sweeps	DraftSeal	Pemko, KN Crowder
Astragals	DraftSeal	Pemko, KN Crowder
Weatherstripping	DraftSeal	Pemko, KN Crowder

2.2

DOOR HARDWARE

.1 Butts and hinges:

- .1 Butts and continuous hinges: designated by letter and numeral identifiers, followed by size and finish, as listed in Hardware Schedule.
- .2 Self-closing hinges and pivots: designated by letter and numeral identifiers as listed in Hardware Schedule.
- .3 Butt hinges on exterior doors and locked doors opening out shall have non removable pins (NRP) and doors equipped with door closers or in high traffic areas shall have ball bearing (BB) hinges.

.2 Locks and latches - Mortise:

- .1 Mortise locks and latches: to ANSI/BHMA A156.13-1994, Series 1000 mortise lock, Grade 1 operational and Grade 1 security, ULC Listed for A label doors, with all functions available in one size case;
- .2 Mortise locks shall have a full ¾” throw two-piece mechanical anti-friction latchbolt, a one-piece stainless steel 1” throw deadbolt, and handing of locks shall be reversible without disassembly of the lockcase.
- .3 Lever Handles: Schlage ND-06/RHO Design, Solid flat-face design, forged, complete with return to door; trims to be vandal-proof where specified.
- .4 Roses: Round design “A” as listed in schedule.
- .5 Normal strikes: box type, lip projection not to exceed ¼” beyond jam.
- .6 Cylinders: FSIC Core, c/w permanent cores keyed to master key system.
- .7 Finish to be Satin Chrome Plated - 626.
- .8 Basis of design products: Locksets – Schlage Lock.

.3 Locks and latches - Cylindrical:

- .1 Locksets and latchsets are to be heavy duty cylindrical, lever type, and meet ANSI Grade 1, A156.2-2011, A117.1 Accessibility, and ULC requirements. Supply vandal proof lever handle trim on exterior doors, or where specified.

- .2 Lever handle trim must have concealed through bolt mounting, and the levers are to be solid cast with a return to the door face. All locks are to have heavy duty cast mounting plates, threaded hub and locking nut, and stainless steel interlocking spindle. Lever handle design to be Schlage ND-RHO.
 - .3 Provide ¾” latch throw for pairs of labeled doors, or where specified.
 - .4 Roses or Escutcheons: Round design 3 7/16” O.D., as listed in schedule.
 - .5 Normal strikes: box type, lip projection not to exceed ¼” beyond jam.
 - .6 Cylinders: Conventional Cores, keyed to building Master Key system.
 - .7 Finish to be Satin Chrome Plated - 626.
 - .8 Basis of design products: Locksets - Schlage Lock.
- .4 Exit Devices:**
- .1 To be heavy duty, grade 1, modern design push bar style, wide or narrow stile, to meet ANSI, ULC, NFPA and ADA certification, to have thru-bolted trim, heavy-duty steel I-beam bar, and heavy gauge latch head with reinforced bracket. All lever trims to be free-wheeling, vandal-resistant, and all devices to have deadlocking latchbolts.
 - .2 Finish to be Satin Chrome 626, for complete devices and trim. Functions and trims to be as listed in Hardware Schedule.
 - .3 Basis of design products: Von Duprin
- .5 Door Closers and Accessories:**
- .1 Door controls (closers): to meet or exceed ANSI A156.4 Grade 1 requirements; to be heavy duty cast aluminum bodies with adjustable spring power and have separate valves for latching, closing, and backcheck control. All closer arms to be forged steel, with power adjustment arm bracket.
 - .2 All closers are to be non-sized to suit door and opening, and to have full covers with finish 689. Brackets, shoes, and plates are to be included for proper mounting of closers. All closers shall have minimum 25 - year warranty.
 - .3 Basis of design products: LCN
- .6 Overhead stops/holders:**
- .1 Door controls (overhead stops/holders): to meet or exceed ANSI A156.8 Grade 1 requirements; to be heavy duty slide track type with heavy duty shock absorber spring and non-metal slide block and shock block, non-handed.
 - .2 To be Type 304 stainless steel material in stainless steel 630 finish.
 - .3 Basis of design products: Glynn-Johnson
- .7 Auxiliary locks:**
- .1 To meet ANSI A156.16 requirements, to be heavy-duty and finished in 626.
 - .2 Cylinders: Conventional Core, rim or mortise type, finished to 626, for installation in deadlocks provided with special doors as listed in Hardware Schedule.
 - .3 Basis of design products: Schlage
- .8 Architectural door trim:**
- .1 To meet ANSI A156.6 requirements, type 304 stainless steel, finished 630.
 - .2 Door protection plates: kick plate type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.
 - .3 Push plates: type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.
 - .4 Push/Pull units: type 304 stainless steel, 1” thick stainless steel, finished to 630.
 - .5 Basis of design products: Ives Hardware

.9 Auxiliary hardware; electric strikes:

- .1 To meet ANSI A156.5 Grade 1 requirements, to meet ULC, Burglary-Resistant and Fire Door and Frame certifications. Finish to be stainless steel 630.
- .2 Electric Strikes shall be all stainless steel construction, non-handed, and be fail secure or fail-safe, as listed, with adjustable strike box and two-piece plug connectors.
- .3 Basis of design products: Von Duprin

.10 Door Operators:

- .1 Power assist and low energy power operated doors: to CAN/CGSB-69.35.; to meet ANSI A117.1, A156.19, and ADA requirements; heavy duty, complete with corrosion resistant coating, for exterior door use.
- .2 All operators are to meet ANSI A156.19 Grade 1, ADA, UBC 7.2, and UL10C requirements; to be heavy duty electromechanical powered system, adjustable spring size, multi-function, with valve adjustable sweep and latch closing speeds, and back check cushioning.
- .3 Operator features to include digital control box, dual independent program memories, on-board diagnostics, on-board power supply, plug & play sensors, "No Destruct" drive system, electronic circuit protection, visual function indicators, and programming mode.
- .4 To have adjustable delay time, opening time/opening force, opening angle and door width selector, and be finished in 689.
- .5 Basis of design products: LCN

.11 Auxiliary hardware; door stops:

- .1 to meet CAN/CGSB-69.32-(M90)/ANSI/BMHA A156.16-1989, designated by letter and numeral identifiers, as listed in Hardware Schedule, finished to 626.
 - .1 Floor stops, dome type, cast brass, finished 626.
 - .2 Wall stops, convex or concave, cast brass, finished 626.
 - .3 Flush Bolts, metal door type, cast brass, finished 626.
- .2 Basis of design products: Ives Hardware

.12 Door bottom seal:

- .1 Heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene seal, surface mounted, adjustable, automatic retract mechanism when door is open, clear anodized finish.
- .2 Basis of design products: Draft Seal

.13 Thresholds:

- .1 100/127mm wide × full width of door opening, extruded aluminum, serrated surface, with thermal break of rigid PVC, clear anodized finish.
- .2 Basis of design products: Draft Seal

.14 Weatherstripping:

- .1 Head and jamb seal:
 - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
 - .2 Adhesive backed santoprene material.
- .2 Door bottom seal:
 - .1 Extruded aluminum frame and closed cell neoprene, one inch drop, automatic closing mechanism, clear anodized finish.
- .3 Basis of design products: Draft Seal

2.3 **FASTENINGS**

- .1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .2 Exposed fastening devices to match finish of hardware.
- .3 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.
- .4 Use fasteners compatible with material through which they pass.

2.4 **KEYING**

- .1 Mortises: Conventional Core 6-pin cylinders to suit, and be keyed to the new building master key system. Locksets to be keyed differently, keyed alike, master keyed or grandmaster keyed as directed. Prepare detailed keying schedule in conjunction with owner's representative.
- .2 Provide three (3) change keys for every lock in this Contract.
- .3 Provide three (3) Master keys for each MK level in this Contract.

PART 3 – EXECUTION

3.1 **INSTALLATION INSTRUCTIONS**

- .1 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .2 Install door hardware only after door and frame finishes are fully cured.
- .3 Furnish manufacturer's instructions for proper installation of all hardware components.
- .4 Install hardware to standard hardware location dimensions in accordance with Canadian Imperial Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.

3.2 **SCHEDULE**

Hardware Set # H-1 – Single Doors # 102.1, 103.1, 104.1, 105.1; Each to have:

- 3 Hinges Ives 5BB1 114 × 101 - 630
- 1 Mortise Lever Privacy Set Schlage LV9440-06-E/K × Occupied Indicator # L283-722 - 626
- 1 Door Closer LCN 4050 Rw/PA-P/A mtg. – 689
- 1 Crash Stop Ives CS115 US26D
- 2 Kickplates Ives 8400B4E- 10 × 34 ½" - 630
- 1 Floor Door Stop Ives FS439 - 626
- 1 Threshold DraftSeal DS5000 × 915 mm - Alum
- 1 Set Door Seal DraftSeal DSS66D × 5183 mm - BN
- 1 Door Sweep DraftSeal DS138CN × 915 mm - AL

Hardware Set # H-2 – Single Doors # 106.1, 108.1; Each to have:

- 3 Hinges Ives 5BB1 4 ½ × 4 - 630
 - 1 Mortise Lever Lockset Schlage LV9485L-06 × Occupied Indicator # L283-722 - 626
 - 1 Automatic Door Operator LCN9531 STD (Pull) × HL/B-36 - 689
 - 2 Full Length Actuator Buttons LCN 8310-836T × B/F logos - 630
 - 1 Mounting Plate LCN 9540-18 × width to suit
 - 1 Kick Plate Ives 8400B4E-10 × 34 ½” - 630
 - 1 Door Stop (floor) Ives FS439 - 626
 - 1 Threshold DraftSeal DS5000 × 915 mm - Alum
 - 1 Set Door Seal DraftSeal DSS66D × 5183 mm - BN
 - 1 Door Sweep DraftSeal DS138CN × 915 mm - AL
 - 1 Electric Strike HES 1006CDB-F Fail Safe × 12/24 V - 630
 - 1 Restroom Control Kit Camden CX-WC17-PS – to include: CX-33PS Advanced Logic Control / Power Supply, and Transformer CX-TRX-4024, CM-7536/8B-36” Column “PUSH TO LOCK” switch, CM-AF503 Single Gang “Occupied” Label, LED Annunciator, CX-MDA Magnetic Door Contact
 - 1 Emergency Control Kit Camden CX-WEC10K2 – to include CM-AF540SO (CM-450R/12, CM-AF501SO combo), CM-AF141SO, CM-SE21A
 - 1 Keypad Schlage MTK15
 - 1 Keyswitch Schlage 653-14 × L2 × Mort. Cyl. 20-022-626 - 630
- NOTE: Wiring, conduit, and hook-up by Section 26 - Electrical

Hardware Set # H-3 – Single Door # 107.1; Each to have:

- 3 Hinges Ives 5BB1 114 × 101 - 630
- 1 Mortise Lever Lockset Schlage LV9080P6D-06 × MK’d - 626
- 1 Door Closer LCN 4050 Rw/PA REG Mtg. × M/S – 689
- 1 Crash Stop Ives CS115 US26D
- 1 Floor Door Stop Ives FS439 - 626
- 1 Threshold DraftSeal DS178CN × 915 mm - Alum
- 1 Set Door Seal DraftSeal DSS66D × 5183 mm - BN
- 1 Set Door Seal DraftSeal DS132CN × 5183 mm - AL
- 1 Door Sweep DraftSeal DS135CN × 915 mm - AL

END OF SECTION 08 71 00

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1

1.2 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
 - .2 CAN/CGSB-12.8-97, Insulating Glass Units.
- .2 Glass Association of North American (GANA)
 - .1 GANA Glazing Manual - 2008.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section, with Port Representative in accordance with Section 01 31 19 - Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.
 - .2 Hold project meetings every week.
 - .3 Ensure key personnel attend.

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 glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

1.5 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

1.6 QUALITY ASSURANCE

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

1.7 AMBIENT CONDITIONS

- .1 Ambient Requirements:
 - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
 - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Design Criteria:
 - .1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
 - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
 - .2 Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to design pressure of ??? kPa.

- .3 Limit glass deflection to 1/200 with full recovery of glazing materials.
- .2 Flat Glass:
 - .1 Float glass: to CAN/CGSB-12.3, glazing quality, 6 mm thick.
 - .2 Silvered mirror glass: 6 mm thick.
 - .1 Type 1B-float glass for high humidity use.
 - .3 G1: Insulating Vision Glass Units: to CAN/CGSB-12.8, double unit, 25 mm overall thickness.
 - .1 Glass: to CAN/CGSB-12.10.
 - .2 Glass thickness: 6 mm each light.
 - .3 Inter-cavity space thickness: 13 mm with low-conductivity spacers.
 - .4 Glass coating: surface number 2, low "E", MSVD.
 - .5 Inert gas fill: argon.
 - .6 Visible light transmittance: 64% average daylight, minimum.
 - .7 Solar heat gain coefficient: 0.63, maximum.
 - .8 Shading coefficient: 0.65.
 - .9 U-Value:
 - .1 Winter: $<1.470 \text{ W/m}^2\cdot\text{K}$
 - .2 Summer: $<1.500 \text{ W/m}^2\cdot\text{K}$
 - .10 Acceptable material:
 - .1 Vitro Solarban on Starphire.
 - .2 Cardinal 366 LoE³.
 - .3 Guardian Sunguard SuperNeutral on UltraWhite.
- .3 Sealant: in accordance with Section 07 92 00 - Joint Sealants.

PART 3 EXECUTION

3.1 SCHEDULE

- .1 G1: Insulating Vision Glass Units.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Drawing A-001: Finish Schedule.
- .2 07 21 29.13 Blown insulation - cellulose: Air and vapour control (AVC) membrane.
- .3 Section 07 92 00 - Joint Sealants.

1.2 ABBREVIATIONS

- .1 AVC: Air and Vapour Control.

1.3 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 AA DAF 45-03 (R2009), Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C475/C475M-17, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C840-20, Standard Specification for Application and Finishing of Gypsum Board
 - .3 ASTM C954-18, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .4 ASTM C1002-20, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .5 ASTM C1047-19 , Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .6 ASTM C1177/C1177M-13, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .7 ASTM C1396/C1396M-17, Standard Specification for Gypsum board.
- .3 Association of the Wall and Ceilings Industries International (AWCI)

- .1 AWCI Levels of Gypsum Board Finish-GA-214-2021.
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-18, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.4 AMBIENT CONDITIONS

- .1 Maintain temperature 10 °C minimum, 21 °C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.
- .2 Apply board and joint treatment to dry, clean, frost free surfaces.
- .3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Standard board: to ASTM C1396/C1396M, 1220 mm wide × maximum practical length, ends square cut, edges bevelled. For walls, ceilings and bulkheads in general areas.
 - .1 Designation: GB.
- .2 Impact-resistant board: to ASTM C1629/C1629M Type X, 16 mm thick, 1200 mm wide × maximum practical length, ends square cut, edges bevelled.
 - .1 Designation: GBIR.
- .3 Water-resistant board: to ASTM C1396/C1396M, paperless, with glass-mat facers, 1220 mm wide × maximum practical length.
 - .1 Designation: GBMR.
- .4 Glass mat water-resistant gypsum backing board: to ASTM C1178/C1178M, 16 mm thick, 1220 mm wide × maximum practical length.
 - .1 Designation: GBB.
- .5 Steel drill screws: to ASTM C1002.
- .6 Laminating compound: as recommended by manufacturer, asbestos-free.

- .7 Corner beads: to ASTM C1047, steel, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one piece length per location.
- .8 Casing beads, control joints and edge trim: to ASTM C1047, PVC, perforated flanges, one piece length per location.
- .9 Shadow mould: 35 mm high, snap-on trim, of extruded PVC plastic, white colour.
- .10 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .11 Air and vapour control (AVC) membrane: per Section 07 21 29.13, installed by this section.
- .12 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self-sticking permanent adhesive on one face, lengths as required.
- .13 Joint compound: to ASTM C475, asbestos-free.
- .14 Joint tape: mould resistant, self-adhesive fibreglass mesh.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied
.....

3.2 ERECTION

- .1 Do application and finishing of gypsum board to ASTM C840 except where specified otherwise.
- .2 Install work level to tolerance of 1:1200.
- .3 Frame with dimensional lumber: perimeter of openings for access panels, light fixtures, diffusers, grilles.

- .4 Install 38 × 93 mm dimensional lumber furring parallel and snug to partition top plates.
- .5 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .6 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .7 Install wall furring for gypsum board wall finishes to ASTM C840, except where specified otherwise.
- .8 Furr openings and around built-in items on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

3.3 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply single layer gypsum board to wood furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 To ASTM C840.
 - .2 Apply gypsum board on ceilings prior to application on walls.
 - .3 Apply gypsum board on walls vertically or horizontally, providing sheet lengths that will minimize number of board edges or end joints.
 - .3 Apply water-resistant gypsum board and glass mat water-resistant gypsum backing board per Finish Schedule. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.
 - .4 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, and other penetrations, in partitions where perimeter sealed with acoustic sealant.
 - .5 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
 - .6 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where fire-rated assemblies require vertical application.
 - .7 Install gypsum board with face side out.

- .8 Do not install damaged or damp boards.
- .9 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure using contact adhesive for full length.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant Type 4.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Install control joints straight and true.
- .6 Ensure that screws are properly applied in process of attaching gypsum board to framing without damaging of gypsum board edges and ends.
- .7 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .8 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .9 Gypsum Board Finish: finish gypsum board walls and ceilings to have paint finish to AWCI Level of Gypsum Board Finish 4.
 - .1 AWCI Levels of Gypsum Board Finish:
 - .1 Level 0: no taping, finishing or accessories required.
 - .2 Level 1: embed tape for joints and interior angles in joint compound. Surfaces free of excess joint compound; tool marks and ridges are acceptable.
 - .3 Level 2: embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.

- .4 Level 3: embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
- .5 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
- .6 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.
- .10 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .11 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board, invisible after surface finish is completed.
- .12 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .13 Completed installation smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .14 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .15 Mix joint compound slightly thinner than for joint taping.
- .16 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .17 Allow skim coat to dry completely.
- .18 Remove ridges by light sanding or wiping with damp cloth.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 07 92 00 - Joint Sealants.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI A108.1-99, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
 - .2 CTI A118.4-2018, Specification for Latex Cement Mortar (included in ANSI A108.1).
 - .3 CTI A118.6-2010(R2016), Specification for Ceramic Tile Grouts (included in ANSI A108.1).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C979-05, Specification for Pigments for Integrally Coloured Concrete.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-75.1-M88, Tile, Ceramic.
- .4 CSA Group (CSA)
 - .1 CAN/CSA-A3000-03 (R2006), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .6 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 2019-2021 Specifications Guide 09 30 00 Tile Installation Manual.
 - .2 Hard Surface Maintenance Guide (2017-2019).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide product data:

- .1 Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Dry-set cement mortar and grout.
 - .3 Divider strip.
 - .4 Elastomeric membrane and bond coat.
 - .5 Reinforcing tape.
 - .6 Levelling compound.
 - .7 Latex cement mortar and grout.
 - .8 Waterproofing isolation membrane.
 - .9 Fasteners.
- .2 Provide samples:
 - .1 Wall tile: submit duplicate, 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.
 - .2 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
 - .3 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.
- .3 Sustainable Design Submittals:

1.4 QUALITY ASSURANCE

- .1 Quality Assurance Submittals:
 - .1 Manufacturer's Instructions: manufacturer's installation instructions.
 - .2 Manufacturer's Field Reports: manufacturer's field reports specified.

1.5 AMBIENT CONDITIONS

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.
- .2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

- .3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.6 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
 - .2 Maintenance material same production run as installed material.

PART 2 PRODUCTS

2.1 WALL TILE

- .1 Type CT1: Unglazed rectified porcelain tile: to CAN/CGSB-75.1, Type 5, Class MR4, 305 mm edges, plain pattern, colour as selected by Departmental Representative from manufacturer's complete range.

2.2 MORTAR AND ADHESIVE MATERIALS

- .1 Latex additive: formulated for use in cement mortar and thin set bond coat.
- .2 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.3 BOND COAT

- .1 Latex Cement mortar: to ANSI A108.1, two-component universal dry-set mortar.
 - .1 Acceptable material:
 - .1 Kerabond premium floor and wall DRY-Set mixed with Keralastic Flexible Polymer additive, by Mapei.
 - .2 #53 thin-set mortar, mixed with #44 acrylic latex thin-set mortar additive, by Flextile.
 - .3 254 Platinum, by Laticrete.

2.4 GROUT

- .1 Colouring Pigments:

- .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.
 - .2 Colouring pigments to be added to grout by manufacturer.
 - .3 Job coloured grout are not acceptable.
 - .4 Use in Latex Cement Grout.
- .2 Latex Cement Grout: to ANSI A108.1, fast curing, high early strength, polymer-modified, stain resistant, unsanded mix for walls and floors with polished tiles commercial tile grout.
- .1 Acceptable material:
 - .1 Keracolor-U(unsanded) by Mapei.
 - .2 500 (unsanded) Flextile Polymer Modified Floor and Wall by Flextile.
 - .3 1600 (unsanded) by Laticrete.

2.5 WATERPROOFING MATERIALS

- .1 Bottom 900 mm of walls: 2-component, flexible, fibre-reinforced waterproofing and crack isolation membrane, complete with all accessories, including but not limited to: inside corner pieces; drain flashing; cove strip.

2.6 ACCESSORIES

- .1 Decorative edge protection: for use at all outside corners and exposed edges of tiled wall surfaces. Roll-formed Type 304 stainless steel V-shaped profile with brushed finish and 38 mm wide exposed surfaces joined by a symmetrically rounded corner, with integral perforated anchoring legs; height to suit finished tile thickness. Install flush with finished tile surface and in strict accordance with the manufacturer's specifications.
- .2 Transition Strips: purpose made metal extrusion; stainless steel type.
- .3 Sealant: in accordance with Section 07 92 00 - Joint Sealants.

2.7 MIXES

- .1 Dry set mortar: mix to manufacturer's instructions.
- .2 Mix bond and levelling coats, and grout to manufacturer's instructions.
- .3 Adjust water volumes to suit water content of sand.

2.8 PATCHING AND LEVELLING COMPOUND

- .1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- .2 Have not less than the following physical properties:
 - .1 Compressive strength - 25 MPa.
 - .2 Tensile strength - 7 MPa.
 - .3 Flexural strength - 7 MPa.
 - .4 Density - 1.9.
- .3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.
- .4 Ready for use in 48 hours after application.

2.9 CLEANING COMPOUNDS

- .1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- .2 Materials containing acid or caustic material are not acceptable.

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 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual, "Ceramic Tile", except where specified otherwise.
- .2 Apply tile or backing coats to clean and sound surfaces.
- .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.

- .4 Maximum surface tolerance 1:800.
- .5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .6 Lay out tiles so perimeter tiles are minimum 1/2 size.
- .7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .8 Make internal angles square, external angles with decorative edge protection trim.
- .9 Install transition at junction of tile flooring and dissimilar materials.
- .10 Allow minimum 24 hours after installation of tiles, before grouting.
- .11 Clean installed tile surfaces after installation and grouting cured.
- .12 Make control joints at 4.5 m in each direction. Make joint width same as tile joints. Fill control joints with sealant in accordance with Section 07 92 00 - Joint Sealants. Keep building expansion joints free of mortar and grout.

3.3 WALL TILE

- .1 Install in accordance with TTMAC detail 305W.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 03 30 00 - Cast-in-place concrete: sub-slab vapour barrier.

1.2 REFERENCES

- .1 American Society for Testing on Materials (ASTM International):
 - .1 ASTM C307-18 Standard Test Method for Tensile Strength of Chemical Resistant Mortar, Grouts, and Monolithic Surfacing.
 - .2 ASTM D4414-95(2020): Measurement of Wet Film Thickness by Notch Gages.
 - .3 ASTM D790-17 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - .4 ASTM D2240-15(2021) Standard Test Method for Rubber Property 8212; Durometer Hardness.
 - .5 ASTM D4060-19 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
 - .6 ASTM F710-21 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - .7 ASTM F1869-16a Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- .2 Canadian Standards Association (CSA International):
 - .1 CSA A23.2-19: A23.2-6B Method of Test to Determine Adhesion by Tensile Load.

1.3 DESIGN REQUIREMENTS

- .1 System Physical Properties: Provide resinous flooring system with the following minimum physical property characteristics when tested according to test methods indicated.
 - .1 Adhesion: 400+ concrete fracture per ASTM D4541.
 - .2 Tensile Strength: 5,000-5,300 per ASTM D638.

- .3 Impact Direct/Reverse: ≤ 95 in.-lb per ASTM D2794.
- .4 Abrasion Resistance: 22-28 maximum weight loss per ASTM D 4060.
- .5 VOC Content: 23.3 as per ASTM D2369.
- .6 Coefficient of Friction: 0.95 (DRY) 0.65 (WET) as per ANSI B101.3.
- .7 System Chemical Resistance: Resistant to acids and alkalis.

1.4 SUBMITTALS FOR REVIEW

- .1 Product Data
 - .1 Submit manufacturer's most recent printed technical product literature, specifications and application instructions for each component of system materials required.
- .2 Samples
 - .1 Submit duplicate 300×300 mm size samples of static dissipative epoxy flooring.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data complete with pertinent details, spare parts lists and warnings against harmful maintenance materials and practices for incorporation into manual.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - .2 Warn all other trades working on the project of any potential hazards associated with the system.
 - .3 Protective clothing, gloves, goggles and respirators, etc., as recommended by the manufacturer, must be worn when working with this system during installation and curing.
- .2 Ventilation:
 - .1 Ventilate area of work by use of approved portable supply and exhaust fans.

- .2 Provide continuous ventilation during and after application of system. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 3 days after completion of application of system.
- .3 Apply system only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
- .4 Substrate and ambient temperature must be within limits prescribed by manufacturer.
- .5 Maintain minimum substrate and ambient air temperature of 20°C or higher for a minimum of 48 hours before, during and after installation or until cured. Maximum relative humidity 85%. Maintain supplemental heating until system has cured sufficiently.
- .6 Provide temporary heating where permanent facilities are not available to maintain minimum recommended temperatures.
- .7 Provide adequate lighting during system application.
- .8 Confirm concrete has cured a minimum of 30 days prior to coating and has a maximum moisture content of 4%. Manufacturer to approve moisture content of the slab.

1.7 QUALITY ASSURANCE

- .1 Single source responsibility: Obtain primary flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer.
- .2 Installer's qualifications:
 - .1 The installer must have completed a minimum of 5 projects of similar size and complexity to this project and be acceptable to or licensed by the manufacturer.
 - .2 A letter of support from the material supplier confirming acceptance and experience of the installer must be submitted to the Departmental Representative prior to the pre-job conference.
- .3 Manufacturer's Obligations:
 - .1 The manufacturer shall play an active role in the application of their products during the period of this contract.
 - .2 The manufacturer shall be represented at all relevant meetings by a qualified technical representative, trained by the manufacturer.

- .3 A minimum of two inspections from the manufacturer's representative must be made prior to and during application of this work to ensure proper application. A final inspection report is also required, in addition to these three.
- .4 After each visit provide a written report to the Departmental Representative within 5 working days.

1.8 PRE-INSTALLATION MEETING

- .1 No less than two weeks before the scheduled start of the work of this section, a pre-job conference shall be held with the following people present:
 - .1 The Departmental Representative.
 - .2 The applicator and his designated inspectors and crew supervisors who will be working on site on this project.
 - .3 The manufacturer's trained inspector.
- .2 The purpose of the meeting shall be to: Thoroughly discuss the resinous flooring system specifications, job conditions, and work to be done in light of the most recent product data sheets and application instructions.

1.9 SCHEDULING

- .1 Submit work schedule for various stages of system application to Departmental Representative for approval. Submit schedule minimum of 72 hours in advance of proposed operations.
- .2 Obtain written authorization from Departmental Representative for any changes in work schedule.

1.10 WARRANTY

- .1 Warranty: five (5) years against delamination of resinous flooring system from substrate, and other failure of system to provide complete, integral, seamless floor covering meeting specified performance requirements.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 A complete, solid colour, low odour, self-leveling, solvent free, resinous surfacing system, designed for interior concrete surfaces, providing high chemical and mechanical resistance.

- .2 Wearing Surface: Textured for slip resistance.
 - .1 Overall System Thickness: 15-20 mils.
 - .2 Acceptable systems:
 - .1 Spartacote by Laticrete.
 - .2 Dur-A-Guard by Dur-a-Flex.
 - .3 Armor-Rez Jet Deck by Arizona Polymers Flooring.
- .3 Base coat: by manufacturer of resinous surfacing system.
 - .1 Resin: Polyaspartic Aliphatic Polyurea.
 - .2 Formulation Description: High Solids.
 - .3 Application Method: Roller, Squeegee or Broom.
 - .4 Thickness of Coats: 8-10 mil.
 - .5 Number of Coats: One.
 - .6 Colour: To later selection by Port Representative from manufacturer's complete range.
- .4 Top coat: by manufacturer of resinous surfacing system.
 - .1 Resin: Polyaspartic Aliphatic Polyurea.
 - .2 Formulation Description: High Solids.
 - .3 Thickness of Coats: 8-10 mil.
 - .4 Number of Coats: One.
 - .5 Colour: To later selection by Port Representative from manufacturer's complete range.
- .5 Aggregates: Incorporate traction additive for increased traction Coefficient of Friction.
- .6 Cove base: by manufacturer of resinous surfacing system.
 - .1 Resin: Epoxy
 - .2 Formulation Description: High Solids.
 - .3 Application Method: Trowel, Roller.

- .4 Thickness of Coats: 3 mm × 25 mm radius.
- .5 Height: 100 mm.

2.2 ACCESSORIES

- .1 Vapor Membrane: Moisture Vapor Barrier recommended by manufacturer for concrete slabs.
 - .1 Formulation Description: 100% Solids Chemically Enhanced Epoxy
- .2 Patching and Fill Material: resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- .3 Joint Filler Material: flexible polyuria joint filler or similar product.

PART 3 EXECUTION

3.1 EXAMINATION

- .1 Before commencing work ensure environmental requirements and site conditions as described in 1.5 are suitable for application and curing.
- .2 Inspect conditions of substrate and report deficiencies in writing to the Port Representative.
- .3 Submit a certified statement issued by the applicator attesting that all areas and surfaces have been inspected and found satisfactory to receive the flooring.
- .4 Commencement of work implies acceptance of conditions existing at the time of application.

3.2 PREPARATION

- .1 Protect surrounding areas from damage during application of products of this section.
- .2 Prepare concrete by mechanical means by using a 4-head 240-volt planetary preparation machine followed by a shot blast machine for removal of bond inhibiting materials such as adhesive residue, curing compounds, laitance, grease, oil, etc.
- .3 Wall and floor intersections and other areas inaccessible to the shot blast machine must be prepared using a diamond cup-wheel grinder equipped with a dust collector.
- .4 Vacuum surface to remove all dust and debris.

- .5 Carefully prepare and mix all materials for installation of the epoxy resin based flooring systems in compliance with the manufacturer's written instructions.

3.3 APPLICATION

- .1 Fill all visible cracks, holes and surface voids in accordance with manufacturer's instructions. Allow adequate cure time prior to applying floor system.
- .2 Apply crack bridging system over all cold joints, shrinkage cracks, movement cracks, etc. in accordance with manufacturer's recommendations.
- .3 General: Apply each component of flooring system in compliance with manufacturer's directions to produce a uniform monolithic surface of thickness indicated, uninterrupted except where indicated or required.
- .4 Penetrating epoxy primer: Mix and apply primer over prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of remaining system components to ensure optimum adhesion between resinous flooring materials and substrate.
- .5 Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, and troweling, sanding, and top coating of cove base. Round internal and external corners.
- .6 Outside edges that do not terminate against a wall or curb must be 'keyed' to avoid feathered edges.
- .7 Finished work shall match approved seamless, be uniform in thickness, sheen, colour, and texture. The finished surface must be free from defects detrimental to appearance or performance of the product.

3.4 FIELD QUALITY CONTROL

- .1 Core Sampling: At the direction of the Departmental Representative and at locations designated by Departmental Representative, take one core sample per 100 m² of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples.
- .2 Repair patch and replace all areas used for inspection and testing purposes.

3.5 CURING, PROTECTION, CLEANING, AND FINAL INSPECTION

- .1 Cure resinous flooring system in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 48 hours.
- .2 Protect completed work from contact with water until cured, approximately twenty-four hours at 20 °C.
- .3 Protect completed flooring from chemical exposure until fully cured, approximately seven days at 20 °C.
- .4 Protect completed system from damage and wear during remaining construction operations with adequate temporary covering materials specific for this purpose acceptable to the Port Representative, as recommended by the manufacturer, and following manufacturer's recommendations for method of application.
- .5 Remove temporary covering and clean flooring just prior to final inspection. Use cleaning materials and procedures recommended by system manufacturer.
- .6 Upon completion of the flooring system, the manufacturer's representative is to provide a final inspection report confirming that the system has been installed in accordance with the project specifications and the manufacturer's recommendations, and provide a complete deficiency list related to the system and its installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section includes:
 - .1 Material and installation of site and certain shop applied paint finishes to new interior surfaces, including site painting of shop primed surfaces.
 - .1 Doors: shop painted.

1.2 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).
- .2 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
- .3 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
- .5 NACE International

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for paint and coating products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit WHMIS SDS.
- .2 Samples:
 - .1 Submit for review and acceptance of each unit.

- .2 Submit 200 x 305 mm sample panels of each paint, stain, and clear coating with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards.
- .3 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Sustainable Design Submittals:
 - .1 Low-Emitting Materials:
 - .1 Submit listing of paints and coatings used in building, comply with VOC and chemical component limits or restriction requirements.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Fire Safety Requirements:
 - .1 Supply one 9 kg Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada (NFC) requirements.

1.5 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .2 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.
 - .2 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.

- .3 Additional application requirements:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Supply paint materials for paint systems from single manufacturer.
- .2 Conform to latest MPI requirements for painting work including preparation and priming
- .3 Materials in accordance with MPI - Architectural Painting Specification Manual "Approved Product" listing.
 - .1 Use MPI-listed materials having E3 rating where indoor air quality requirements exist.
 - .2 Primer: VOC limit 100 g/L maximum to SCAQMD Rule 1113.
 - .3 Paint: VOC limit 100 g/L maximum to SCAQMD Rule 1113.
- .4 Colours:
 - .1 Colours to later selection by Departmental Representative.
 - .2 Base colour schedule on selection of 2 base colours and 1 accent colours.
- .5 Mixing and tinting:
 - .1 Perform colour tinting operations prior to delivery of paint to site, in accordance with manufacturer's written recommendations. Obtain written approval from Departmental Representative for tinting of painting materials.
 - .2 Use and add thinner in accordance with paint manufacturer's recommendations.
 - .1 Do not use kerosene or similar organic solvents to thin water-based paints.
 - .3 Thin paint for spraying in accordance with paint manufacturer's written recommendations.
 - .4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- .6 Gloss/sheen ratings:

- .1 Finish gloss is defined as sheen rating of applied finish, to ASTM D523, in accordance with following values:

	Gloss @ 60°	Gloss @ 85°
G1 / Level 1 – Traditional matte	≤ 5	≤ 10
G2 / Level 2 – High-side sheen, flat, velvet.	≤ 10	10 to 35
G3 / Level 3 – Traditional eggshell.	10 to 25	10 to 35
G4 / Level 4 – Satin.	20 to 35	≥ 35
G5 / Level 5 – Traditional semi-gloss.	35 to 70	
G6 / Level 6 – Traditional gloss.	70 to 85	
G7 / Level 7 – High gloss	> 85	

- .7 Doors and frames: All faces and edges:

- .1 EXT 5.3D Polyurethane, pigmented over vinyl wash primer and epoxy primer.
Gloss: G6.

- .8 Exterior painting:

- .1 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).

- .1 INT 5.3K - Waterborne light industrial coating (over waterborne primer).
Gloss: G7

- .2 Dimension Lumber: exterior benches:

- .1 EXT 6.2J - Polyurethane, pigmented. Gloss: G6.

- .3

- .9 Interior painting:

- .1 Shop-primed structural steel and metal fabrications:

- .2 Unprimed ferrous metals:

- .1 INT 5.1K - Epoxy-Modified Latex (over W.B. rust-inhibitive primer) finish.

- .3 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, etc.

- .1 INT 9.2B - High performance architectural latex G4 gloss level (over latex primer/sealer) finish.

- .4 Plywood backer boards in electrical rooms and closets, and communications rooms:

- .1 INT 6.4P - Fire Retardant, Pigmented. S.B. (ULC rated).

- .5 Canvas and cotton coverings.
 - .1 INT 10.1A - Latex insert gloss level G5 (over latex primer/sealer) finish.

PART 3 EXECUTION

3.1 GENERAL

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.
- .2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual except where specified otherwise.

3.2 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.3 PREPARATION

- .1 Protection of in-place conditions:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.

- .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
- .4 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual specific requirements and coating manufacturer's recommendations.
- .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .6 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .8 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements
- .9 Touch up of shop primers with primer as specified.

3.4 APPLICATION

- .1 Paint only after prepared surfaces have been accepted by Departmental Representative
- .2 Use method of application approved by Departmental Representative.
 - .1 Conform to manufacturer's application recommendations.
- .3 Apply coats of paint in continuous film of uniform thickness.
 - .1 Repaint thin spots or bare areas before next coat of paint is applied.
- .4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

- .5 Sand and dust between coats to remove visible defects.

- .6 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

- .7 Steel Doors and Frames:
 - .1 Shop paint under conditions suited to specified paint coatings, prior to installation of door hardware.

 - .2 Finish top, bottom, edges and cutouts of doors as specified for door surfaces.

 - .3 Package and protect after painting.

 - .4 Touch up after installation.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
- .2 ANSI/ICC A117.1-2017, Standard for Accessible and Usable Buildings and Facilities.
- .3 ASTM International
 - .1 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A653/A653M-20, Standard Specification for Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 - .3 ASTM B32-20, Standard Specification for Solder Metal.
 - .4 ASTM B456-17, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- .4 Braille Literacy Canada (BLC)
 - .1 Accessible Signage Guidelines, 2016.
- .5 CSA Group
 - .1 CSA B651-18, Accessible Design for the Built Environment, Includes Errata 1 (2020)
 - .2 CSA W47.2-11 (R2020), Certification of companies for fusion welding of aluminum, Includes Update No. 1 (2011), Update No. 2 (2012)
 - .3 CSA W59-18, Welded Steel Construction, Includes Errata (2020)
 - .4 CSA W59.2-18, Welded Aluminum Construction.
- .6 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI SSF 6-2012, Sheet Steel Facts #6, Metallic Coated Sheet Steel for Structural Building Products.
- .7 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 7001:2007, Graphical symbols - Public information symbols.
- .3 ISO 7010:2019, Graphical symbols - Safety colours and safety signs - Registered safety signs.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit construction details, material descriptions, dimensions of individual component and profiles, and finishes for each sign type.
- .3 Shop Drawings:
 - .1 Indicate materials, thicknesses, sizes, finishes, colours, construction details, removable and interchangeable components.
 - .2 Show locations of signage on floor plans and elevations.
 - .1 Plans: Scale: metric, not less than 1:50.
 - .2 Sections: Scale: metric, not less than 1:20.
 - .3 Details: Scale: metric, not less than 1:10.
 - .3 Submit full scale artwork for each sign type and pictographs.
 - .4 Schedule: Develop a signage schedule in consultation with Departmental Representative, including required graphics, names and numbers. Refer to room names indicated on Drawings for guidance.
- .4 Samples:
 - .1 Submit representative sample of each type sign, sign image and mounting method. Samples will be returned for use in project. Sample to include painted aluminum. Allow for three samples of painted aluminum.
- .5 Mock-ups:
 - .1 Allow for 1 mock-up of each sign type. Mock-ups shall reflect signage designed for this project.
 - .2 Submit full scale mock-ups of each sign type for initial selection prior to general production. Obtain approval before proceeding.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for illuminated signs for incorporation into manual.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- .1 Supply and install signage in accordance with the requirements of
 - .1 Nova Scotia Building Code Regulations, 15 MAR 2021.
 - .2 CSA B651 Accessible Design for the Built Environment, for Rick Hansen Foundation Accessibility Certification.

2.2 STANDARD OF ACCEPTANCE

- .1 Basis-of-Design: Eyecandy Signs Inc. Halifax, Nova Scotia.
- .2 Acceptable Alternates:
 - .1 KING Architectural Products | a Division of WSI Sign Systems Ltd.
 - .2 Modulex Americas Inc.
 - .3 Steel Art Signs.
- .3 Contrasting colour accent profiles required at wayfinding signs.
- .4 Wayfinding and identification signs to have raised graphic braille.
- .5 Signs: numbers, names and/or pictographs to ISO 7001, Graphical symbols - Public information symbols.
- .6 Safety signage: to ISO 7010 and ISO 3864.
- .7 Sign corners: 3 mm radius.
- .8 Concealed fasteners, frameless, wall mounted, ceiling suspended or projecting as recommended by Contractor and selected by Departmental Representative.
- .9 Concealed acrylic locking pins.

2.3 GENERAL FABRICATION REQUIREMENTS

- .1 Fabricate signs in accordance with municipal signage guidelines.
- .2 Fabricate signs in accordance with details, specifications, shop drawings, and instructions of Departmental Representative.
- .3 Build units square, true, accurate to size, free from visual or performance defects.
- .4 Accurately fit and securely join sections to obtain tight, closed joints.
- .5 Allow for thermal movement without distortion of components.

2.4 BRAILLE AND TACTILE PRINT SIGNAGE REQUIREMENTS

- .1 Comply with BLC Accessible Signage Guidelines. Link:
<https://www.brailleliteracycanada.ca/storage/standards/AccessibleSignageGuidelines2016.pdf>
- .2 Supply and install braille and high-contrast tactile print signage as follows, exact positions determined by Departmental Representative.
 - .1 Washrooms: both general and specifically accessible facilities.
 - .2 Room name/number plates.
 - .3 Emergency doors and exits.
 - .4 Emergency evacuation instructions.
 - .5 Cautionary signage.
 - .6 Signage in assembly areas and gathering places
 - .7 Operating instructions: e.g., for adult change table or toilets.

2.5 ADDITIONAL BARRIER-FREE REQUIREMENTS

- .1 Signs incorporating the international symbol of accessibility and such other graphics, tactile and/or written directions as are needed to indicate clearly the type of facility available, shall be provided at barrier-free entrances, means of egress, washrooms, parking areas, etc.

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 signage installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Manufacturer's Instructions: compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.
- .2 Locate signs and accessories as required, using mounting methods of types described by manufacturer.
- .3 Install signs level, plumb, and at elevations indicated, with sign surfaces free from distortion and other defects in appearance.
- .4 Comply with sign manufacturer's installation instructions and approved shop drawings.

3.3 DOOR AND WALL PLATES

- .1 Encapsulated Polycarbonate Destination Signage:
 - .1 Custom fabricated signage consisting of 3 mm black acrylic backer with encapsulated polycarbonate skin, two colours, bonded to backer complete with tactile letters, numbers, graphics and braille raised 1 mm from sign surface. Appliqué, bead braille, and raster braille not acceptable.
 - .2 70% contrast between background colour and letters, numbers, graphics and braille,
 - .3 Signage to be fixed securely to locations indicated with self-adhesive foam tape.

3.4 PICTOGRAPHS

.1 To ISO 7001, Graphical symbols - Public information symbols, as noted below:

Sign type	Graphics	Copy
Gender-neutral Washroom	Handicap Symbol Water Closet Symbol Diaper Change Symbol	Washroom
Gender-neutral Washroom with adult change table	Handicap Symbol Water Closet Symbol Adult Change Table Symbol	Washroom
Gender-neutral Change Room	Handicap Symbol Changing Room Symbol Diaper Change Symbol	Change room
Mechanical Room	"No Entry" Symbol	No entry

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

Division 26: power to adult change table.

1.2 REFERENCE STANDARDS

ASTM International (ASTM)

ASTM A240/A240M-20A, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

ASTM A269/A269M-15A(2019), Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

ASTM A480/A480M-20a, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

ASTM B456-17, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

ASTM A653/A653M-20, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

ASTM A924/A924M-19, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

ASTM C1048-18, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

ASTM C1503-18, Standard Specification for Silvered Flat Glass Mirrors.

Canadian General Standards Board (CGSB)

CAN/CGSB-12.5-M86, Mirrors, Silvered

CSA Group (CSA)

CAN/CSA-B651-18(2020), Accessible Design for the Built Environment.

CAN/CSA-G164-18(2020), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

Product Data:

Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

Shop Drawings:

Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

1.4 CLOSEOUT SUBMITTALS

Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

Tools:

Provide special tools required for assembly, disassembly or removal for toilet and bath accessories.

1.6 WASTE MANAGEMENT AND DISPOSAL

Collect, separate, recycle, and reuse all site generated waste materials in accordance with Section 01 74 21 - Construction & Demolition Waste Management.

PART 2 PRODUCTS

2.1 MATERIALS

Sheet steel: to ASTM A653/A653M with ZF001 designation zinc coating.

Stainless steel sheet metal: to ASTM A240/A240M-20A, Type 304, with finish as specified.

Stainless steel tubing: to ASTM A269/A269M, Type 304, seamless welded, 1.2 mm wall thickness.

Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

Fasteners: concealed screws and bolts stainless steel, exposed fasteners stainless steel. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 COMPONENTS

All accessories by same manufacturer, except as specified. Refer to plans for quantities and locations.

T1 - Toilet tissue dispenser: double roll type, surface mounted, cast aluminum frame, capacity of 500 double-ply roll, roll under spring tension for controlled delivery

T2 - Roll Paper Towel Dispenser: 2.4 mm stainless steel, satin finish; roll towel mechanism fabricated from enameled steel and impact-resistant plastic; roll towel mechanism shall be adjustable to dispense several preset lengths of paper towel; push bar dispensing lever shall operate with a force of less than 22N of force; surface mounted.

T3 - Soap Dispenser: Body of drawn, one-piece 0.9 mm stainless steel, satin finish; back of 0.9 mm stainless steel, welded to body; valve shall be operable with one hand and with a force of less than 22N; container shall be equipped with a tamper-resistant, hinged stainless steel door for top filling; capacity of 1.18 litres; surface-mounted:

Acceptable material:

Bobrick B-2111.

Bradley 6562.

American Specialties 0347.

Frost 708A.

T4 - Feminine napkin disposal bin: stainless steel surface mounted unit including continuous hinged door, self closing, embossed with universally accepted symbol, removable stainless steel receptacles fitted with spring clip for deodorizer block

T5 - Framed Mirror: One piece channel-framed mirror, Type 304 stainless steel, satin finish; galvanized steel back; secured to concealed wall hanger with concealed locking screws; 605 mm wide × 1525 mm high; 6 mm tempered glass mirror for high humidity use, Mirror Select Quality to ASTM C1503, tempered to ASTM C1048.

Acceptable material:

Bobrick B-165 2460.

Bradley 781-2-24×60.

American Specialties 0620B-24×60.

T6 - Grab bar, 90 degree angle, 762 mm horizontal × 762 mm vertical: 30/32 mm diameter × 1.6 mm wall tubing of stainless steel; 38 mm clear from wall finish to grab bar; 76 mm diameter concealed mounting plates, with escutcheon secured by set screws, mounting plates welded to tubular bar, provided with steel back plates and all accessories. Peen bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2 kN. Custom fabricated to suit if required.

Acceptable material:

Bobrick B-5846.99 and B-5856.99.

Bradley, to match specification and dimensions.

American Specialties 3707-4-M-1600x750 LH and RH.

T7 - Grab bar, 610 mm long: 30/32 mm diameter × 1.6 mm wall tubing of stainless steel; 38 mm clear from wall finish to grab bar; 76 mm diameter concealed mounting plates, with escutcheon secured by set screws, mounting plates welded to tubular bar, provided with steel back plates and all accessories. Peen bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2 kN. Custom fabricated to suit if required.

Acceptable material:

Bobrick.

Bradley.

American Specialties.

T8 - Swing up grab bar, with integral toilet roll holder, 762 mm long: 32 mm diameter × 1.6 mm wall tubing of stainless steel; 5 mm thick stainless steel exposed mounting plates. Peen bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2 kN. Operable by one hand with no more than 22.2 N force and designed to prevent it from accidentally falling into position.

Acceptable material:

Bobrick B-4998.99 with integral toilet roll holder.

Bradley 8370-105.

American Specialties 3414-25.

T9 Robe hook: Satin finish stainless steel flat bar forming hat and coat hooks; 50 mm square flange:

Acceptable Material:

Bobrick B-682

Bradley 9135

American Specialties 7382-B

T10 - Waste receptacle: 0.8mm (22 ga.) stainless steel; exposed surfaces to have satin finish; equipped with vinyl bumper strip and rubber feet; cover equipped with 2 spring-loaded doors which have an international graphic symbol to indicate waste disposal; interior to be equipped with hooks for securing removeable liners; capacity of 73 to 79 litres.

Acceptable material:

Bobrick B-2250.

Bradley 377.

American Specialties 0812.

T11 - Framed Mirror: Identical to T5, but 457 mm wide × 915 mm high.

Acceptable material:

Bobrick B-165 1836.

Bradley 781-2-18×36

American Specialties 0620B-18×36

T12 - Diaper changing station: surface mounted wall unit, stainless steel, plastic laminate insert, steel-on-steel hinge assembly, integral support mechanism, tamper resistant hardware, diaper bag hook, concealed gas shock, safety belt, safety instructions graphic illustration, labelled with universally accepted symbol. Mount with bottom of work surface 700 mm above finished floor.

T13 - Wall-mount Fold-up Adult Changing Table: 200 kg capacity. Electric motorized height adjustment operation by wired remote control. Fold-down and fold-up with hydraulic damping and assist. Lying surface: 1 830 mm long × 813 mm wide with foldable safety rail and body belt.

Acceptable material: Vario by Ropox.

T14 - Custodial Utility Shelf: Surface mounted stainless steel shelf with satin finish; 915mm long, 4 mop holders, 3 rag hooks.

Acceptable material:

Bobrick B-224 × 36.

Bradley 9984 × 36.

American Specialties 1315-4.

2.3 FABRICATION

Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

Wherever possible form exposed surfaces from one sheet of stock, free of joints.

Brake form sheet metal work with 1.5 mm radius bends.

Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

Back paint components where contact is made with building finishes to prevent electrolysis.

Hot dip galvanize concealed ferrous metal anchors and fastening devices to CAN/CSA-G164.

Shop assemble components and package complete with anchors and fittings.

Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

Provide steel anchor plates and components for installation on studding and building framing.

2.4 FINISHES

Stainless steel: to ASTM A480/A480M, No. 6 J-type finish.

PART 3 EXECUTION

3.1 EXAMINATION

Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.

Inform Departmental Representative of unacceptable conditions immediately upon discovery.

Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

Install and secure accessories rigidly in place as follows:

Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.

Install grab bars on built-in anchors provided by bar manufacturer.

Use tamper proof screws/bolts for fasteners.

Fill units with necessary supplies shortly before final acceptance of building.

Install mirrors in accordance with Section 08 80 00 - Glazing.

3.3 ADJUSTING

Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.

Lubricate moving parts to operate smoothly and fit accurately.

3.4 PROTECTION

Protect installed products and components from damage during construction.

Repair damage to adjacent materials caused by toilet and bathroom accessories installation.

3.5 SCHEDULE

Locate accessories where indicated.

END OF SECTION

PART 1 - GENERAL

1.1 General

- .1 The word "provided" shall mean "supply and install" unless otherwise indicated.
- .2 Provide new materials, equipment and plant of proven design and quality and of current models with published ratings for which replacement parts are readily available.

1.2 Scope of Work

- .1 The work included in this Contract shall include the furnishing of all labour, materials, equipment, plant tools and services necessary for, and incidental to the supply, installation and completion of installation to the full intent of the Drawings and as hereafter specified.
- .2 Thermal Insulation
 - .1 Work shall include, but is not necessarily limited to installation of the following
 - .1 Domestic hot and cold water and recirculation pipe.
 - .2 Vent pipe.
 - .2 Removable insulation on bodies of valves.
- .3 Plumbing
 - .1 Work shall include, but is not necessarily limited to installation of the following:
 - .1 A complete sanitary drainage and vent system and all drains as shown on the drawings or specified herein.
 - .2 A complete hot and cold water distribution system as shown on drawings or specified herein.
 - .3 Plumbing fixtures.
 - .4 Connections to equipment.
 - .5 Supply and installation of thermometers and pressure gauges as specified in Section 23 05 16.
 - .6 Supply and installation of valves as specified in Section 23 05 20.
 - .7 Supply and installation of hangers and supports as specified in Section 23 05 29.
 - .8 Identification in conformance with Section 23 05 54.
 - .9 Start-up, cleaning and performance verification procedures as specified in Section 23 08 01.
 - .2 PVC conforming to CAN/CSA-B181.2 with size to diameter ration (SDR) of 35 or less with PVC joints and gasketed fittings. Flame spread rating less than 25 and smoke development rating less than 50.
 - .3 Copper type DWV conforming to CAN/CSA-B125. Joints shall be lead free soldered with screwed joints at fixtures.

1.3 Drawings and Specifications

- .1 Not intended to show structural details or architectural features.
- .2 Except where dimensioned, indicates general mechanical layouts only. Do not scale.
- .3 The Mechanical Trade Contractor shall check the content of all architectural, structural, mechanical and electrical drawings and specifications, and review these documents for coordination of clearances available for equipment and services, required equipment power supplies and equipment quantities. Before proceeding, report to the Engineer any error or omission, or lack of coordination between the plans and specifications.
- .4 These specifications are to be considered as an integral part of the drawings which accompany them, neither the drawings nor the specifications shall be used alone. Any item which is omitted in one but which is reasonably implied in the other, shall be considered properly and sufficiently specified and must, therefore, be provided under the Contract. The decision of the Engineer shall be final, if interpretation is required.
- .5 It is this contractor's responsibility to ensure that what is being installed will function as intended. Any items on the drawings that will not permit for the system to operate as intended are to be brought to the Engineers attention prior to commencement of the installation. Should the contractor proceed with the installation that they know, or should know will not function as intended, it will be this contractors responsibility to correct. Misinterpretation of drawings and specifications shall not relieve the Mechanical Trade Contractor of responsibility.
- .6 All Mechanical Trade Contractors shall make themselves familiar with the overall intended operation of the mechanical systems prior to installation so that all necessary accessories such as dampers, vents, valves, controls, etc., can be installed during the normal progress of the work. Failure to do so will result in Mechanical Trade Contractor's responsibility in providing such devices, at his expense when the need of such devices becomes apparent during start-up.

1.4 Guarantees

- .1 This Mechanical Trade Contractor shall guarantee all his work free from defects for a period of one (1) year, unless specifically noted otherwise, after final acceptance of such work by the Owner and shall make good all defects other than normal wear and tear during the life of the guarantee. This Mechanical Trade Contractor shall guarantee all work and equipment supplied by him to work quietly and satisfactorily and to accomplish the work for which it was installed during the life of the above guarantee. At any time during this period, he shall make any necessary changes and adjustments or replacements, to accomplish this at his own expense.
- .2 Submit manufacturers' written guarantees to the Construction Manager.

- .3 Bind guarantees in hard cover report binder suitable for 212 mm x 275 mm (8-1/2" x 11") sheets. Label cover "Guarantees" and show project name. Provide title sheet and table of contents.
- .4 Each guarantee shall include:
 - .1 Project name and address.
 - .2 Guarantee time period (commencement date shall be as date shown on Project Final Certificate of Completion unless otherwise indicated).
 - .3 Clear and concise definition of what is guaranteed and remedial action provided.
 - .4 Signatures of Mechanical Trade Contractor and a company officer of the manufacturing firm.
 - .5 Include all extended guarantees (and service contracts) as specified in individual sections.

1.5 Permits and Regulations

- .1 All Mechanical Trade Contractors shall comply with all regulations of Authorities having jurisdiction, where applicable, including but not limited to the following:
 - Provincial Department of Labour
 - Provincial Fire Marshal
 - Municipal Plumbing Inspector
 - Provincial Department of Health
 - CSA B51 - Boiler and Pressure Vessel, and Pressure Piping
 - CSS B149 – Natural Gas and Propane Piping
 - Nova Scotia Stationary Engineers Act
- .2 The Mechanical Trade Contractor shall obtain and pay for any permits required by Local Codes and Regulations and arrange for inspections.
- .3 Any additional materials or labour required to conform to any of these rules and regulations will be furnished under the Contract with no additional cost to the Owner.

1.6 Reference Standards

- .1 Use following latest editions and amendments in effect on date of Tender call:

ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CEMA	Canadian Electrical Manufacturers Association
CFUA	Canadian Fire Underwriters' Association
CHVAC	Canadian Heating, Ventilation and Air Conditioning Code (NRC)
CSA	Canadian Standards Association
CUA	Canadian Underwriters' Association
HRA	Heating, Refrigeration and Air Conditioning Institute of Canada
NACE	National Association of Corrosion Engineers
NBC	National Building Code of Canada
NBFU	National Board of Fire Underwriters'

NBS	National Bureau of Standards
NSC	National Standards of Canada
SMACNA	Sheet Metal and Air Conditioning Contractors National
UL	Underwriters' Laboratories
ULC	Underwriters' Laboratories of Canada
CGSB	Canadian Government Standards Board

1.7 **Co-ordination**

- .1 Co-ordinate work with other trades to avoid conflict.
- .2 Locate distribution systems, equipment and materials to provide minimum interference and maximum useable space.
- .3 Co-ordinate location of duct drops, pipe drops and risers with trades erecting walls and ceilings to ensure that all pipes and ducts are concealed in walls or ceilings spaces. If space is not available in walls or ceilings, locate ducts and pipes so that they can be easily boxed in by the relevant trades. Where pipes are shown rising in concrete block walls, placement of the pipe shall be done in conjunction with the erection of the wall.
- .4 Each Mechanical Trade Contractor shall consult with structural requirements and other Trade Contractors where their respective installations conflict and shall re-route pipes or ducts or re-locate equipment as required subject to the approval of the Construction Manager. Where the drawings show multiple services from the same trade, and/or from different trades in the same location, this contractor is to bring the conflict to the attention of the Construction Manager for resolution prior to commencement of installation of the affected services. Should the contractor proceed with the installation prior to coordination with the Construction Manager, this contractor will be responsible, at their cost, to relocate affected services should the Construction Manager deem relocation necessary.

1.8 **Alternates**

- .1 Wherever an item or class of material is specified exclusively by trade name of maker or by catalogue reference or under "Acceptable Products", only such item shall be used unless the Engineer's approval for an alternative is secured in writing.
- .2 Should the Mechanical Trade Contractor desire to substitute another material for one or more specified by name, he shall apply in writing for such permission at least two (2) calendar days before closing date of Mechanical Trade Tenders. He shall also provide data and/or samples for the Engineer's consideration. Alternate requests will not necessarily be addressed through addendum, but will be confirmed or rejected by the Engineer in writing.
- .3 Equipment submitted as alternate to that specified on the drawings or in the specifications by model number or catalogue reference must be capable of meeting the full range of operating parameters as the specified equipment. It must also be configured and set to meet the specific design point parameters as called for on the plans or in the specifications.

- .4 The Mechanical Trade Contractor shall note that all layouts on the mechanical drawings are based on the specified equipment and any changes necessitated in service connections, etc., will be done at the Mechanical Trade Contractor's expense. Furthermore, if it is found that the provisions made regarding space conditions are not met, the right is reserved by the Engineer to require installation of the equipment used in the tender drawings.
- .5 Definitions:
 - .1 Acceptable Products (Acceptable Manufacturer)- Any product mentioned may be used provided it meets or exceeds the quality, performance capability, and space requirements of the equipment shown and called for on the plans and in the specifications.
 - .2 Standard of Acceptance - Only the product mentioned may be used unless alternate products are approved by the Engineer.

1.9 Shop Drawings

- .1 This Mechanical Trade Contractor shall prepare an electronic submission of the shop drawings in PDF format. These electronic shop drawings are to be prepared using 1st generation PDF's. Scanned copies of printed shop drawings will be rejected.
- .2 Thermal Insulation
 - .1 Submit for approval if requested, manufacturer's catalogue literature related to insulation for pipe, fittings and valves.
- .3 Plumbing
 - .1 Plumbing fixtures and trim.
 - .2 Floor drains, cleanouts, wall hydrants, access doors, trap primers.
 - .3 Domestic hot water circulator.
 - .4 Domestic hot water tanks and heaters.
 - .5 Valves.
 - .6 Expansion tanks.
- .4 All such drawings shall be submitted to the Construction Manager for review by the Engineer, and the work shall not commence until such review has been obtained.
- .5 The Engineer's review of these drawings is general. It is not intended to release the Mechanical Trade Contractor from necessity of furnishing systems/equipment that meet the intent of the drawings and specifications in relationship to capacity, power supply, functionality, etc. as required to perform as required by the plans and specifications.
- .6 All shop drawings must be checked against the requirements of the plans and specifications by this Mechanical Trade Contractor prior to forwarding them to the Construction Manager. Appendix A at the end of this section must be completed and signed and must accompany all shop drawing submissions. Submissions not accompanied by Appendix A will be returned for re-submission.

- .7 Where drawings and specifications are in metric or in both imperial and metric, all design data, capacities, sizes and dimensions specifically called for on the drawing or in the specifications will be submitted in like terms on the shop drawings.
- .8 All shop drawings, other than standard manufacturers dimensions and data sheets, shall bear the stamp of a registered professional Engineer who shall be fully responsible for the Engineering content of such drawings. Where such drawings are prepared in Nova Scotia and/or apply to products to be manufactured in Nova Scotia, the Engineer shall be a member of APENS.

1.10 Packaged Equipment

- .1 The Mechanical Trade Contractor shall note that whenever package equipment is specified it is intended that this equipment shall be a complete package with all necessary accessories to allow for safe automatic operation.
- .2 These accessories shall include all necessary starters, disconnects, relays, transformers, pressure switches, sensors, timers, etc.. Where subject to the weather, the device shall be enclosed in a "weatherproof" enclosure.
- .3 The Mechanical Trade Contractor shall be responsible for checking with the supplier of the equipment to ensure that the packaged equipment is complete with all necessary accessories. He shall also determine which accessories are factory mounted and which ones are shipped loose with the equipment. The Mechanical Trade Contractor shall include in his Tender an amount for all necessary wiring and piping, etc. necessary to incorporate any pieces of equipment, which are shipped separately into the job, at no additional cost to the Owner.
- .4 Disconnect switches shall not obscure manufacturer's nameplate data.
- .5 The Mechanical Trade Contractor shall note that this refers to all packaged equipment including boilers, pump sets, etc. and it shall be his responsibility to co-ordinate this with the supplier of the equipment and to either have the supplier include an amount in his price or the Mechanical Trade Contractor shall include the necessary amount to ensure the supply and installation of any accessories necessary for the operation of this equipment.

1.11 Electrical Connections, Motors And Starters

- .1 Where motors for pumps, or other mechanical equipment is connected to Variable Speed Drives, premium efficiency inverter duty type motors are to be installed.
- .2 Electrical equipment shall bear CSA Label. Obtain special inspection labels required by Provincial Authority having jurisdiction.
- .3 The Mechanical Trade Contractor is to review electrical drawings and ensure that equipment power supplies match those indicated on the Electrical Trade Contractors

drawings and specification. Bring all discrepancies to the attention of the Engineer prior to ordering equipment. Failure to complete this coordination review that results in equipment arriving on site that is not suitable for the power supply installed, will result in the equipment being changed at this contractors cost.

- .4 Conform to requirements of Canadian Electrical Code, and Electrical Trade Contractors Division 26 specifications, Local and Municipal and Provincial Authorities, and specified standards.
- .5 All equipment not located in mechanical rooms shall be supplied complete with a disconnect switch. Where exposed to the weather, "weatherproof" disconnects shall be provided. This contractor will be responsible to supply disconnect switches that are not specified or indicated for installation by the Electrical Trade Contractor.

1.12 Cutting and Patching

- .1 Cutting and patching for interior services to be performed by the Mechanical Trade Contractor. Cutting and patching of the building envelop is by the Construction Manager under the supervision of this contractor.
- .2 Make every effort to minimize cutting and patching and provide dimensions, locations and other data for bases, sleeves, boxes, etc., to be built in as construction proceeds. Set sleeves and make openings in concrete forms and masonry before placing concrete and masonry.

1.13 Excavation and Backfilling

- .1 Excavation and backfilling will be performed by under direction of the Construction Manager by others. Supervision by this Contractor.

1.14 Sleeves and Escutcheons

- .1 Sleeves:
 - .1 Unless otherwise specified, supply pipe sleeves for all points where pipe passes through masonry or concrete walls or floors. Sleeve shall be supplied by the Mechanical Sub-Contractor and built-in by appropriate trade.
 - .2 Unless otherwise specified, construct sleeve of galvanized sheet steel with lock seam joints of minimum 16 gauge.
 - .3 Use cast iron or galvanized steel pipe sleeves with perimeter fin continuously welded at mid point.
 - .1 Where sleeve extends above finished floor.
 - .4 In kitchens, washrooms and other wet areas where water from spills or leaks may penetrate the floor slab, sleeves to be Schedule 40 pipe and extend 25mm (1") above the finished floor. In all other areas, sleeves shall be flush with the finished floor.
- .2 Sizes:
 - .1 Provide approximately 13mm (2") clearance, all around, between sleeve and pipes or between sleeve and insulation.
 - .2 Where piping passes below footings, provide minimum all round clearance of

- 50mm (2") between piping and sleeves. Backfill up to underside of footing with concrete of same strength as footing.
- .3 Unless otherwise specified, terminate sleeves flush with walls and ceilings.
 - .4 Sleeves shall be sized to accommodate the insulated pipe diameter.
- .3 Unless otherwise indicated for pipes passing through roofs, use galvanized or cast iron sleeves with caulking recess and flashing clamp device. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make watertight durable joint.
- .4 Escutcheons and Plates:
- .1 Provide on pipes passing through finished walls, partition floors and ceilings.
 - .2 Use chrome or nickel plated brass, either split or solid type, with set screws for ceiling or wall mounted. For equipment room use cast iron type.
 - .3 Inside diameter shall fit around finished pipe insulation or uninsulated pipe. Outside diameter shall cover sleeve.
 - .4 Where sleeve extends above finished floor, escutcheons or plates shall be bell shaped to cover the sleeve extension.
 - .5 Secure to pipe or sleeve but not to insulation.
- .5 Penetrations of Fire Separations:
- .1 Where pipes or ducts pass through walls or floors which provide either rated or non rated (smoke barriers), seal around openings with ULC Listed firestop assemblies. Installation to be in accordance with the manufacturers' recommendations and shall provide a fire rating equal to that of the separation which has been penetrated.
 - .2 Acceptable Manufacturers: 3M, Hilti, Dow Corning

1.15 Bases and Supports

- .1 Concrete bases are by the Construction Manager.
- .2 Concrete bases will be required under all floor mounted equipment including equipment with attached skids and bases unless otherwise noted. All such bases will be 100 mm (4") deep and will be 100 mm (4") larger in all directions than the equipment being supported.
- .3 Where equipment is raised above the floor it will be supported by means of angle iron, I beams or pipe. All such supports shall be anchored to the floor and shall have a metal base to spread the load. These supports shall be cross-braced with diagonal members.
- .4 Where equipment is suspended from the structure provide appropriately sized hanger rods, channel iron or angle iron hangers. Distribute the weight of the units uniformly across the structure, consistent with the design loading for the structure and as approved by the Engineer.
- .5 Where structure has not been designed to support equipment, this Mechanical Trade Contractor shall provide pipe stands or angle iron supports to support the equipment from the floor.

- .6 Unless specifically noted otherwise, provide spring isolators under all floor mounted vibrating, rotating or oscillating equipment designed to eliminate 90% of the vibration from being transmitted to the structure. For similar suspended equipment, provide spring hangers.

1.16 Painting

- .1 Piping, ductwork and equipment identification, glue and sizing and touch-up painting is the responsibility of the Mechanical Trade Contractor.
- .2 Apply to hangers, supports and equipment fabricated from ferrous metals at least one (1) coat of corrosion resistant paint before shipment to job site.
- .3 Touch-up damaged finish surfaces to satisfaction of Engineer. Use primer or enamel to match original. Do not paint over nameplates.
- .4 Ductwork behind open face grilles, such as egg crate type in public areas, is to be finished with a matte black paint compatible with galvanized sheet metal.

1.17 Special Tools And Spare Parts

- .1 Furnish spare parts as follows:
 - .1 Six (6) gaskets for plumbing cleanout plugs
 - .2 One (1) set of seats, washers, and o-rings for all flush valves, faucets, hose bibbs, etc. for each different type of fixture.
 - .3 One glass for each gauge glass installed.
 - .4 One set of packing or seals for each pump.
 - .5 Two pressure gauges and two thermometers for each type and range used on the job.
 - .6 Two replacement filters for each filter type installed with the compressed air system.
- .2 Identify spare parts containers as to contents and replacement parts number.
- .3 Provide one set of all tools required to service equipment as recommended by manufacturers.
- .4 Furnish one grease gun and adapters to suit different types of greases and grease fittings.
- .5 Upon handover of spare parts to the Owner, obtain the signature of the Owner's representative on the list of spare parts confirming receipt of the spare parts. Provide a copy of the signed list to the Engineer.

1.18 Operating Instructions and Maintenance Manuals

- .1 Provide factory trained personnel to instruct operating staff on maintenance, adjustment and operation of mechanical equipment. Instruct staff on changes or modification in equipment made under terms of guarantee.
- .2 Provide instruction during regular work hours prior to acceptance and turn over to operating staff for regular operation.
- .3 Prepare a maintenance schedule which will advise the Owner's staff what maintenance must be done and the suggested intervals at which it should be done.
- .4 Provide three (3) copies to the Owner of the maintenance manual suitably bound with hard covers, 216mm x 279mm (8½" x 11"). Binders shall be thick enough to hold literature flat. Where necessary, provide two (2) binders. Provide one (1) copy of the Manuals in PDF format using 1st generation PDF's.
- .5 The maintenance manual shall include the following:
 - .1 Have a title sheet, or sheets, preceding data on which shall be recorded Project name, date, list of contents, and Trade Contractor's name.
 - .2 Be organized into applicable Sections of work with each Section separated by hard paper dividers with plastic covered tabs marked by Section.
 - .3 Contain a list of local (or nearest) representative of each piece of equipment including address and phone number.
 - .4 One (1) copy of each final approved shop drawing on which have been recorded changes made during fabrication and installation.
 - .5 Typed or printed information and notes, and neatly drafted drawings.
- .6 Maintenance and operating instructions on all building equipment supplied by the Mechanical Trade Contractor.
- .7 Maintenance instructions as by the equipment manufacturer.
- .8 Brochures and parts lists on all equipment as supplied by the equipment manufacturer.
- .9 Sources of supply for all proprietary products used in the work.
- .10 Lists of supply sources for maintenance of all equipment in the project of which more detailed information is not included above.
- .11 List of recommended spare parts.
- .12 Submit all guarantees and extended guarantees together in a separate binder.
- .13 Material Safety Data Sheets (MSDS) for all chemicals supplied including, but not limited to, water treatment, materials in neutralizing tanks and grease interceptors, glycol, refrigerants, fuel oil, and fire extinguishing agents.

1.19

Completion

- .1 Nothing herein contained can be constructed to relieve this Trade Contractor from making good and perfect work in all usual details of construction and in accordance with best standard practice and in strict compliance with provisions of any and all laws and ordinances, and the rules and regulations of any duly constituted public body having jurisdiction over this work.
- .2 This Trade Contractor shall be held responsible to provide and furnish all necessary labour and to bear all expenses incidental to the satisfactory completion of the work.

1.20 Cleaning Mechanical Equipment Before Use

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of air handling units. If ductwork is not wiped clean during installation and is not adequately sealed to prevent entry of dust and debris during construction, the Contractor will be required to properly clean the ducts prior to acceptance by the Owner.

1.21 Use of Mechanical Systems

- 1 Use of new permanent plumbing systems is permitted only under the following conditions:
 - .1 Entire system is complete, pressure tested, cleaned, flushed out.
 - .2 Building has been closed in, and not subjected to further dust-producing processes.
 - .3 There is no possibility of damage from any cause.
 - .4 All systems will be:
 - .1 Operated as per manufacturer's recommendations or instructions.
 - .2 Operated by Mechanical Trade Contractor.
 - .3 Monitored continuously by Mechanical Trade Contractor.
 - .5 Warranties and guarantees are not thereby relaxed.
 - .6 Regular preventive and all other manufacturers recommended maintenance routines are performed by this Trade Contractor at his own expense and under supervision of Construction Manager.
 - .4 Before static completion, entire system to be refurbished, cleaned internally and externally, restored to "as- new" condition, filters in air systems replaced.
- .2 Filters referred to herein are over and above those specified elsewhere in this specification.
- .3 Exhaust systems are not included in any approvals for temporary heating ventilation.

1.22 Record Drawings

- .1 One (1) set of white prints and one (1) set of reproducibles will be provided for record drawing purposes. Maintain project "as-built" record drawings and accurately record significant deviations from the Contract Documents, caused by site condition or Contract change. Mark changes on white prints in "RED". At the completion of the projects, and prior to final inspection, neatly transfer "as-built" corrections and notations to reproducible transparencies, and submit to the Engineer for review.

- .2 Record drawings shall show inverts at the beginning and end of main storm and sanitary branches, and at the exit from the building. The dimensions off column centre lines shall also be indicated.
- .3 Provide PDF copy of scanned As-Built Drawings.

1.23 Owner Supplied Equipment

- .1 Take delivery of and install certain pieces of equipment which is being provided by the Owner or his representative.
- .2 Provide all necessary piping and duct connections as necessary to leave the equipment ready for operation.

1.24 Demonstration of Complete Systems

- .1 At the conclusion of the job, the Mechanical Trade Contractor shall review and demonstrate to the Owner all equipment and their respective functions and operation. Such demonstration shall be provided for such reasonable periods of time as the complexity of the job warrants, and as approved by the Engineer. Such review and demonstration shall be made by an authorized representative of the Mechanical Trade Contractor, fully knowledgeable of the project, its installation and operation.
- .2 Provide the Engineer with a schedule of system demonstration at least two (2) weeks prior to demonstration.

1.25 Manufacturers Review

- .1 It shall be the responsibility of the Mechanical Contractor to have the equipment supplier or his representative to review all proposed connections, clearances, sizes, valves, breakers, etc. including wire and pipe sizes to his equipment before installation commences. At that time, he shall inform the Engineer of any changes required to make the equipment function satisfactorily.
- .2 Provide the Mechanical Trade Contractor with a letter accepting all connections as proposed and where required recommend necessary changes.
- .3 If any changes or additional material and labour are required to make the equipment function properly to capacity and the manufacturer has not pointed out this work prior to commencement of work, the additional and/or corrective work shall then be done at the expense of the equipment supplier.

END OF SPECIFICATION SECTION

1.26 APPENDIX A

1.1 SHOP DRAWING SUBMITTAL FORM

General Contractor: _____

Phone Number: _____ Fax No. _____

Mechanical Contractor: _____

Phone Number: _____ Fax No. _____

Mechanical Contractor Project Representative: _____

Item: _____

Number of Copies: _____

Supplier: _____

Manufacture: _____

Specification Section and Item: _____

Drawing Reference: _____

Specified Options Indicated Yes No

Items are in Conformance with Plans and Specifications Confirmed by Contractor.
Yes No

If No, explain: _____

Contractors Signature: _____

Date: _____

PART 1 - GENERAL

- 1.1 **General**
.1 All conditions included in Section 22 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.
- 1.2 **Reference Standards**
.1 National Plumbing Code of Canada
- 1.3 **Submittals**
.1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 22 05 00 – Common Work Results for Plumbing.
- 1.4 **Closeout Submittals**
.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- 1.5 **Maintenance Material Submittals**
.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- 1.6 **Delivery, Storage and Handling**
.1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.
.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
.3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

- 2.1 **Domestic Hot Water Circulating Pumps**
.1 Construction: closed-coupled, in-line centrifugal, stainless steel or lead-free bronze construction, stainless steel shaft, stainless steel or lead free bronze shaft sleeve, permanently lubricated ball bearings. Rated for 100 psi and 105°C continuous service.
.2 Motor: drip-proof, with thermal overload protection.
.3 Supports: provide as recommended by manufacturer.
.4 Connections : Screwed or flanged.
.5 Acceptable Materials: Armstrong, Aurora, Bell & Gossett, Grundfos, Taco, Wilo, Xylem, Flobab

PART 3 – EXECUTION

3.1 **Manufacturer's Instructions**

- .1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage, and installation instructions, and datasheets.

3.2 **Installation**

- .1 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .2 Ensure pump and motor assembly do not support piping.
- .3 Ensure pumps are readily accessible for servicing without interfering with installation or operation of other equipment.
- .4 Align vertical pit mounted pump assembly after mounting and securing cover plate.

3.3 **Start-Up**

- .1 Run-in pumps for 4 hours for circulation pumps.
- .2 Eliminate causes of cavitation, flashing, air entrainment.

END OF SPECIFICATION SECTION

PART 1 - GENERAL

1.1 General

- .1 All conditions included in Section 22 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

1.2 Reference Standards

- .1 ASME
 - .1 ASME B31.9 – 2020 Building Services Piping.

1.3 Submittals

- .1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 22 05 00 – Common Work Results for Plumbing.

1.4 Closeout Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.5 Maintenance Material Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.6 Delivery, Storage And Handling

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 General

- .1 All exposed water piping shall be heavy triple chrome plated.
- .2 Copper Types K and L conforming to ASTM/B42, B88 with wrought copper or cast brass fittings.
- .3 PE/AL/PE composite pipe and fittings used for potable water systems shall conform to CAN/CSA-B137.9, Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite pressure-pipe Systems complete with O-ring and brass threaded fittings.
- .5 Polyethylene SDR-9 PEX tubing to CSA B137.5, ASTM F-876/F-877/CTS-OD, SDR9 O-ring brass threaded fittings.

2.2 Water Piping Above Ground – Risers and Mains

- .1 Pipe: Type L copper conforming to ASTM B88.
- .2 Fittings: Wrought copper or cast brass.

- .3 Joints: Lead-free solder except that within 3m (10ft) of the domestic hot water tank for pipes 2" and larger silfos shall be used. Unions at fixtures.
- .4 Acceptable Joining Methods: Victaulic Couplings, Viega ProPress, Apollo Copper Press (1/2" to 4")

2.3 Water Piping Above Ground – Runouts To Fixtures

- .1 Pipe: Polyethylene SDR-9 PEX tubing. Where tubing is used, a single piece of tubing is to be installed from the point of connection to the cooper piping system to the plumbing fixture connection. Intermediate piping joints will not be permitted, or Type L copper conforming to ASTM B88, or CPVC conforming to ASTM D1784
- .2 Fittings: Threaded brass or plastic PEX, or wrought copper or cast brass, or same material as pipe if CPVC used.
- .3 Joints: Compression fittings or lead-free solder with unions at fixtures, or solvent welded if CPVC used.

2.3 Trap Primer Pipe

- .1 Polyethylene aluminum.
- .2 Type K soft copper tubing.
- .3 Polyethylene SDR-9 PEX tubing.

PART 3 - EXECUTION

3.1 Installation

- .1 Conform to requirements of ANSI B31.9 Building Services Piping.
- .2 Install straight, parallel and close to walls and ceilings, with specified pitch. Use standard fittings for direction changes.
- .3 Install groups of piping parallel to each other; spaced to permit application of insulation, identification, and service access, on trapeze hangers.
- .4 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets.
- .5 Provide drain at all low points in above grade piping system.
- .6 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment. Reducing bushings are not permitted.
- .7 Brass and copper pipe and tubing shall be free from surface damage. Replace damaged pipe or tubing.

- .8 Ream ends of pipes and tubes before being made up.
- .9 Lay copper tubing so that it is not in contact with dissimilar metal and will not be kinked or collapsed.
- .10 Use non-corrosive lubricant or Teflon tape applied to male thread.
- .11 Clean all excess flux and solder from joints.
- .12 Grooved pipe ends: Cut square, seating surface clean and free from indent and score marks.
- .13 Install di-electric couplings wherever piping of dissimilar metals are joined.
- .14 Install swing or swivel joints to connect risers to mains.
- .15 All piping shall be run concealed in pipe spaces where possible. Piping that is run exposed in finished areas shall be located in corners and boxed in. Where exposed piping is not boxed in, it is to be chrome plated.
- .16 All pipes passing under or through walls or underground shall be protected from breakage. All pipes below grade shall be carefully supported and every precaution taken against injury to pipe and joints.
- .17 Each main, all branch mains and runouts to a future group shall be valved.
- .18 It shall be the responsibility of this Contractor to space all pipes so that they may be completely and separately insulated. Where possible, hot water pipes shall not run below parallel cold water pipes.
- .19 Pipe all relief valves to the nearest funnel floor drain. In other than Mechanical Rooms, pipe relief valves to floor drains or service sink.
- .20 Where runouts serve down-feed risers, install hose end drain cocks at the low point in an easily accessible location. Where pipes will drain completely through faucets, drains may be omitted.
- .21 The Contractor shall provide all necessary piping and make all connections to all special equipment such as heating equipment, etc.
- .22 Keep piping free from scale and dirt. Protect open pipe and wherever work is suspended during construction, to prevent foreign bodies entering or lodging, using temporary plugs, burlap or other approved materials for protection.

3.2 Testing

- .1 Notice of Tests: Give written notice for a minimum of four working days prior to date when tests will be made.
- .2 Prior Tests: Do not concealed or insulated work prior to required testing. Insulate and conceal work only after testing and approval by the mechanical design engineer. Conduct tests in the presence of the mechanical design engineer or person authorized by the

mechanical design engineer.

- .3 Acceptance Tests: Conduct in presence of the Engineer's representative or representative of Agencies having jurisdiction.
- .4 Costs: Bear all costs in connection with all tests.
- .5 Fill with water and hydraulically test at 1-1/2 times system operating pressure or at 862 kPa (125 psi) whichever is greatest. Unless otherwise noted maintain test pressures without loss for a four (4) hour period.
- .6 Test backflow preventors in accordance with the local water utility.

3.3 Flushing and Chlorinating

- .1 Complete after all testing has been completed and certified as acceptable by the Engineer.
- .2 Flush all water mains and cold water service pipes both exterior and interior prior to chlorination through all available outlets. Flushing shall be done after the hydrostatic tests have been completed. The minimum flushing velocity shall be 1 metre per second (3 feet per second) in the mains.
- .3 The disinfecting of water mains shall be in accordance with ANSI/AWWA-C65192 Standard for Disinfecting Water Mains. Water mains shall be chlorinated so that a free available chlorine residual of 25 ppm remains after 24 hour retention on the pipe. This may be expected with an initial application of 50 ppm chlorine under ordinary conditions. The rate of chlorine application shall be proportional to the water entering the pipe: chlorine application shall be close to the point of filling, and at the same time tests shall be taken for chlorine residual close to the extreme end of the line under disinfection. Every precaution shall be taken to prevent the disinfecting solution from entering water mains already in use.
- .4 Flush and drain systems until free of dirt, sludge, oil, grease and other foreign material. Clean strainers.

END OF SPECIFICATION SECTION

PART 1 - GENERAL

1.1 General

- .1 All conditions included in Section 22 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

1.2 Reference Standards

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-B125.3-05, Plumbing Fittings.
 - .2 CSA B602, Mechanical couplings for drain, waste, and vent pipe and sewer pipe.

1.3 Submittals

- .1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 01 33 00 - Submittal Procedures and section 22 05 00 – Common Work Results for Plumbing.

1.4 Closeout Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.5 Maintenance Material Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.6 Delivery, Storage And Handling

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 General

- .1 All plastic pipe shall conform to the smoke and flame ratings as outlined in the Nova Scotia Building Code Regulations.
- .2 All exposed waste or vent piping, traps, etc. shall be heavy triple chrome plated or cast iron.
- .3 ABS conforming to CAN/CSA-B181.1 with ABS fitting and solvent joints.
- .4 PVC conforming to CAN/CSA-B181.2 with size to diameter ratio (SDR) of 35 or less with PVC joints and gasketed fittings. Flame spread rating less than 25 and smoke development rating less than 50.
- .5 Copper Type DWV conforming to CAN/CSA-B125. Joints shall be lead free soldered with screwed joints at fixtures.
- .6 Combustible plastic pipe and fittings penetrating fire separations to be sealed with a fire stop system approved by the National Building Code.

2.2 Drainage & Vent Piping Above Grade (3" And Larger):

- .1 Pipe: Cast iron conforming to CAN/CSA-B70.
P.V.C. DWV conforming to CAN/CSA-B181.2 and NBC Sub-section 3.1.10.
- .2 Fittings: Same as pipe.
- .3 Joints: Mechanical joint or solvent weld on P.V.C. DWV.

2.3 Drainage & Vent Piping Above Grade (2½" And Smaller):

- .1 Pipe: DWV copper conforming to ASTM/B306.
P.V.C. DWV conforming to CAN/CSA-B181.2 and NBC Sub-section 3.1.10.
- .2 Fittings: Copper - cast brass conforming to CAN/CSA-B125.
P.V.C. DWV same as pipe.
- .3 Joints: Copper - 50-50 soldered, screwed at fixtures.
P.V.C. DWV solvent weld.

PART 3 - EXECUTION

3.1 Installation

- .1 Install straight, parallel and close to walls and ceilings, with specified pitch. Use standard fittings for direction changes.
- .2 Install groups of piping parallel to each other; spaced to permit application of identification, and service access, on trapeze hangers.
- .3 All piping shall be run concealed in pipe spaces, chases and ceiling spaces where possible. Piping that is run exposed in finished areas shall be located in corners and boxed in. Where exposed piping is not boxed in, it is to be chrome plated.
- .4 Right angle connections in drain pipes shall be made with Y branches and 1/8 bends, the use of 90 degree tees and elbows is not permitted.
- .5 Each fixture shall be provided with back vent connections and individual trap.
- .6 All pipes passing under or through walls or underground shall be protected from breakage. All pipes below grade shall be carefully supported and every precaution taken against injury to pipe and joints.
- .7 A cleanout easily accessible shall be provided to each alternate change in direction in main soil or waste pipe and at the base of each stack. All cleanouts shall be of the same nominal size as the pipes up to 100 mm (4") and not less than 100mm (4") for larger pipes. The distance between cleanouts in horizontal soil and waste lines shall not exceed 15,000mm (50'-0") in pipe 100mm (4") and smaller.

- .8 The Contractor shall provide all necessary piping and make all connections to all special equipment such as heating equipment, etc.
- .9 Keep piping free from scale and dirt. Protect open pipe and wherever work is suspended during construction, to prevent foreign bodies entering or lodging, using temporary plugs, burlap or other approved materials for protection.

3.2 Testing

- .1 Notice of Tests: Give written notice for a minimum of four working days prior to date when tests will be made.
- .2 Prior Tests: Do not concealed or insulated work prior to required testing. Insulate and conceal work only after testing and approval by the mechanical design engineer. Conduct tests in the presence of the mechanical design engineer or person authorized by the mechanical design engineer.
- .3 Acceptance Tests: Conduct in presence of the Engineer's representative or representative of Agencies having jurisdiction.
- .4 Costs: Bear all costs in connection with all tests.
- .5 Certificates: Obtain acceptance certificates from Agencies having jurisdiction. Work is not considered complete until certificates have been delivered to Architect.
- .6 Sanitary and vent piping shall be tested by sealing outlets and filling the system with water to provide 10ft of head above the highest point. The water level shall remain constant for a minimum of two (2) hours.

3.3 Flushing and Cleaning

- .1 Fill with solution of water and approved non-foaming, phosphate free detergent. Circulate solution throughout piping systems.

END OF SPECIFICATON SECTION

PART 1 - GENERAL

1.1 General

- .1 All conditions included in Section 22 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

1.2 Reference Standards

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .1 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-11-2008, 2nd Edition, Environmental Standard for Paints and Coatings.

1.3 Submittals

- .1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 01 33 00 - Submittal Procedures and section 22 05 00 – Common Work Results for Plumbing.

1.4 Closeout Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.5 Maintenance Material Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.6 Delivery, Storage And Handling

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 Electric Hot Water Heaters

- .1 Tanks shall have 150 psi working pressure and be equipped with extruded high density anode.
- .2 All internal surfaces of the heater(s) exposed to water shall be glass lined with an alkaline borosilicate composition that has been fused to steel by firing at a temperature range of 1400°F to 1600°F.
- .3 Electric heating elements shall be low watt density. Each element shall be controlled by an individually mounted thermostat and high temperature cut-off switch.
- .4 All internal circuits shall be fused.
- .5 The outer jacket shall be of baked enamel finish and shall be provided with fullsize control compartment for performance of service and maintenance through hinged front panel and shall enclose the tank with 2” thick foam insulation.
- .6 Electrical junction box with heavy duty terminal block shall be provided.
- .7 The drain valve shall be located in the front for ease of servicing.
- .8 Heater tank shall have a three year limited warranty.

- .9 Be complete with ASME-rated temperature and pressure relief valve
- .10 Comply with ASHRAE 90.1.
- .11 Acceptable Products: Rheem, A.O. Smith, Bradford White, Giant, Eco-King.

PART 3 - EXECUTION

3.1 Electric Hot Water Heaters

- .1 Locate tank to ensure proper access to elements for servicing and removal.
- .2 Provide unions at inlet and outlet of tank.
- .3 Pipe relief valve to the nearest floor drain.

END OF SPECIFICATION SECTION

PART 1 - GENERAL

1.1 General

- .1 All conditions included in Section 22 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

1.2 Reference Standards

- .1
 - .1 American Society of Sanitary Engineers
 - .1 ASSE 1017 (2009), Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems.
 - .2 ASSE 1051 (2009), Performance Requirements for Individual and Branch Type Air Admittance Valves for Sanitary Drainage Systems
 - .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A126-04(2014), Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62-17, Specification for Composition Bronze or Ounce Metal Castings.
 - .3 American Water Works Association (AWWA).
 - .1 AWWA C700-02, Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 AWWA C701-02, Cold Water Meters-Turbine Type for Customer Service.
 - .3 AWWA C702-1-01, Cold Water Meters-Compound Type.

1.3 Submittals

- .1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 01 33 00 - Submittal Procedures and section 22 05 00 – Common Work Results for Plumbing.

1.4 Closeout Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.5 Maintenance Material Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.6 Delivery, Storage And Handling

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 General

- .1 Plumbing specialties shall be Zurn, Enpoco, Ancon, J.R. Smith, or approved alternate unless otherwise noted.
- .2 All parts of specialties (other than gaskets) shall be metallic.

- .3 Exposed parts in finished area to be chrome plated or stainless steel.
- .4 Acceptable Alternates: MiFab, Beeco, Lawler, Apollo mixing valves

2.2 Floor Drains

- .1 Floor drain shall have Dura-Coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with seepage slots, polished nickel bronze light-duty strainer and ½" trap primer connection.
- .2 Where required, funnel to be polished nickel bronze with round grate and stainless steel screws.

2.3 Cleanouts

- .1 Adjustable floor cleanout complete with Dura-Coated cast iron body with neoprene body sleeve, gasketed polished nickel bronze adjustable head, scoriated heavy-duty cover with stainless steel screws.

2.4 Electronic Trap Primers

- .1 Electronic trap primer programmed as standard to provide a six second water injection to traps every twenty-four hours*, complete with galvanized steel combination surface or recessed mount box and cover, ½" solder copper inlet connection, brass ball type stop valve, slow closing 24 VAC solenoid valve with integral strainer, 120 - 24 VAC transformer, brass atmospheric vacuum breaker, PEX waterway, and anti-scaling multi-port manifold with five ½" Male PEX outlet connections.
- .2 Acceptable Manufacturers: Precision Plumbing Products, Zurn

2.5 Water Hammer Arrestors

- .1 Provide where indicate on drawings on hot and cold water piping water hammer arrestors.
- .2 Arrestors shall be sized in accordance with P.O.I. Standard WH201 where not indicated on the drawings. Both casing and bellows to be constructed of Type 304 stainless steel.
- .3 Standard of Acceptance: Zurn Z-1700
- .4 Acceptable Manufacturers: Ancon, Enpoco, J.R. Smith

2.6 Wall Hydrants – Non-freeze Exterior Encased Type

- .1 To be anti-siphon automatic draining wall hydrant for flush installation. Complete with non-freeze type integral backflow preventer, bronze casing, all bronze interior parts, non-turning operating rod with free-floating compression closure valve, replaceable bronze seat and seat washer, and combination 3/4" female straight IP inlet. Nickel bronze box and hinged cover with operating key lock and "WATER" cast on cover.
- .2 Standard of Acceptance: Zurn Z1300
- .3 Acceptable Manufacturers: Ancon, Enpoco, JR Smith

2.7 Wall Hydrants – Interior Wall Mounted

- .1 Lead free cast brass construction with tee-handle c/w soldered inlet and threaded hose connection. Maximum Working Pressure is 125psi (8.6 bar) CWP.
- .2 Standard of Acceptance: Watts LSFC
- .3 Acceptable Manufacturers: Ancon, Enpoco, JR Smith

2.8 Strainers

- .1 Minimum service rating of a gauge pressure of 140 psi or system pressure whichever is greater. To be non-ferrous on domestic water service, with cleanable "Y" pattern. removable screen and made from 20 bronze with screwed brass cap.
- .2 Acceptable Products (2" and under): Spirax/Sarco BT, Armstrong F4SC, Braukmann FY32, Watts LF777

2.9 Backflow Preventers

- .1 2" and smaller: Single access cover and modular check construction for ease of maintenance, with top entry so all internals immediately accessible. Has captured springs for safe maintenance, internal relief valve for reduced installation clearances, replaceable seats for economical repair, bronze body construction for durability, ball valve test cocks.
 - .1 Standard of Acceptance: Watts 009
 - .2 Acceptable Alternates: Braukman, Conbraco, Febco
- .2 2.1/2" and larger: Inline serviceable assembly, reversible & replaceable discs, field replaceable seats, ductile iron valve body design, stainless steel check, valve body drain ports, clapper check assembly.
 - .1 Standard of Acceptance: Febco LF856
 - .2 Acceptable Alternates: Braukman, Conbraco

2.10 Thermostatic Mixing Valves – Point-of-Use

- .1 Lead-free thermostatic mixing valves are designed to control and limit the volumes of cold and hot water required to deliver mixed water at a predetermined temperature either from the "point of source" or "point of use" in compliance with ASSE 1070, integral strainers and check valves, thermostat over-temperature protection, tamper resistant maximum temperature setting adjustment, instantaneous cold or hot water supply failure shut-off protection
- .2 Construction: lead free bronze shuttle with noryl modified polyphenylene oxide sensor, brass/wax filled O-ring, chloramine resistant EPDM spring, stainless steel cap, ASSE 1017 temperature actuated mixing valve for Hot Water Distribution Systems, maximum working pressure 150 psig (1034 kPa), maximum temperature 200 °F (93 °C), hot water inlet temperature range 120 – 180 °F (49 – 82 °C), mixed water temperature range 80 – 120 °F (27 – 49 °C), mixed water temperature tolerance ± 7°F (1.7 °C).
- .3 Standard of Acceptance: Apollo Model MVB-LF
- .4 Acceptable Alternates: Wilkins, Watts, Leonard, Acorn

2.11 Thermostatic Mixing Valves – Master Mixer

- .1 Lead-free thermostatic mixing valve complete with thermostatic type with liquid-filled thermal motor, bronze body construction with replaceable corrosion-resistant components. Valve construction shall employ a sliding piston control mechanism. Sliding piston and liner shall be of stainless steel material. Valve shall come equipped with union

end stop and check inlets with removable stainless steel strainers. Valve shall control temperature from a low flow of 2 GPM up to a maximum flow rate for a given pressure differential.

- .2 Construction: to ASSE 1017, maximum working pressure 150 psig (1034 kPa), mixed temperature range 110 °F - 140°F.
- .3 Standard of Acceptance: Lawler Model 802
- .4 Acceptable Alternates: Watts, Leonard, Acorn

2.12 Pre-Charged Expansion Tanks

- .1 Pre-charged expansion tank of the size and capacity indicated in drawings. Tank to be suitable for 150 psi, w.p..
- .2 Tank to be pre-charged for use in potable water system, and complete with heavy butyl diaphragm , antimicrobial polypropylene liner, stainless steel connection, red oxide primer finish, Schrader air valve with EPDM seat and precharged to 55 psig
- .3 Standard of Acceptance: Amtrol Model ST-12-C
- .4 Acceptable Products: American Tube, Expanflex, Taco, Armstrong, B & G, Flobab, Wessels

PART 3 - EXECUTION

3.1 Plumbing Specialties

- .1 Floor drains shall be individually vented and individually trap primed.
- .2 Access panel to be provided for trap primer.
- .3 Every cleanout shall be easily accessible and it shall be the responsibility of the Mechanical Contractor to see that access panels are provided for this purpose. Provide cleanouts in trap arms or in vertical waste lines. Provide cleanouts in vertical waste lines below double waste fittings. All traps to have cleanable dips. Ensure cleanouts meet the requirements of the Canadian Plumbing Code.
- .4 Install air chambers on hot and cold water supply to each fixture. These chambers shall consist of extending the water piping 450 mm (18") long by 20 mm (3/4") diameter.
- .5 Water hammer arrestors shall be located according to the manufacturer's recommendations.
- .6 Install wall hydrants 600 mm (24") above finished grade unless otherwise noted.

END OF SPECIFICATION SECTION

PART 1 - GENERAL

1.1 GENERAL

1.1 General

- .1 All conditions included in Section 23 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

1.2 Reference Standards

- .1 National Building Code
- .2 US Environmental Protection Agency (EPA)
 - .1 WaterSense Label

1.3 Submittals

- .1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 01 33 00 - Submittal Procedures and section 22 05 00 – Common Work Results - Mechanical.

1.4 Closeout Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.5 Maintenance Material Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.6 Delivery, Storage And Handling

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 Plumbing Fixtures and Trim

- .1 Plumbing fixtures shall be the product of one manufacturer. All fixtures are to be white.
- .2 The lid of tank type water closets shall be bolt down, tamper proof.
- .3 Acceptable Products:
Crane, American Standard, Eljer, Kohler, Novanni, Franke, Kindred, Steel Queen, Stern Williams, Krowne, Contrac, Lawler, Symmons.
- .4 Trim shall be heavy duty pattern for institutional use and be of one manufacturer.
- .5 Acceptable Products: Crane, American Standard, Waltec, Emco, Brasscraft, Cambridge Brass, Chicago Faucet, Kohler, Sloan, McQuire, and equal in quality to the specified product.

- .6 Materials:
 - .1 Vitreous china to C.S.A. B45.1.
 - .2 Stainless steel fixtures to C.S.A. B45.494 Class II, Type 302 in accordance with C.S.A. G110.61978 unless otherwise stated.
 - .3 Plumbing fittings to C.S.A. B12593.
 - .4 Exposed plumbing brass and metal work shall be heavy triple chromium plated.
- .7 Carriers to be provided for all wall mounted fixtures.
- .8 The Mechanical Trade Contractor is responsible to supply and install plumbing fixtures that comply with all requirements of Section 3.8 Barrier Free Design of the Nova Scotia Building Code Regulations.
- .9 Plumbing fixtures and trim shall be as indicated on the drawings.

PART 3 - EXECUTION

3.1 Fixture Installation

- .1 Each fixture shall be separately trapped. Traps shall have cleanouts or be removable.
- .2 Provide supports necessary to set fixture level and square. Carriers to be provided for all wall mounted fixtures.
- .3 Provide lockshield stops on the hot and cold water supply to each fixture.
- .4 Provide check valves on supplies to mixing faucets and thermostatically controlled mixing valves.
- .5 Exposed pipe and stops shall be chrome plated. Supplies in cabinets or concealed spaces may be Speedway CP tubing with CP escutcheons at walls.
- .6 Fixtures mounted on glazed tile surfaces shall have ground faces to finished surface.
- .7 Fixture mounting heights measured from floor shall be in accordance with following paragraphs:
 - .1 Water Closets:
 - .1 Standard: 380 mm (15") to top of bowl rim.
 - .2 For barrier free: 60mm (18") to top of seat.
 - .2 Lavatory:
 - .1 Standard: 787mm (31") to top of basin rim.
 - .2 For barrier free: 812mm (32") to top of basin rim.
- .8 Seal/caulk between the base of the water closet and the floor, between wall hung lavatories and the wall, and between the top of the tanks and wall on tank type water closets with mildew resistant silicone sealant.
- .9 Paint aluminum all exposed piping, traps, etc..

3.2 Field Quality Control

- .1 Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.
- .2 Tests and Inspections:
 - .1 Perform each visual and mechanical inspection.
 - .2 Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - .3 Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
 - .4 Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- .3 Prepare test and inspection reports.

3.3 Adjusting

- .1 Adjust or replace fixture flow regulators for proper flow.
- .2 Adjust equipment temperature settings.

END OF SPECIFICATION SECTION

PART 1 - GENERAL

1.1 General

- .1 All conditions included in Section 23 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

1.2 Reference Standards

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B40.100-01, Pressure Gauges and Gauge Attachments.
 - .2 ASME B40.200-01, Thermometers, Direct Reading and Remote Reading.

1.3 Submittals

- .1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 01 33 00 - Submittal Procedures and section 23 05 00 – Common Work Results - Mechanical.

1.4 Closeout Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.5 Maintenance Material Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.6 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 Thermometers

- .1 Adjustable type, 225mm (9") metal case, calibrated in Degrees F and Degrees C with range to suit the normal operating temperature of the fluid.
- .2 Thermometer Wells: Copper or bronze for copper pipe, brass or stainless steel for steel pipe.
- .3 Acceptable Products: Winters Vari-angle, Terice BX, Taylor-Weiss, Weksler.

2.2 Pressure Gauges

- .1 112mm (4-1/2") diameter, equal to Ashcroft No. 1010.

- .2 All gauges to be complete with a petcock for isolation.
- .3 Acceptable Products: Ashcroft, Morrison, Taylor, Weksler.

PART 3 – EXECUTION

3.1 Thermometers

- .1 Thermometers to be installed for easy reading where indicated on the drawings and as indicated below.
 - .1 For plumbing systems, install thermometers on the outlet of all DHW tanks and on the inlet and outlet of tempering valves. Also install thermometers on domestic hot water return (recirculation piping).

3.2 Gauges

- .1 Pressure gauges to be installed for easy reading where indicated on the drawings and as indicated below.
 - .1 For plumbing systems, provide for each pump over 2 hp, on the water service inside the building, and on the outlets of pressure reducing valve assemblies.

END OF SPECIFICATION SECTION

PART 1 - GENERAL

1.1 General

- .1 All conditions included in Section 23 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

1.2 Submittals

- .1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 01 33 00 - Submittal Procedures and section 23 05 00 – Common Work Results - Mechanical.
- .2 Submit valve tag list for review prior to installing tags.

1.3 Closeout Submittals

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.4 Maintenance Material 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 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 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.

PART 2 - PRODUCTS

2.1 Manufacturer's Equipment Nameplates

- .1 Provide on each piece of equipment a metal nameplate, mechanically fastened with raised or recessed letters.
- .2 Include registration plates (e.g. Pressure vessel, Underwriters' Laboratories and CSA approval) as required by respective agency and as specified. Indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors, all factory supplied.
- .3 Locate nameplates so that they are easily read. Do not insulate or paint over plates.

2.2 **System Nameplates**

- .1 Provide laminated plastic plates with black face and white centre of minimum size 150 mm x 75 mm x 2.5 mm (6" x 3" x 1/8") nominal thickness, engraved with minimum 12mm (2") high lettering. Use 25mm (1") lettering for major equipment.
- .2 Fasten nameplates securely in a conspicuous place. Where nameplates can not be mounted on cool surface, provide standoffs.
- .3 Identify equipment type and number and service or areas or zone of building served.

2.3 **Pipe Identification**

- .1 Identify medium in piping with (markers or) stencils showing name and service including temperature and pressure and directional flow arrows where relevant.
- .2 For building additions and alterations, use existing coding system, where none exists, use the schedule listed in this specification.
- .3 For new buildings, conform to colour coding system schedule listed in this specification.
- .4 Colour bands, Arrows and Wrap Mark
 - .1 Plastic coated cloth material with protective over coating and waterproof contact adhesive undercoating, suitable for continuous operating temperature of 300 F and intermittent temperature of 400 F.
 - .2 Use 2" wide tape single wrapped around pipe or pipe covering with ends overlapping one pipe diameter but not less than 1" for colour bands. Tape is to be cut, not torn.
 - .3 Block capital letters 2" high for pipes 3" nominal and larger o.d. including insulation and not less than 3/4" high for smaller diameters to be used.
 - .4 direction arrows 6" long by 2" wide for piping of 3" nominal or larger o.d. including insulation and 4" long by 3/4" wide for smaller diameters to be used. Double headed arrows to be used where direction of flow is reversible.
 - .5 Waterproof and heat resistant plastic marker tags to be used for pipes and tubing 3/4" nominal and smaller o.d.
 - .6 Use black pipe marker letters and direction arrows. Use white on red background for fire protection pipe markers.
 - .7 Use wrap mark in lieu of colour band, arrows and stencils.
 - .8 Acceptable Material: SMS Coilmark, W.H. Brady Inc., Seton Name Plate Corp., and Top Tape and Label Ltd.
- .5 Stencilled Identification:
 - .1 As an alternate to manufactured pipe markers identification may be stencilled a first quality environmentally friendly paint and colour bands. Letters shall be a minimum of 50mm (2") high. Use only on canvas insulation jacket.

.6 Table: Pipe and Valve Identification

Pipe Marker Legend	Valve Tag Legend	Primary Colour	Secondary Colour
Domestic Cold Water	C.W.	Green	None
Domestic Hot Water Supply	D.H.W.S.	Green	None
Domestic Hot Water Recirc.	D.H.W.R.	Green	None
Sanitary Sewer	SAN.S.	Green	None
Vent Plumbing	V.P.	Green	None

2.4 **Valve Identification**

- .1 Provide brass or lamicoïd tags with 12 mm (2") stamped code lettering and numbers filled with black paint. Secure with non-ferrous chains or "S" hooks. Use for all valves and operating controllers.

PART 3 - EXECUTION

3.1 **Nameplates**

- .1 Locate in conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Provide for nameplates on hot and/or insulated surfaces.
- .3 Do not paint, insulate or cover in any way.

3.2 **Location of Identification on Piping Systems**

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: At not more than 15 m (50ft) 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 room through which piping 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, other confined spaces, at entry and exit points, and at each access opening.
- .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, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.

- .9 Identification to be easily and accurately readable from usual operating areas and from access points.
- .10 Position of identification to be 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.

3.3 **Valves**

- .1 Provide six copies of the tag schedule, designating number, service, function, and location of each tagged item and normal operating position of valves.
- .2 Mount where directed one copy of flow diagram and schedule mounted in glazed frame. Provide one copy in each maintenance instruction manual.
- .3 Consecutively number valves in systems.
- .4 Provide six identification flow diagrams of approved size for each system.
- .5 Boxes, valves and dampers shall be color coded as follows:

Service	Colour of Disc
Plumbing System Valves	Dark Blue
Water Heating System Valves	Cyan
Control System Boxes	White/Red

END OF SPECIFICATION SECTION

PART 1 – GENERAL

1.1 General

- .1 All conditions included in Section 23 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

1.2 References

- .1 Health Canada
 - .1 Guidelines for Canadian Drinking Water Quality - 2020

1.3 Commissioning

- .1 The work of this project is being commissioned to the requirements of LEED. Provide documentation and assistance required by Commissioning Agent as documented elsewhere in the specification.

1.4 Potable Water Systems

- .1 When cleaning is completed and system filled:
 - .1 Verify performance of equipment and systems as specified elsewhere in Division 23.
 - .2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.
 - .3 Confirm water quality consistent with supply standards, verifying that no residuals remain resulting from flushing and/or cleaning.
- .2 Take water samples from remote tap and one outside hose bib to have analyzed at an accredited lab to ensure water meets the drinking water standard.

1.5 Sanitary Drainage Systems

- .1 Buried systems: perform tests prior to back-filling. Perform hydraulic tests to verify grades and freedom from obstructions.
- .2 Ensure that traps are fully and permanently primed.
- .3 Ensure that fixtures are properly anchored, connected to system.
- .4 Operate flush valves, tank and operate each fixture to verify drainage and no leakage.
- .5 Ensure Cleanouts are accessible.

1.6 Reports

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports, supplemented as specified herein.

PART 2 - PRODUCTS

2.1 Not Used

.1 Not Used.

PART 3 - EXECUTION

3.1 Not Used

.1 Not Used.

END OF SPECIFICATION SECTION

1 General

1.1 **GENERAL REQUIREMENTS**

- .1 Division 1 and the General Conditions of the Contract between the Owner and the Contractor shall deem to apply and be part of this section.

1.2 **SUMMARY**

.1 Section Includes:

- .1 General requirements that are common to NMS sections found in Division 26 – Electrical, 27 – Communications and 28 - Electronic Safety and Security.

.2 Related Sections:

- .1 26 05 01 Common Work Results - For Electrical
.2 26 05 20 Wire and Box Connectors 0-1000 V
.3 26 05 21 Wires and Cables (0-1000 V)
.4 26 05 29 Hangers and Supports for Electrical Systems
.5 26 05 31 Junction, Pull Boxes and Cabinets
.6 26 05 32 Outlet Boxes, Conduit Boxes and Fittings
.7 26 05 33 Raceway and Boxes for Electrical Systems
.8 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings
.9 26 05 43.01 Installation of Cables in Trenches and in Ducts
.10 26 24 17 Panelboard Breaker Type
.11 26 27 26 Wiring Devices
.12 26 50 00 Lighting
.13 26 52 00 Emergency Lighting

1.3 **REFERENCES**

.1 Canadian Standards Association (CSA International)

- .1 CSA C22.1-21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.
.2 Abbreviations of electrical terms: to CSA Z85.
.3 CSA Electrical Bulletins in force at the time of tender submission, while not identified and specified by number in this division, are to be considered as forming part of the related CSA Part II standard and must be complied with.

.2 Health Canada / Workplace Hazardous Materials Information System (WHMIS 2015)

- .1 Material Safety Data Sheets (MSDS)

1.4 **CONTRACT DRAWINGS**

- .1 No omissions in the drawings or specifications are intended and the Contractor shall give due consideration to this matter. Any work or material referred to in the drawings and not in the specifications, or vice versa, shall be furnished and performed as though fully covered in both. This shall apply particularly to the drawings where descriptions are sufficiently detailed so as to require little or no mention in the specifications. Items indicated on floor plans and not on riser diagrams, or vice versa, shall be considered fully covered by both.
-

- .2 Runs of conduit and outlet locations indicated on the drawings are diagrammatic and exact locations must be determined by the Contractor as the work proceeds, with due regard to the structure and the work of other trades. The Engineer reserves the right to alter locations of conduit and outlets up to 10'-0" without extra cost, provided that the Contractor is advised prior to roughing in. The Contractor shall make any changes dictated by structural requirements, or conflicts with other trades, without charge to the Owner.
- .3 Any error or omission shall be referred to the Engineer whose decision shall be final.
- .4 Building dimensions shall not be scaled from the electrical drawings but shall be obtained from the Architectural and/or Structural drawings. Any discrepancy between the drawings and the building shall be questioned before proceeding with the installation.

1.5 **WORK INCLUDED**

- .1 The specifications complement the drawings in describing the supply and installation of the complete electrical systems. These systems shall include but not be limited to the following:
 - .1 120/208V Normal Power Systems
 - .2 120/208V-3 phase-4 wire Light & Power Systems
 - .3 Door Access Control

1.6 **WORK NOT INCLUDED**

- .1 The specifications and drawings do not include for the supply and/or installation of the following limited items.
 - .1 Supply and installation of active telephone equipment.
 - .2 Supply and installation of active data equipment.

1.7 **DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.8 **SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for review single line electrical diagrams, drawing 24" x 24" minimum size, under plexiglass and locate as indicated.
 - .1 Electrical distribution system in main electrical room and all sub electrical rooms.
 - .2 Communication riser in main communication room and all communication closets.
- .3 Shop drawings:
 - .1 Contractor shall prepare shop drawings showing in detail the design and construction of all equipment, panels, cabinets, lighting fixtures, etc. High quality electronic "PDF" copies of shop drawings are acceptable, provided they are submitted as one organized "PDF" attachment per system. All such drawings shall be submitted to the Engineer for review, and the work shall not be executed until such review has been obtained.

- .2 All shop drawings, other than standard manufacturers' dimensions and data sheets, shall bear the stamp of a registered professional Engineer who shall be fully responsible for the Engineering content of such drawings.
 - .3 Prior to submission the Contractor shall carefully check all shop drawings to ensure that they comply with the drawings and specifications in both intent and detail. No consideration will be given to shop drawings submitted without this approval and review from the Contractor. Appendix A at the end of this section must be completed and signed and must accompany all shop drawing submissions. Submissions not accompanied by Appendix A will be returned for re-submission.
 - .4 The Engineer's review of these drawings is general and is not intended to serve as a check and shall not release the Contractor from responsibility for errors or from the necessity of checking the drawings himself, or of furnishing the materials and performing the work as required by the plans and specifications.
- .4 Quality Control:
- .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - Load Balance.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.
- .5 Manufacturer's Field Reports: submit to Consultant manufacturer's written report, within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.9 QUALITY ASSURANCE

- .1 Qualifications: electrical Work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
 - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

1.10 SYSTEM STARTUP

- .1 At the conclusion of the job, the Contractor shall review and demonstrate to the Owner, all electrical equipment and their respective functions and operation. Such demonstration shall be provided for such reasonable periods of time as the complexity of the job warrants, and as approved by the Engineer. Such review and demonstration shall be made by an authorized representative of the Contractor, who shall be fully knowledgeable of the project, its installation and operation. An indexed PDF copy and three bound maintenance and operational manuals shall be reviewed and left with the Owner. These manuals shall be custom written for materials and systems supplied for this project. Generic information may accompany the manuals but must only be supplemental information. These manuals shall include, but not be limited to, approved copies of all shop drawings, guarantees, manufacturers maintenance instructions, diagrams, and parts lists, all packaging and installation instructions, and all operating instructions. Where manufacturers' literature is not available, or appropriate, the Contractor shall provide same in written form. This shall apply particularly to the general light, power and control system. Refer

also to Section 01 78 00. Prior to final inspection, submit these manuals to the Engineer for review.

- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.11 **COMMISSIONING**

- .1 Deficiencies and/or discrepancies discovered during the commissioning are to be immediately rectified. Exceptional arrangements for labour and materials required to correct deficiencies which prevent the satisfactory completion of the commissioning process in the indicated time frame will be the responsibility and liability of the contractor.
- .2 Prior to owner training, the following items must be completed and/or submitted:
 - .1 O&M manual(s) completed and reviewed by the engineers.
 - .2 For the system/assembly that training will occur on:
 - .1 Contractor testing, and verification has been 100% completed, with no remaining deficiencies
 - .2 Commissioning Functional Performance Testing has been 100% completed, with no remaining deficiencies, or items on the Commissioning Issues Log.
 - .3 Two weeks in advance of the scheduled training date, provide the following:
 - .1 A detailed agenda
 - .2 A Trainer's biography
 - .4 Training materials specific to the Agenda, in electronic form.
 - .5 Should any deficiencies be discovered during training, the session will be rescheduled.
 - .6 The Owner reserves the right to reject the Trainer, or modify the Agenda, if either are found to be unacceptable.

1.12 **MINIMUM STANDARDS**

- .1 All work shall be performed in accordance with Canadian Electrical Code, National Building Code, and CAN/ULC-S524, as minimum standards. These standards together with all Local or Municipal Rules, Regulations, and Ordinances shall be considered as the Latest Approved Editions at the time of Tender Closing. In no instance, shall the standard established by the drawings and specifications, be reduced by any codes.

1.13 **PERMITS, FEES AND INSPECTION**

- .1 The Contractor shall obtain all inspections and permits required by all laws, ordinances, rules, and regulations by public authority having jurisdiction in this district, and shall obtain certificates of such inspections and shall pay all charges in connection therewith. The final certificate of inspection shall be obtained before final payment for work shall be considered due.
- .2 In no instance shall the standard established by the drawings and specification be reduced by any codes, etc..

1.14 **SUPERVISION**

- .1 The Contractor shall provide supervision and sufficiently qualified foreman to ensure that the job proceeds in a proper and efficient manner. If in the opinion of the Engineer, such personnel are not competent to carry out their work, the Contractor shall replace these men immediately upon written request of the Engineer.

1.15 **OTHER TRADES**

- .1 The Contractor shall co-operate and investigate with other trades to make maximum use of the spaces and avoid conflict with pipes, ducts, equipment radiation, etc. Shop drawings shall be prepared by the Contractor indicating the route of main conduits and ducts which shall be submitted to the Engineer for review.
- .2 The Contractor shall co-operate with other Contractors on the site and carry out the work, in such a way, as not to hinder or hold-up the work of other trades.
- .3 The Contractor shall consult with other Contractors, where their respective installations conflict and shall re-route conduits, ducts, outlets, equipment, etc., as required, subject to the approval of the Engineer.
- .4 The Contractor shall obtain from the mechanical and other trades complete detailed wiring diagrams of equipment requiring connections and shall be responsible for pointing out any discrepancies or the reason why they cannot be adhered to.

1.16 **UTILITY CO-ORDINATION**

- .1 Utility related HV and communication services are to be coordinated between this contractor, the owner and respective utilities as required to provide a complete working system.

1.17 **FIRE PENETRATIONS**

- .1 Where conduits and cables pass through fire separations and sound rated separations, including floors, walls, membranes, etc., provide a metallic sleeve, or core drill to 1" radius larger than the conduit or cable passing through the fire separation. Construct a ceramic fibre insulation dam, or dams as required, and fill the penetration with 3M PUTTY 303 or 3M CAULK CP25. A minimum depth of (2") (50 mm) of putty or caulk is required. As an alternate system, pack the space with ceramic fibre insulation to within 1 inch of each face of the separation, and fill the remaining voids with (1") (25 mm) of Electrovert AA 400 FLAMESEAL PUTTY, on each side. Either installation shall be in strict accordance with manufacturers recommendations and to suit UL and/or ULC requirements. All such work shall be performed by personnel familiar and experienced with this type of work.

1.18 **GUARANTEE**

- .1 The Contractor shall guarantee all work, under this Division, free from defects, for a period of one (1) year, after final acceptance of the entire project. The Contractor shall make good all defects, other than normal wear and tear, during the life of the guarantee. Notwithstanding the above, longer guarantees may be required for specific installations or equipments, as indicated in other sections of the specifications.
- .2 Guarantees shall be submitted in writing, bound where more than one is required, and submitted to the Engineer for review. Each guarantee shall include:
 - .1 Project name and address.
 - .2 Guarantee time period (commencement date shall be the date as shown on the project final certificate of completion, unless otherwise indicated).
 - .3 Clear and concise definition of what is guaranteed.
 - .4 Signatures of company officers of the Contractor and/or manufacturers, as applicable.

1.19

RECORD DRAWINGS

- .1 One (1) set of white prints will be provided for record drawing purposes. Maintain project "as-built" record drawings and accurately record significant deviations from the Contract Documents, caused by site condition or Contract change. Mark changes on white prints in "RED".
- .2 Prior to start of testing, balancing and adjusting, finalize production of as-built drawings.
- .3 Testing, balancing and adjusting to be performed using as-built drawings.
- .4 Turn over the as built drawings to the owner at the completion of the project.

2

Products

2.1

MATERIALS AND EQUIPMENT

- .1 Contract materials shall be new and C.S.A. approved for their specific use..
- .2 For the purposes of uniformity similar materials shall be of one manufacturer (i.e. all panels and switchgear; all motor control equipment; all light fixtures in as much as is possible; etc.)
- .3 To avoid the possibility of the work being delayed, the Contractor shall order all materials as soon as possible, and he shall report at once to the Engineer any delays in the delivery of materials which would hold up the completion of the job.
- .4 "Approved Manufacturers" catalogue designations are included in portions of this specification and also on the drawings. Manufacturers and equipments not listed are not acceptable. Requests for approval of alternatives to the equipment specified may be submitted to the Engineer for consideration ten (10) days prior to Tender closing. Where such approvals are granted, the Contractor shall assume full responsibility for the use of alternates with respect to conformance with the specifications, and physical limitations incurred

2.2

ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 All power and control wiring associated with the mechanical systems of this project shall be performed by the electrical contractor but only to the limits of what is actually shown on the electrical drawings.
- .3 The Contractor shall obtain from the mechanical and other trades complete detailed wiring diagrams of equipment requiring connections and shall be responsible for pointing out any discrepancies or the reason why they cannot be adhered to
- .4 Prior to rough in of electrical services, co-ordinate location of all mechanical equipment with the mechanical contractor.

2.3

WARNING SIGNS

- .1 Warning Signs: As specified and in accordance with requirements of Electrical Inspection Department and Consultant.
- .2 Decal signs, minimum size 7" x 10".

2.4

WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum (NUAL) conductors.

2.5 **EQUIPMENT IDENTIFICATION**

- .1 All switchboards, panels, disconnect switches, receptacles, voice/data and cable T.V. outlets, MCC's, transformers, control panels, magnetic starters, TOL's, etc. are to be provided with "lamicoid" nameplates as further described herein. Care is to be taken to ensure that all plates are affixed true and level, and plumb in all instances.
- .2 Nameplates are to be affixed to all "metal" surfaces with steel type "pop-rivets".
- .3 Nameplates are to be affixed to other types of surfaces with contact type cement.
- .4 Nameplates are to be affixed to building "exterior" surfaces with nylon inserts and self tapping screws unless specifically indicated otherwise.
- .5 Contact type cement is to be applied (buttered) to complete rear side of plate, as opposed to several locations or areas on same
- .6 Lamicoid nameplates installed on distribution panelboards, motor control centres, splitter troughs, transformers, etc. shall indicate the following:
 - .1 Designated name of equipment.
 - .2 Amperage of overcurrent protection device.
 - .3 Voltages, number of phases and wires.
 - .4 Designation of power source
 - .1 Example:

**PANEL 101 – 150AMPS
120/208V–3PH–4W
FED FROM MAIN SWITCHBOARD**

- .7 Lamicoid nameplates installed on combination starters, magnetic starters, manual starters, and all various system controls, control panels, disconnect switches, etc. shall contain the following information.
 - .1 Designated name of equipment.
 - .2 Designated name of power source.
 - .3 Branch circuit breaker number(s) where possible.
 - .4 Voltage(s).
 - .1 Examples:

**EXHAUST FAN NO. 1
PANEL H – 120V
CCT. NO.17**

**SUPPLY FAN NO. 1
M.C.C. NO.1
600V–3PH**

- .8 Lamicoid nameplates installed on fusible type disconnect switches are to also indicate maximum designated/designed fuse size.
- .9 Lamicoid nameplates are to be installed on all junction and/or pull boxes sized 6" x 6" and larger indicating name of system, designated panel name and electrical characteristics where applicable.
- .10 Lamicoid nameplates are to be installed adjacent to each overcurrent devices located in switchboards, CDP panels, etc. They need only indicate designated name and/or number of equipment they feed. Unused O.C. devices are to be identified as spare(s).

- .11 Lamicoid nameplates installed on “main” service entrance switches, or “main” entrance switchboards to indicate the following information on minimum size (6" x 2" plate complete with two lines of 1/2" high lettering. (Size #8 nameplate.)

.1 Example:.

**MAIN BREAKER 1000 AMPS
347/600V-3PH-4W**

- .12 Install an additional “lamicoid” nameplate on all, or any piece of electrical equipment, or apparatus (i.e.: main switchboard, CDP panels, panelboards, motor control centres, etc.) that may contain overcurrent devices, i.e. circuit breakers and/or fuses, that have been designed for, and incorporate interrupting capacity sized “larger” than 10 kaIC.

.1 Example:.

**Minimum interrupting capacity of breakers
installed in this panel to be not less than 25
kaIC.**

**Minimum interrupting capacity of fuses
installed in this MCC to be not
less than 25 kaIC.**

- .13 Lamicoid nameplates are to be installed above all types of receptacles and abutted directly to tops of their respective device plates. Identification is to indicate respective panel source complete with associated circuit breaker number(s).

.1 1/16" thick x 1/2" high complete with 1/4" black letters on white face, directly above all flush receptacles. (Plate to be identical width as finish device plate)

.1 Example:.

PANEL 101-20

- .14 General purpose receptacles located in rooms or areas containing additional receptacles intended for computer, electronic or other sensitive types of electronic equipment, etc. are to be identified as per the following:

.1 1/16" thick x 3/4" high complete with 1/4" black letters on white face, directly above all flush receptacles. (Identical width as finish device plate).

.1 Example:.

**General Purpose Only
PANEL 101-24**

- .15 Lamicoid nameplate(s) for Cable T.V. and voice/data outlets are to be installed above the outlets and abutted directly to tops of their respective coverplates.

- .16 Allow for an “average” of forty letters for each lamicoid nameplate.

.1 Lamicoid 1/8" thick plastic engraving sheet, black letters, white face, for all electrical systems except fire alarm systems which shall have white letters on red face.

- .2 1/16" thick nameplates above receptacles as previously indicated, with top left and right corners to be rounded off.
- .3 Lettering on lamicoïd nameplates shall not "start" or "end" nearer than 3/8" from either, or both ends of said plates. Size of lettering, including overall lengths of various plates shall be as indicated in the following chart.
- .4 Sizes as follows:

NAMEPLATE SIZES

Size 1	3/8" x 2"	1 line	3/16" high letters
Size 2	1/2" x 3"	1 line	1/4" high letters
Size 3	5/8" x 3"	2 lines	3/16" high letters
Size 4	3/4" x 3 1/2"	1 line	3/8" high letters
Size 5	1 1/2" x 3 1/2"	2 lines	1/2" high letters
Size 6	1" x 4"	1 line	1/2" high letters
Size 7	1 1/2" x 4"	2 lines	1/4" high letters
Size 8	2" x 6"	2 lines	1/2" high letters

- .17 Labelling of all branch circuit phase and neutral conductors to be done on both ends of all circuit conductors plus in "all" junction and/or pull boxes located in between. Use write-on, self-laminating labels sized as necessary. To be installed in a "flagged" manner around individual conductor(s).
- .18 Coverplates for junction and/or pull boxes located above finish ceilings housing branch circuits are to have each branch circuit number neatly identified on coverplate. Felt marker-pen may be used for this purpose..
- .19 All of the following conductors are to have their insulation colours identified as indicated:

Phase A	Red
Phase B	Black
Phase C	Blue
Neutral	White/Grey
Bond	Green
Ground	Green
Isolated Ground	Green c/w Yellow Strip

- .1 Colour code conductor insulation and others as per the following:
 - .1 All sizes of phase conductors up to and including #2 AWG.
 - .2 All sizes of neutral, bond and/or ground conductors, up to and including #3/0 AWG.
- .2 Approved coloured tapes in lieu of insulation colouring may be used to identify conductors that exceed sizes as indicated in items .19.1.1 and .19.1.2 above, and is to take place on both ends of runs for a minimum of 12" from where terminations take place.

- .20 Some examples of electrical apparatus that could have (identical types) of removable covers, and will require to have their lamicoïd nameplates installed on wall(s) adjacent to control, rather than directly to their covers are the following.
- .1 Magnetic starters.
 - .2 Manual TOL switches
 - .3 Magnetic contactors.
 - .4 Relays.
- .21 Lamicoïd nameplates shall be provided and installed on, or adjacent to, all various systems' control panels and/or cabinets, etc. complete with information as indicated. Plates are to reflect system's assigned name, and where applicable, shall also indicate both, designated panel name and associated branch circuit breaker number(s).
- .1 Fire alarm panels.
 - .2 Security (intrusion) panels.
 - .3 Energy management panels.
 - .4 Television cabinets.
 - .5 Communication panels.
- .22 Control Transformers:
- .1 Concealed control transformers located within ceiling spaces are to have lamicoïd nameplates installed adjacent to same indicating their identified system, primary power source including designated panel name, and associated branch circuit breaker number(s).
 - .2 A second plate with identical information is to be installed on underside of room grid system or access opening frame so as to identify concealed location of same control transformer.
 - .3 All control transformers installed in control cabinets, and/or on walls adjacent to same, are to be identified with lamicoïd nameplates containing information as previously indicated.
- .23 All various pieces of mechanical equipment are to be identified with identical information as indicated on electrical equipment nameplate feeding same mechanical equipment.
- .24 Both plates are to be supplied and installed by the electrical contractor in the absence of any mechanical trade identification.
- .25 Bonding conductors require labelling on both ends of runs where they are "dedicated" solely to the designated branch circuit they accompany. Identify with same number(s) being used to identify accompanying branch circuit phase and neutral conductor.
- .26 All junction and/or pull boxes, conduit fittings (and covers), etc., complete with their respective coverplates are to be colour coded as per the following. Boxes are to be coloured both inside and outside, where "one" colour only is required. Boxes are to be coloured on inside only where "two" colours are required. Metal coverplates are to have both colours applied diagonally where "two" colours are required. Complete plate is to be painted where one colour only is required.
- .27 All various systems concealed junction and/or pull boxes located within ceiling spaces are to have their locations identified on room side of T-bar grid spline or access cover frames with appropriate colour coded, circular shaped, self adhering discs. Discs are to be both, 3/4" and 1/4" in diameter, as described in the following legend, with (1/4") (6 mm) discs being centred in the middle of 3/4" discs. Concealed junction, pull and/or outlet boxes, conduit fittings, etc., in ceiling spaces complete with their respective metal coverplates.
- .28 A legend of colour coding used is to be provided under plexiglass and located in the main electrical room, 24" x 24" minimum size frame.
-

- .29 Schedules shall be installed on the back of each door for panels, neatly arranged and mounted in frame under transparent cover. Schedules shall show system voltage, which outlets are on each circuit and any special information necessary. Schedules shall be typewritten and of a permanent nature.

2.6 WIRING IDENTIFICATION

- .1 Identify wiring on both ends of phase conductors of feeders and branch circuit wiring by circuit number at all panelboards, pull and junction boxes, outlet and equipment connections, and all devices. Labels shall be Panduit PLD-1 or PLD-2 as required. Labels to be installed in such a manner as to present white area with information in "flagged" position. Wrap around conductor in "U" fashion and have it adhere to itself. Identify neutrals and bond wires indicating which circuits with which they are used.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 The individual conductors and conductor pairs used in the various communications cables shall be colour coded. Maintain the colour coding scheme for each system throughout.

2.7 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 49' intervals.
- .3 Colours: 1" wide prime colour and ¾" wide auxiliary colour.

Type	Prime	Auxiliary
251 to 600V	Orange	
51 to 250 V	Yellow	
0 to 51Volts	Violet	
Telephone	Black	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow
CCTV	Yellow	White
Security	Brown	

2.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .1 Paint outdoor electrical equipment ["equipment green" finish] to EEMAX Y1-1-1995.
- .2 Paint indoor switchgear and distribution enclosures [light gray] to EEMAC 2Y-1-1958.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks, and fastenings to prevent rusting.

2.9 ACCESS DOORS

- .1 Supply access doors for furred ceilings or spaces for servicing equipment and accessories or for inspection of safety, operating or fire devices for installation under section erecting the walls or ceilings.

-
- .2 Access doors shall be flush mounted 24" x 24" for body entry and 12" x 12" for hand entry, unless otherwise noted. Doors shall open 180 degrees, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps. Doors shall be of approved manufacturer with published literature. Access doors shall be minimum 14 gauge thick.
 - .1 General: Prime coated steel.
 - .2 Special areas such as tiled or marble surfaces: stainless steel.

 - 3 Execution

 - 3.1 **INSTALLATION**
 - .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
 - .2 Do underground systems in accordance with CAN/CSA-C22.3 No.7 except where specified otherwise.

 - 3.2 **NAMEPLATES AND LABELS**
 - .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

 - 3.3 **CONDUIT AND CABLE INSTALLATION**
 - .1 Install conduit and sleeves prior to pouring of concrete, laying of concrete block, and the installation of drywall partitions.
 - .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 10" horizontal clearance between boxes.
 - .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 10'-0", and information is given before installation.
 - .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

 - 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.
 - .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 46".
 - .2 Wall receptacles:
 - .1 General: 18".
 - .2 Above top of counters or counter splash backs: 6".
-

- .3 Panelboards: 72" to top as required by Code or as indicated.
- .4 Telephone and interphone outlets: 18".
- .5 Wall mounted telephone and interphone outlets: 46".
- .6 Fire alarm stations: 42".
- .7 Fire alarm bells: 90".
- .8 Television outlets: 18".
- .9 Door bell pushbuttons: 46".

3.6 **MOTOR AND EQUIPMENT CONNECTIONS**

- .1 Provide final connections to all motors, equipment, controls, etc. indicated on the drawing. These motors, equipment, controls, etc. shall include those supplied under other sections of this specification, as well as Owner supplied items. Ensure that equipment will operate properly (e.g. proper rotation) and report any instance of defective equipment to the Engineer.

3.7 **CO-ORDINATION OF PROTECTIVE DEVICES**

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings prior to energization of equipment.

3.8 **CUTTING AND PATCHING**

- .1 Should Division 26 be late or negligent in the placing of conduits, boxes, etc. during the rough-in period, then any patching or cutting required to accommodate the equipment shall be done by the General Contractor, but the cost for the same shall be the responsibility of, and be borne by, Division 26.
- .2 Make every effort to minimize cutting and patching by providing dimensions, locations and other data for bases, sleeves, boxes, etc., to be built in as construction proceeds. Set sleeves and mark openings in concrete forms and masonry before placing concrete and masonry.

3.9 **FIELD QUALITY CONTROL**

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment. Such adjustments shall be made under normal load conditions.
 - .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.
- .1 Conduct following tests:
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm system, communications.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

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- .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
- .2 Check resistance to ground before energizing.
- .3 Test all wiring included in the Contract, to ensure there are no shorts or grounded conductors and that insulation values are as required by the Canadian Electrical Code
- .4 The Engineer reserves the right to use any piece of electrical equipment, device, or material installed under this Contract for such reasonable lengths of time and at such times as he may require to make a complete and thorough test of the same, before the final completion and acceptance of the work
- .5 The following wiring methods detailed below are designed to enhance the ability to perform capacitive leakage tests; these methods are to be strictly followed and tests performed under this Contract
- .1 All circuit conductors are to be individually tie wrapped to their corresponding labelled neutral conductor in all panelboards, pull boxes and junction boxes. Enough slack conductor length should be left to enable the ability to clamp the ground detector around the individually tie wrapped circuit conductor and its corresponding labelled neutral. This wiring method is to be neat and of good workmanship quality
- .2 The tie wrapping of the neutral with its respective phase conductors is to be made at the closest point of entry into panelboards, pull boxes and junction boxes.
- .3 The main switchboard, CDP's, panelboards, MCC's, etc. are to have their respective feeder phase and neutral conductors tie wrapped together and enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality.
- .4 The main electrical switchboard is to have each of its sub-feeder phase conductors tie wrapped together with each respective neutral. This tie wrapping is to be located such that ease of clamping the ground detector can be accomplished without excessive exposure to live bus.
- .5 After all electrical wiring has been completed by the Electrical Sub-Contractor, he is to test the grounded electrical distribution system to ensure there are not ground shorts, and capacitive leakage in the system is within acceptable limits
- .6 All feeders or branch circuits, which do not have neutral conductors, are to have their respective phase conductors tie wrapped together in accordance with the methods described previously.
- .6 Submit properly prepared and bound reports of all tests indicating:
- .1 The date and time of the test.
- .2 The name or names of those who conducted the test.
- .3 The purpose of the test.
- .4 The results of the test.
- .5 Any applicable code limits or bounds.
- .7 Such tests shall not be construed as evidence of acceptance of any part of the Contract, and it is agreed and understood that no claim for damage will be made for any injury or breakage to any part or parts of the above, due to the aforementioned tests, where caused by weakness or inaccuracy of parts, or by defective materials or workmanship of any kind whatsoever.
- .8 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .9 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.

3.10

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.
- .3 Luminaires shall be protected from dust and debris during construction. Reflectors, housings and lenses shall be protected from fingerprints during installation and adjustment. Cleaning of lenses and reflectors shall be carried out as per the manufacturer's recommended practices.
- .4 On completion of this project, the Contractor shall remove all debris and leave the site neat and tidy. Equipment shall be checked for proper fitting and alignment, adjusted, cleaned, repainted where necessary, and left in first class condition.

End of Section

APPENDIX A

Dillon Job Number: 21-2330

Shop Drawing Submittal Form

1

General Contractor:	
Phone Number:	Fax No:

Electrical Contractor:	
Phone Number:	Fax No:

Electrical Contractor Project Representative:	
Phone Number:	Fax No:

Shop Drawing Items:
Number of Shop Drawing Copies:
Supplier of Shop Drawings:
Manufacturer of Shop Drawings:
Specification Section and Items:

<p><i>Specified Options Indicated</i> <input type="checkbox"/> <i>Yes</i> <input type="checkbox"/> <i>No</i></p> <p><i>Items are in Conformance with Plans and Specifications Confirmed by Contractor.</i> <input type="checkbox"/> <i>Yes</i> <input type="checkbox"/> <i>No</i></p> <p><i>(If No, explain):</i></p> <p><i>Contractor's Signature:</i></p> <p><i>Date:</i></p>
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- 1 General
- 1.1 **SECTION INCLUDES**
- .1 Materials and installation for wire and box connectors.
- 1.2 **REFERENCES**
- .1 CSA International
- .1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
- .2 CAN/CSA-C22.2 No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
- .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)
- 1.3 **WASTE MANAGEMENT AND DISPOSAL**
- .1 Remove from site and dispose of all 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 wiring materials from landfill to metal recycling facility as approved by Consultant.
- 2 Products
- 2.1 **MATERIALS**
- .1 For branch circuit wiring #10 AWG and smaller, use spring type pressure wire connectors with current carrying parts of copper, or copper alloy, and insulating cap, all to fit copper conductors as required. Standard of acceptable quality: Ideal "wing nuts".
- .2 Joints for all other wiring shall be made using T & B colour keyed compression type connectors, 54000 series, and T & B series compression tools. Insulation shall consist of a first layer of compound type tape followed by a layer of Scotch #33 vinyl tape.
- .1 Burndy and Panduit compression connectors shall be considered an equal to the T&B compression connectors.
-

3 Execution

31 **INSTALLATION**

- .3 Remove insulation carefully from ends of conductors and:
 - .1 Install spring type wire connectors for branch circuit and control wiring #10 AWG and smaller. Plier tighten all wire nut joints and connections.
 - .2 Install pressure type wire connectors for branch circuit wiring larger than #10 AWG. Insulating tapes to overlap successive wraps by a minimum of 50%.
 - .3 The splicing of feeders conductors is not acceptable.
- .4 All connections shall be made electrically and mechanically secure. The sizes of connectors shall be according to manufacturer's recommendations for each wire size and combination of wires.

End of Section

-
- 1 General
- 1.1 **RELATED SECTIONS**
- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.
- 1.2 **REFERENCES**
- .1 CAN/CSA C22.2 No .0.3-09 (R2014), Test Methods for Electrical Wires and Cables.
- 1.3 **PRODUCT DATA**
- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- 1.4 **WASTE MANAGEMENT AND DISPOSAL**
- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.
- 2 Products
- 2.1 **GENERAL**
- .1 Wire and cable shall conform fully to the latest specifications of the Canadian Standards Association (C.S.A.), Electrical and Electronic Manufacturers Association of Canada (EEMAC), the Insulated Power Cable Engineers Association (IPCEA), and the American Society of Testing Materials (ASTM).
- 2.2 **BUILDING WIRES**
- .1 Wiring on circuits exceeding 50 volts to ground shall be of soft drawn stranded copper of 98% conductivity and of full size and AWG gauge. Insulation shall be cross-linked polyethylene NMD90 rated 600 volts. Wiring shall be continuously colour coded as follows:
- .1 Phase A Red
- .2 Phase B Black
- .3 Phase C Blue
- .4 Neutral – White/Grey
- .5 Ground Green
- .6 Where extra colours are required for three way switches, etc., they shall be yellow.
- .2 Conductors pertaining to the wiring of thermostats, motorized valves, damper actuators, and electric pneumatic relays shall be stranded copper conductor of 95% conductivity and of full size and AWG gauge. Insulation shall be thermoplastic "TW" rated 600 volts. Colour code shall be orange and brown. Minimum size shall be No. 18 AWG.
- .3 Colour coding shall be by insulation colour as follows: Phase conductors on sizes up to and including No. 2 AWG. Neutral, ground and bond conductors on sizes up to and including No. 3/0 AWG. Approved coloured tape, in lieu of coloured insulation, may be used for phase conductors sized No. 1 AWG and larger, neutral, ground and bond conductors sized No. 4/0 AWG and larger.
- .4 ACM alloy conductors may be utilized for feeders 100A or above, size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.
-

2.3 **Armoured Cables**

- .1 AC-90 cables shall be soft drawn solid copper of 98% conductivity and of full size and AWG gauge. Insulation shall be cross-linked polyethylene rated 600 volts. Outer armour shall be of interlocking aluminum. Colour coding of AC-90 cable shall be as follows:
 - .1 Phase Conductors Black or Red
 - .2 Neutral Conductor White
 - .3 Ground / Bond Conductor - Bare (light fixture drops only)
 - .4 Ground / Bond Conductor - Green
 - .5 Dedicated / Isolated Bond Conductor - Green

2.4 **CONTROL CABLES**

- .1 Type LVT: Soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket.

3 Execution

3.1 **GENERAL**

- .1 The Contractor shall run all circuits so that the voltage drop, in no case exceeds 3% of the line volts. The neutral wire, wherever it is run shall be continuous with no fuses, switches, or breaks of any kind.
- .2 The installation of more than 3 conductors in a run of conduit is permissible provided C.E.C. Section 4-004(1) is adhered to with respect to the derating of the conductors.

3.2 **INSTALLATION OF BUILDING WIRES**

- .1 Where pulling wires and cables, the use of an approved lubricant only will be permitted. No wires or cables shall be pulled in conduits until such conduits are free from moisture and in no case shall wires be pulled until approval of the Engineer is obtained.

3.3 **INSTALLATION OF CONTROL CABLES**

- .1 The installation of "surface" wiring on walls or in open (non-enclosed) type ceilings, shall be Type EMT conduit complete with associated steel type connectors and couplings.
- .2 EMT conduit is to be extended to within (24") (600mm) of "all" various control devices associated with the operation of any given piece of mechanical equipment.
- .3 Unless specifically indicated otherwise, liquid tight, flexible metal type conduit complete with steel type connector and steel locknut may be used for the "final" (24") (600 mm) connection between the end of the EMT conduit and the applicable control device.
- .4 EMT or PVC type conduit "wall stubs" complete with flush installed device box shall be installed in all masonry or concrete partitions where, and as may be required, where plenum rated cabling is used.
- .5 EMT connectors complete with nylon insulated throat or threaded type bushing shall be installed on end of EMT stub above "finish" type ceilings, etc., where plenum rated cabling is used.

- .6 All EMT conduit stubs are to be “bonded” to ground as per CEC.
- .7 Ground control cable shield.

3.4 STRANDED CONDUCTORS

- .1 All stranded conductors prior to terminating under device bolts such as circuit breakers, switches, receptacles, etc., are to be twisted together so as to form a single conductor to ensure a reliable mechanical connection.

3.5 CAPACITIVE LEAKAGE WIRING METHODS

- .1 The following wiring methods detailed below are designed to enhance the ability of the Owner to perform capacitive leakage tests in the future:
 - .1 All circuit conductors are to be individually ty-wrapped to their corresponding labelled neutral conductor in all panelboards, pull boxes and junction boxes. Enough slack conductor length should be left to enable the ability to clamp the ground detector around the individually ty-wrapped circuit conductor and its corresponding labelled neutral. This wiring method is to be neat and of good workmanship quality.
 - .2 The ty-wrapping of the neutral with its respective phase conductors is to be made at the closest point of entry into panelboards, pull boxes and junction boxes.
 - .3 The main switchboard, CDP's, panelboards, etc. are have their respective feeder phase and neutral conductors ty-wrapped together with enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality. This ty-wrapping is to be located such that ease of clamping the ground detector can be accomplished without excessive exposure to live bussing.
 - .4 After all electrical wiring has been completed by the Electrical Sub-Contractor, he is to test the grounded electrical distribution system to ensure there are no ground shorts or grounds.
 - .5 All feeders or branch circuits which do not have neutral conductors are to have their respective phase conductors ty-wrapped together in accordance to the methods described previously.

End of Section

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- 1 General
- 1.1 **RELATED SECTIONS**
- .1 Section 26 05 01 Common Work Results - For Electrical.
- 1.2 **WASTE MANAGEMENT AND DISPOSAL**
- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.
- 2 Products
- 2.1 **SUPPORT CHANNELS**
- .1 U shape, size (1½" x 1½" x 1/10") (38 mm x 38 mm x (2.54 mm) thick, surface mounted, suspended, set in poured concrete walls and ceilings.
- .2 All strut to be galvanized.
- .3 All threaded hanger rods to be minimum (3/8") (10 mm) diameter, larger if required, made from mild steel.
- .4 In concrete use cast in threaded inserts wherever possible. Should additional inserts be required use a "red head" type of insert capable of carrying at least (500 lbs) (227 kg).
- .5 Supports for all conduit work shall be one hole steel pipe straps; unistrut, or equal, with necessary fittings, approved for their respective use.
- .6 All pull and junction boxes, wireways, and multiple conduits shall be supported by a steel channel support system with all components, hangers, wall supports, cable clamps, etc., specifically manufactured and approved for their application.
- .7 Fastening devices for cabinets, boxes, supports etc., shall be nut and bolt, expansion shields, wedge anchors, or toggle bolts, size and number to suit the application or as detailed on the drawings. Toggle bolts may not be used in plasterboard construction.
- .8 Fastening devices for outlet boxes shall be nut and bolt, expansion shields, wedge anchors or caddy clips, size and number to suit the application or as detailed on the drawings.
- .9 Where outlet boxes are set in drywall construction, a piece of steel stud shall be secured to either side of the outlet box or use caddy quick-mount box supports, or caddy J-1-A for side box supports.
- 3 Execution
- 3.1 **INSTALLATION**
- .1 Secure all equipment in a manner so as not to distort or cause undue stress on any components.
- .2 Secure equipment to masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .3 Secure equipment to poured concrete with expandable inserts.
- .4 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts. Toggle bolts shall not be used to secure equipment to plasterboard, drywall, or acoustic tile surfaces.
-

- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables (2") (53 mm) and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than (2") (53 mm).
 - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with (3/8") (10 mm) dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by (3/8") (10 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 (5'-0") (1,500 mm)(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 the Consultant.
- .13 Do not support any electrical conduits, wire or equipment from ceiling system support cables. Ceiling systems support cables may be utilized to marshal AC90 drops to fixtures.
- .14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .15 In addition to the C.E.C. conduit support requirements, all suspended conduit runs containing horizontal or vertical elbows shall have one additional support installed not greater than (12") (300 mm) from the midpoint of the 90° bend.

End of Section

1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
- .1 CSA C22.1-21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 JUNCTION AND PULL BOXES

- .1 Pull and junction boxes, where larger than standard boxes shall be the equivalent to Type "C" or "D" boxes sized according to C.E.C. Sections 12 3000 to 12 3038. Use Type "D" for boxes up to (12" x 12") (300 mm x 300 mm) and Type "C" for boxes (12" x 12") (300 mm x 300 mm) or larger.
- .2 Pull boxes shall be of sheet metal construction with all welded steel corners and screw on flat covers for surface mounting.
- .3 All flush installed boxes shall be Type "D". Covers for flush mounted pull boxes shall extend a minimum of (1") (25 mm) all around.
- .4 Concealed junction boxes (within ceiling space) shall not be smaller than (4") (100 mm) square.
- .5 All junction boxes containing more than three circuits shall be complete with terminal strips for phase conductors, neutral and bonds.

2.2 CABINETS

- .1 Cabinets shall be steel, fabricated to C.S.A. & EEMAC Standards with baked enamel finish. Cabinet shall be EEMAC Standard Types "C", "D", or "T" as indicated on the drawings. Type "T" cabinets shall be complete with hinged door, lock, two keys, and handle, and be lined with (3/4") (19 mm) plywood.
-

3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations and secure them adequately to the building structure. Pull boxes installed in the middle of conduit runs without backing are not acceptable.
- .2 The location of junction and/or pull boxes in suspended ceiling spaces, i.e. - dry wall, T-Bar, etc., is not to be greater than 30" above the finished ceiling and must be easily accessible.
- .3 All suspended junction, pull and outlet boxes shall be supported with minimum size 3/8" threaded rods, nuts and flat washers. Threaded rods shall be secured to boxes with one flat washer and nut installed on both sides of box. One rod required for all boxes sized up to and including (4¾") (120 mm) square. Two rods required for boxes larger than (4¾") (120 mm) square, up to and including (8") (200 mm) square. A minimum of four rods required for all boxes larger than (8") (200 mm) square.
- .4 Mount cabinets with top not higher than (78") (1981 mm) above finished floor.
- .5 Install terminal blocks as indicated in cabinets.
- .6 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 100' of conduit run between pull boxes.

3.2 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name, voltage, phase and circuit numbers where applicable.

End of Section

1 General

1.1 GENERAL REQUIREMENTS

- .1 Division 1 and the General Conditions of the Contract between the Owner and the Contractor shall deem to apply and be part of this section.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
- .1 CSA C22.1-21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 (4") (102 mm) square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

- .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size (3" x 2" x 1 1/2") (76 x 50 x 38 mm) or as indicated. (4") (102 mm) square outlet boxes when more than one conduit enters one side with extension and plaster tile as required.
- .2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size (4" x 2" x 2") (102 x 54 x 48 mm).
- .3 (4") (102 mm) square or octagonal outlet boxes for lighting fixture outlets.
- .4 (4") (102 mm) square outlet boxes with extension and plaster rings for flush mounting devices in finished walls.
- .5 Surface outlet boxes installed below (8'-0") (2500 mm) shall be hot dipped galvanized cast "FS", or "FD" series boxes with metal coverplates.

2.3 FLOOR BOXES

- .1 Install floor boxes in concrete formwork, prior to concrete pour, securely set to ensure finished collar is flush with the finished floor.
-

- .2 Refer to drawings for additional information.

2.4 CONDUIT BOXES

- .1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.

2.5 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 (1.1/4") (32 mm) and pull boxes for larger conduits.
.4 Double locknuts and insulated bushings on sheet metal boxes.

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 (150 mm) (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.
.5 At each local switch, convenience outlet, receptacle, ceiling or wall fixture, continuous row of fixtures, or system unit (i.e. fire alarm, etc.) provide and install a standard pressed steel outlet box unless specifically noted otherwise. All outlet boxes shall be galvanized inside and out and set flush with finished surfaces. They shall be rigidly and securely set. Boxes shall not be mounted back to back, but separated by a minimum of (12") (305 mm), to prevent noise transmission.
.6 In centering outlets, the Contractor is cautioned to allow for radiation, pipes, ducts, etc., and for the variation in arrangement and thickness of finishes, etc.. His failure to comply with this will not relieve him from the cost of necessary alterations.
.7 The Contractor shall allow for the relocation of an outlet up to (10'-0") (3048 mm) from where shown, provided he has been notified so prior to rough-in of the same.
.8 No outlet or junction box may be installed more than (30") (762 mm) above a finished ceiling.
.9 All suspended boxes are to be supported with minimum size (3/8") (9 mm) threaded rod(s).
.10 All flexible conduit fixture feeds shall originate from the side of the outlet box and not from the box cover.
.11 Flush installed (4") (100 mm) square or a (4-11/16") (119 mm) square box being used as a junction or pull box that requires a blank metal coverplate, is to have an appropriate sized, one or two gang "plaster ring" installed on same. This permits the use of a standard, one or two gang (blank) finish metal coverplate to be used, and avoids the necessity of acquiring an oversized, custom made coverplate.
.12 When installing flush boxes in metal drywall partitions, always screw a short piece of metal stud (same width as partition) to non-supported side of box.

- .13 Concealed boxes installed above drywall ceilings or behind walls, are to have their locations identified on room sides of access opening frames with properly colour coded identification discs.
- .14 Condulet fittings (LB, LL, LR, etc.) and their respective covers/plates are to be painted, and where concealed, have their locations identified with appropriate colour coded, (3/4") (19 mm), self adhering discs, applied to T-bar splines and/or access opening frames, in similar manner as for concealed junction and/or pull boxes, etc..
- .15 Tile type extension rings are not to be used on boxes that have not been "flush" installed. They are not intended, not acceptable for "surface" type application.
- .16 Install floor boxes in concrete form work, prior to concrete pour, securely set to ensure finished collar is flush with the finished floor.

3.2

IDENTIFICATION

- .1 All outlet boxes shall be colour coded as per the colour coding legend for conduits and cables. Refer to Specification Section 26 05 01. Outlet boxes are to be coloured only on the inside.

End of Section

1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 05 53 – Identification for Electrical Systems.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well ventilated area.

2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
 - .2 Single and multi gang flush device boxes for flush installation, minimum size (3" x 2" x 1 1/2") (76 x 50 x 38 mm) or as indicated. (4") (102 mm) square outlet boxes when more than one conduit enters one side with extension and welded tile rings as required.
 - .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size (4" x 2" x 2") (102 x 54 x 48) mm.
 - .4 (4") (102 mm) square or octagonal outlet boxes for lighting fixture outlets.
-

- .5 Extension and welded tile rings for flush mounting devices in finished plasterboard or 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 welded tile rings as required.

2.5 CONDUIT BOXES

- .1 Cast FS and FD boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.6 OUTLET BOXES FOR AC90 CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size (3" x 2" x 2 1/2") (76 x 50 x 63 mm) with two double clamps to take metallic sheathed cables

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size (3" x 2" x 2 1/2") (76 x 50 x 63 mm) with two double clamps to take non-metallic sheathed cables.

2.8 JUNCTION AND BOXES

- .1 All surface pull and junction boxes larger than 119 mm square shall be Type "E" boxes sized in accordance with C.E.C. Sections 12-3000 to 12-3036.
- .2 All flush pull and junction boxes shall be Type "D" boxes. Covers shall be extended a minimum of (1") (25 mm) all around.
- .3 Construction: welded steel enclosure.
- .4 Boxes sized (6" x 6") (152 mm x 152 mm) and larger shall have bonding terminal strip.

2.9 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 (1 1/4") (35 mm) and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

- 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 welded tile rings to permit wall finish to come within 6 mm of opening.

- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Sectional type boxes shall not be used with rigid galvanized steel conduit, type PVC, or thinwall EMT type conduit installation. Sectional type boxes are only to be used with flexible conduits, AC-90, NMD90, and/or other types of pliable cables, including those associated with other systems rated less than 50 volts.
- .7 Cast type FS or FD boxes shall be utilized for all surface wiring of devices installed lower than (8') (2,438 mm) AFF, (regardless of systems type involved) c/w matching steel type sheet metal device plates unless specifically indicated otherwise. Cover plates shall be specifically made for FS & FD boxes and are to utilize 4 point fastening.
- .8 Identify systems for boxes in accordance with Section 26 05 53 – Identification for Electrical Systems.

End of Section

1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985(R2017), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-06(R2016), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-15, Mechanical Protection Tubing (MPT) and fittings, (Bi-national standard, with UL 1696)

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 CONDUITS

- .1 Rigid steel threaded conduit shall conform to C.S.A. C22.2 No. 45 galvanized, sized as indicated.
- .2 Thinwall Type "EMT" conduit shall conform to C.S.A. C22.2 No. 83, galvanized, sized as indicated.
- .3 Flexible galvanized steel liquid tight conduit shall conform to C.S.A. C22.2 No. 56, sized as indicated.
- .4 Rigid PVC conduit shall conform to C.S.A. C22.2 No. 211.2, sized as indicated.
- .5 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3, sized as indicated.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits (2") (50 mm) and smaller. Two hole steel straps for conduits larger than (2") (50 mm).
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at (60") (1,500 mm) on centers.
- .4 Threaded rods, (3/8") (10 mm) diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
-

- .2 Factory "ells" where 90 degree bends are required for (1") (25 mm) and larger conduits.
- .3 Couplings for thinwall Type "EMT" shall be set screw type, zinc with matching locknuts.
- .4 Connectors for thinwall Type "EMT" shall be set screw type, zinc with matching locknuts.
 - .1 Connectors (1¼") (32 mm) and larger shall be complete with threaded plastic bushings. Connectors less than (1¼") (32 mm) shall be complete with insulated throats.
- .5 Couplings and connectors for P.V.C. rigid conduit shall be C.S.A. Approved for their respective use. All P.V.C. fittings shall be solvent weld type. Push-fit type fittings are not acceptable.
- .6 Connectors for flexible conduit, armoured cable shall be set screw galvanized steel. Units shall be equal to T&B #3110 series, steel, and be complete with case hardened locknuts.
- .7 Connectors for liquid tight flexible conduit shall be watertight, compression type galvanized steel or aluminum. Locknuts shall be case hardened. Dry type connectors may be used in dry indoor areas not exposed to liquids or moisture, if approved for use.
- .8 Utilize watertight connectors and couplings for exposed vertical runs of EMT.

2.4 FISH CORD

- .1 Polypropylene.

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 Rigid PVC or Galvanized rigid steel threaded conduit shall be used in all poured concrete construction. Thinwall Type "EMT" shall be used for all branch circuit wiring and all systems installed exposed on ceilings and walls unless noted otherwise. Bends, offsets, or elbows made on the job for steel conduits shall be made so that the conduit is not injured or flattened.
- .4 All branch circuit wiring run in thinwall Type EMT conduit shall be complete with a No. 12 AWG minimum green insulated bonding conductor, increasing as required by Table 16 of the C.E.C..
- .5 P.V.C. conduits sized (1") (25 mm) in diameter and larger shall be installed in trenches not less than (12") (300 mm) in depth from underside of concrete floor slab to bottom of trench. Conduits shall be placed on a (2") (50 mm) bed of sand and have a second (2") (50 mm) of sand placed on top (completely around) of conduits prior to backfilling.
- .6 All concealed and exposed conduit shall be kept parallel to building lines and run "on the square". All conduits shall be installed to avoid proximity to steam and hot water pipes by (6") (150 mm). Conduits shall run through ceiling spaces and down in walls. No conduit shall run in or under floor slabs unless specifically indicated.
- .7 All conduits shall be securely held in place by means of approved supports and in accordance with C.E.C. Sections 12-1010, 12-1114 and 12-1406. All EMT conduit straps shall be steel. Cast

straps are not acceptable. EMT conduit shall be installed as a complete system and shall be securely fastened in place within (3'-0") (900 mm) of each outlet box, junction box, cabinet, couplings or fittings and the spacing between supports as follows:

- .1 Less than (60") (1,500 mm) for (1/2") (12 mm) and (3/4") (19 mm) EMT;
 - .2 Less than (90") (2,286 mm) for (1") (25 mm) and (1 1/4") (32 mm) EMT;
 - .3 Less than (120") (3,048 mm) for (1 1/2") (38 mm) EMT or larger.
 - .8 Code approved P.V.C. rigid conduit shall be used for underground circuits and where otherwise specifically noted. Conduit shall be joined with approved connectors and P.V.C. solvent cement. The proper size bonding conductor, as per the C.E.C., shall installed in all P.V.C. conduits.
 - .9 No branch circuit wiring shall run in concrete slabs. Conduit stubs in concrete shall be protected from damage during construction. Conduit openings shall be sealed with plugs or caps to prevent entrance of foreign materials. Where conduits pass through a waterproof membrane an oversize sleeve shall be installed and caulking applied to maintain the waterproof properties of the membrane. A cold cure mastic shall then be applied between sleeve and conduit.
 - .10 Flexible conduit, not smaller than (3/8") (10 mm) I.D., or flexible armoured cable with separate grounding conductor, and complete with insulating anti shorts, shall be used between lighting fixtures and their respective junction boxes, and where rigid or "EMT" conduit cannot be used, such as in cabinet work.
 - .11 Liquid tight flexible conduit, not smaller than (3/8") (10 mm) I.D., shall be used for connections to all transformers, motors and equipments, in both wet and dry areas.
 - .12 Upon installation of all conduits, terminate in boxes, cabinets, and fittings, or install suitable plugs or caps, to prevent the entrance of foreign materials. Conduits shall be swabbed out using a drag, consisting of tight fitting rubber washers and shall be dry before conductors are pulled in.
 - .13 All conduit subject to corrosive elements shall be treated with corrosion resistant compounds.
 - .14 Conduit shall not pass through structural members without the permission of the Engineer.
 - .15 A sufficient number of fittings shall be used to permit easy pulling of wires. Conduits shall be continuous, and shall be made electrically and mechanically secure throughout.
 - .16 Conduits shall not run directly between outlets on the opposite sides of a common partition, in order to prevent sound transmission.
 - .17 Install conduit sealing fittings in hazardous areas. Fill with compound.
 - .18 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
 - .19 Mechanically bend steel conduit over (3/4") (19 mm) diameter.
 - .20 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
 - .21 Install fish cord in empty conduits.
 - .22 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
 - .23 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 (5') (1,500 mm) 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 (3'') (75 mm) parallel to steam or hot water lines with minimum of (1'') (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 COUPLINGS AND CONNECTORS

- .1 Threaded couplings shall be used for all rigid steel threaded conduit joints. All joints in or below concrete slabs shall be thoroughly red leaded and screwed tight. No exposed threads shall be left, i.e., running thread couplings are not approved. Ericson couplings are approved.
- .2 Rigid steel threaded conduit shall connect to boxes and cabinets with the use of two case hardened steel locknuts and insulated bushing. Painted area at locknut connections shall be scraped clean, and locknuts screwed tight to ensure ground continuity.
- .3 Thinwall Type "EMT" couplings shall be securely tightened.
- .4 Connectors for thinwall Type "EMT", liquid tight and flexible conduit or cable shall terminate at boxes and cabinets with one case hardened locknut. Painted area shall be scraped clean, and locknut screwed tight to ensure ground continuity.
- .5 Couplings and connectors for rigid P.V.C. shall be cleaned with solvent and joined with cement C.S.A. approved for the purpose.

3.5 CONDUIT FITTINGS

- .1 Install conduit fittings where required. Secure conduit in fittings and secure conduit to structure within (12'') (300 mm) of fitting.
- .2 Colour code coverplates, ceiling splines and access covers in accordance with Section 26 05 01.

End of Section

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .2 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association, (CSA International)
- .2 Insulated Cable Engineers Association, Inc. (ICEA)

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal, and with the Waste Reduction Workplan.
- .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 MARKERS

- .1 Under Ground Cable Markers: as indicated, with words similar to: "Under Ground Electrical Cable(s)".

Part 3 Execution

3.1 DIRECT BURIAL OF CABLES

- .1 After sand bed specified in Section 31 23 10 - Excavating, Trenching and Backfilling, is in place, lay cables maintaining (3") (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 (6") (150 mm) for each 200' run, maintaining minimum cable separation and bending radius requirements.
 - .3 Underground cable splices not acceptable.
 - .4 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.
 - .5 Cable separation:
 - .1 Maintain (6") (150 mm) minimum separation between cables of different circuits.
 - .2 Maintain (12") (300 mm) horizontal separation between low and high voltage cables.
 - .3 When low voltage cables cross high voltage cables maintain (12") (300 mm) vertical separation with low voltage cables in upper position.
 - .4 At crossover, maintain (3") (75 mm) minimum vertical separation between low voltage cables and (6") (150 mm) between high voltage cables.
-

- .5 Maintain (12") (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 (24") (600 mm) in each direction at crossings.
- .6 After sand protective cover specified in Section 31 23 10 - Excavating, Trenching and Backfilling, is in place, install continuous row of overlapping (2" x 6") (50 mm x 150 mm) pressure treated planks to cover length of run.

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 multiconductor 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 Locate electrical identification marker midway (between grade and duct) below grade and directly above runs of direct buried cable, conduit, duct, and duct banks.
- .2 Where markers are removed to permit installation of additional cables, reinstall existing markers.

3.4 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - 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 megohms.
- .5 Pre-acceptance tests.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V 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 Provide Consultant with list of test results showing location at which each test was made, circuit tested and result of each test.
- .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

End of Section

1 General

1.1 GENERAL REQUIREMENTS

- .1 Division 1 and the General Conditions of the Contract between the Owner and the Contractor shall deem to apply and be part of this section.

1.2 SECTION INCLUDES

- .1 Materials and installation for standard and custom breaker type panelboards.

1.3 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
.3 Section 06 10 11 - Rough Carpentry - Short Form: Plywood Backboard.
.4 Section 26 05 01 - Common Work Results - Electrical.
.5 Section 26 28 21 - Moulded Case Circuit Breakers.

1.4 REFERENCES

- .1 Canadian Standards Association (CSA International)
.1 CSA C22.2No.29-15, Panelboards and enclosed Panelboards.

1.5 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, voltage and phase characteristics, and enclosure dimensions, as well as any special options called for on the drawings.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal, and with the Waste Reduction Workplan.
.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.
-

2 Products

2.1 PANELBOARDS

- .1 Panelboards: to [CSA C22.2No.29] and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 240 V panelboards: bus and breakers rated for 10,000 A (symmetrical) interrupting capacity or as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 All bussing shall be aluminum, tin plated, with a full capacity neutral, with an ampere rating as per the drawings.
- .7 Mains: suitable for bolt-on breakers.
- .8 All panelboard trims and door finishes are to be baked grey enamel. All enclosures to be EEMAC 1, suitable for flush or surface mounting as indicated on the drawings. All surface mounted tubs to be sprinkler proof in accordance with C.E.C. 26-008.
- .9 All panelboard tubs shall be minimum 14 gauge galvanized steel, minimum (20") (508 mm) wide.

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 installed as indicated on panel schedules.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
 - .2 Nameplate for each panelboard size 4 engraved indicating:
 - .1 Panel number as per the drawings.
 - .2 Voltage and phase characteristics of panel.
 - .3 Amperage of panel.
 - .4 Where panel is fed from.
 - .3 Nameplate for each circuit in distribution panelboards size 2 engraved.
-

- .4 A typed directory under transparent cover shall be provided on the inside of each panel showing the location and load connected to each circuit.

2.4 MANUFACTURERS

- .1 Standard of acceptability:
.1 Panelboards: Cutler-Hammer "Pow-R-Line 1" Series.
.2 Other acceptable manufacturers: Square 'D' and Siemens.

3 Execution

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
.2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.
.3 Mount panelboards to height specified in Section 26 05 01 - Common Work Results - Electrical or as indicated.
.4 Connect loads to circuits.
.5 Connect neutral conductors to common neutral bus with respective neutral identified.
.6 Emergency, exit, fire alarm, sprinkler excess pressure pump and bells, and night lighting, circuit breakers shall have locking devices on the handles to prevent unauthorized operation.
.7 Wiring in panelboards shall extend beyond the respective breakers, forming a (6") (152 mm) loop before returning to connect to the breaker terminals, so there will be flexibility for reconnecting within the panel. Wiring shall be secured with Ty-wraps or equivalent means to present a neat workmanlike appearance.
.8 Rigidly anchor floor mounted panels to the floor and wall.
.9 All recessed panelboards shall have three (1")(25 mm) empty EMT conduits stubbed up and out into accessible ceiling spaces above the panel (where such spaces exist), all for future use. Each pair of spare conduits to be terminated in one (6" x 6" x 4") (152 mm x 152 mm x 102 mm) Type 'D' box.

End of Section

1 General

1.1 GENERAL REQUIREMENTS

- .1 Division 1 and the General Conditions of the Contract between the Owner and the Contractor shall deem to apply and be part of this section.

1.2 SECTION INCLUDES

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

1.3 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
.2 Section 26 05 01 - Common Work Results - Electrical.

1.4 REFERENCES

- .1 Canadian Standards Association (CSA International)
.1 CSA-C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
.2 CSA-C22.2 No.42.1-13 (R2017), 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, twelfth edition).

1.5 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
.2 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 SWITCHES

- .1 Line voltage switches shall be specification grade, toggle type, flush mounted where possible, and C.S.A. approved as general purpose alternating current switches.
.2 Manually-operated general purpose ac switches with following features:
.1 Terminal holes approved for No. 10 AWG wire.
.2 Silver alloy contacts.
-

- .3 Urea or melamine moulding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 White 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 Acceptable materials:
 - .1 120V - single pole:
 - .1 Hubbell Cat. No. 1221-W
 - .2 Pass & Seymour Cat. No. CS20AC1W
 - .3 Leviton Cat. No. 1221-2W
 - .2 120V - three way
 - .1 Hubbell Cat. No. 1223-W
 - .2 Pass & Seymour Cat. No. CS20AC3W
 - .3 Leviton Cat. No. 1223-2W
 - .3 120V - four way
 - .1 Hubbell Cat. No. 1224-W
 - .2 Pass & Seymour Cat. No. CS20AC4W
 - .3 Leviton Cat. No. 1224-2W
- .6 Other types of switches shall be as specifically indicated on the drawings.

2.2 RECEPTACLES – 15A

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 Industrial specification grade.
 - .2 White urea moulded housing.
 - .3 Suitable for No. 10 AWG for back and side wiring.
 - .4 Break-off links for use as split receptacles.
 - .5 Eight back wired entrances, four side wiring screws.
 - .6 Triple wipe contacts and rivetted grounding contacts.
 - .7 Construction series receptacles will not be accepted.**
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.
- .4 Specified materials:
 - .1 Hubbell Cat. No. HBL5262 W
- .5 Alternate materials:
 - .1 Pass & Seymour and Leviton.

2.3 RECEPTACLES – 20A

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15/20 A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 Industrial specification grade.
 - .2 White urea moulded housing.
 - .3 Suitable for No. 10 AWG for back and side wiring.
 - .4 Break-off links for use as split receptacles.
 - .5 Eight back wired entrances, four side wiring screws.
 - .6 Triple wipe contacts and rivetted grounding contacts.
 - .7 Construction series receptacles will not be accepted.**
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.
- .4 Specific materials:
 - .1 Hubbell Cat. No. HBL5362 W
- .5 Alternate materials:
 - .1 Pass & Seymour and Leviton.

2.4 GFCI RECEPTACLES – 15A

- .1 GFCI duplex u-ground receptacles shall be industrial specification grade, A.C. rated 15 amperes at 125 volts, U ground, having parallel slots with double wiping contacts, ground terminal, and one piece body.
- .2 GFCI receptacles shall be white; coverplates see below. Approved manufacturers are: Leviton Cat. No. G5362-WTW (led indication, smartlock series).
- .3 Other acceptable manufacturers: Hubbell, Bryant, Pass & Seymour.

2.5 GFCI RECEPTACLES – 15/20A

- .1 GFCI duplex u-ground receptacles shall be industrial specification grade, A.C. rated 15/20 amperes at 125 volts, U ground, having parallel slots with double wiping contacts, ground terminal, and one piece body.
- .2 GFCI receptacles shall be white; coverplates see below. Approved manufacturers are: Leviton Cat. No. G5362-WTW (led indication, smartlock series).
- .3 Other acceptable manufacturers: Hubbell, Bryant, Pass & Seymour.

2.6 SPECIAL RECEPTACLES

- .1 Receptacles of specified amperage and voltage shall be supplied and installed where noted on the drawings. Where such units are noted they shall be best quality, specification grade and conform to the noted rating and applicable C.S.A. configuration.
-

- .2 See below for coverplates for all receptacles noted in .1. Receptacles shall be complete with lamicoid nameplates indicating voltage, amperage, & phase characteristic.

2.7 COVERPLATES

- .1 Coverplates for wiring devices to: [CSA-C22.2 No.42.1].
- .2 Coverplates 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 cover plates, for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal utility style cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof coverplates, for exterior applications, shall be Extra-Duty in use equivalent to Leviton Cat. No. 5980-UGY.

3 Execution

3.1 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 All switches, and their wall plates, shall be installed plumb, with switch handle in the "up" position when switch is closed. Pigtail branch circuit conductors shall be used for connection to switches in multi-gang outlets. Do not use feed through features on switches. Twist stranded conductors and form under head of screw. Tighten terminal screw to specified torque. Use back wiring feature for conductor sizes #12 and #10.
 - .3 Install switches in gang type outlet box when more than one switch is required in one location.
 - .4 Mount toggle switches at height in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 01 - Common Work Results - Electrical.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 All receptacles, and their wall plates, shall be installed plumb, with long axis in the vertical position, U ground terminal on the top. Pigtail branch circuit conductors shall be used for connection to receptacles in cases where more than one phase conductor or neutral conductor exist in the outlet box. Do not use feed through features on receptacles. Twist stranded conductors and form under head of terminal screw. Tighten terminal screw to specified torque.
 - .5 Power and neutral conductor terminations shall be made using the back wiring feature on the receptacle for conductor sizes #12 and #10. Where voltage drop considerations

require #8 AWG conductors to feed a receptacle, the #8 conductor shall be extended to a surface mounted junction box located in the ceiling space directly above the receptacle. The #8 AWG conductor shall be reduced to #10 AWG in the junction box before extending on down in the vertical drop to the receptacle.

- .6 Install a green insulated bonding conductor, equal in ampacity to the receptacle ampacity, between the grounding terminal of the receptacle and the grounding screw or stud of the outlet box.
 - .7 Receptacles above counters shall be installed above the splashback to a height as indicated on the drawings and coordinated on the site.
 - .8 All receptacles are to be polarity tested.
 - .9 All receptacles are to be identified with Lamicoid nameplates in accordance with Section 26 05 01 - Common Work Results - Electrical. The nameplate for each receptacle shall indicate the panel from which the receptacle is fed, as well as the branch breaker circuit number(s). In addition, a Ty-Rap Cat. No. TY5532M identifying tag shall be secured in the outlet box, marked with the same identification and arrange to be visible when the coverplate is removed, without removal of the receptacle.
- .3 Coverplates:
- .1 Protect all cover plates with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common coverplates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

End of Section

1 General

1.1 GENERAL REQUIREMENTS

- .1 Division 1 and the General Conditions of the Contract between the Owner and the Contractor shall deem to apply and be part of this section.

1.2 REFERENCES

- .1 Illuminating Engineering Society of North America (IESNA):
- .1 IES-LM-79-08, Electrical and Photometric Measurements of Solid-State Lighting Products.
 - .2 IES-LM-80-15, Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules.
 - .3 IES-TM-21, Projecting Long Term Lumen Maintenance of LED Light Sources.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE):
- .1 ANSI/IEEE C62.41-1991 (R1995), Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.:
- .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International).
- .5 ICES-005-07, Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC).

1.3 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
- .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for the manufacturer's standard production model luminaire, for review by Departmental Representative. The report shall include all photometric and electrical measurements, as well as all other pertinent data outlined under "14.0 Test Report" in IES-LM-79.
 - .3 LEDs shall be tested per IES-LM-79, IES-LM-80, and IES-TM-21 parameters.
- .3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
-

- .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and maintenance.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 Divert unused metal materials from landfill to metal recycling facility.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 DRIVERS

- .1 Rated life: 50,000 hours (minimum) at Tcase of $\leq 70^{\circ}$ C.
- .2 Flicker free dimming range.
- .3 Power factor 90% minimum.
- .4 Class "A" sound rating.
- .5 Thermally protected.
- .6 Dynamic end of life protection circuit.
- .7 Rated for 60 Hz and voltage as indicated by the circuit on the drawings.
- .8 0-10V dimming to 1% otherwise.
- .9 LEDs of the same luminaire supplied from the same batch during manufacturing.

2.2 FINISHES

- .1 Baked enamel finish:
 - .1 Conditioning of metal before painting:
 - .1 For corrosion resistance conversion coating to ASTM F1137.
 - .2 For paint base, conversion coating to ASTM F1137.

- .2 Metal surfaces of luminaire housing and reflectors finished with high gloss baked enamel or polyester powdercoat to give smooth, uniform appearance, free from pinholes or defects.
- .3 Reflector and other inside surfaces finished as follows:
 - .1 White, minimum reflection factor 85%.
 - .2 Colour fastness: yellowness factor not above 0.02 and after 250 hours exposure in Atlas fade-ometer not to exceed 0.05.
 - .3 Film thickness, not less than 0.03mm average and in no areas less than 0.025mm.
 - .4 Gloss not less than 80 units as measured with Gardner 60E gloss meter.
 - .5 Flexibility: withstand bending over 13mm mandrel without showing signs of cracking or flaking under 10 times magnification.
 - .6 Adhesion: 25mm square lattice made of 3mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and pulled. Adhesion satisfactory if no coating removed.
- .2 Alzak finish:
 - .1 Aluminium sheet fabricated from special aluminum alloys and chemically brightened, subsequently anodically treated to specifications established by Alcoa, to produce:
 - .1 Finish for mild commercial service, minimum density of coating 7.8 g/m², minimum reflectivity 83% for specular, 80.5% for semi-specular and 75% for diffuse.
 - .2 Finish for regular industrial service, minimum density of coating 14.8 g/m², minimum reflectivity 82% for specular and 73% for diffuse.
 - .3 Finish for heavy duty service, minimum density of coating 21.8 g/m², minimum reflectivity 85% for specular, 65% for diffuse.

2.3 LUMINAIRES

- .1 For Luminaire Type 1, Luminaire LED #LVP524 2FT MIN1 25W 35K MVOLT CLP WHT shall be a specified unit.
- .2 For Luminaire Type 2, Luminaire LED #VSPLS PYC HLO SW 80 500 35 4FT UNV D1 1 GSM TF W shall be a specified unit.
- .3 For Luminaire Type 3, Lithonia # WDGE2LED P2 30K 80CRI VW MVOLT SRM DDBXD shall be a specified unit.
- .4 For Luminaire Type 4, Lithonia # WDGE2LED P2 30K 80CRI VW MVOLT SRM DDBXD shall be a specified unit.

3 Execution

3.1 INSTALLATION

- .1 Supply, store and install all luminaires in such a manner that their attachment to the ceiling shall be secure in all respects. In order to avoid any danger that the weight of the fixtures might distort hung ceilings (where such occur), provide approved type independent supports to the satisfaction of the Departmental Representative.

- .2 Luminaires shall not be hung directly from plasterboard ceilings, but shall derive their support from channels independently mounted in the ceiling space.
- .3 Provide any supporting angles, channels, unistrut, caddy clips, etc., required to adequately secure and support the luminaires. Exposed supporting system shall be painted white and blended in with the background colours.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

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.

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

End of Section

1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for emergency lighting systems.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 21 - Wires and Cables (0-1000 V).
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-10, Emergency Lighting Equipment

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data to indicate system components, mounting method, source of power and special attachments.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 EQUIPMENT

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
 - .2 Supply voltage: Universal 120V to 347 V, AC.
 - .3 Output voltage: 12V DC.
 - .4 Operating time: 30 min.
 - .5 Battery: sealed, maintenance free with ten year life warranty.
 - .6 Charger: solid state, three stage, self diagnostic circuitry, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.
-

- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 87.5% battery nominal voltage.
- .9 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: integral on unit or remote as indicated on the drawings, 345° horizontal and 180° vertical adjustment. Lamp type: MR16 LED, 12V, 7W.
- .11 Cabinet: suitable for direct to wall mounting and c/w knockouts for conduit termination.
- .12 Finish: White.
- .13 Auxiliary equipment:
 - .1 Test switch.
 - .2 Battery disconnect device.
 - .3 AC input and DC output terminal blocks inside cabinet.
 - .4 Automated self diagnostic circuitry.
- .14 Acceptable Product Manufacturer:
 - .1 Wall /Surface Mount: Aimlite Cat . No. EBQV-12xxx-2-7LA-LMR16-WHT-ATD-VDR
 - .1 Battery capacity (shown as xxx in the above catalog number) to be determined from the drawings.
 - .2 T-Bar Mounted Units: Aimlite Cat . No. EBTB-12xxx-2MB-7LA-LMR16-WHT-ATD-NLC
 - .3 Dual-Lite, Lumacel, Stanpro and Ready-Lite shall be considered acceptable alternate manufacturers provided they comply.
- .15 Acceptable product manufacturer of remote heads:
 - .1 Wall/Surface Mount: Aimlite Cat. No. RMQVD-1-12-7WLA-WHT
 - .2 T-Bar / Ceiling Mount: Aimlite Cat. No. RMMD-1-12-7WLA-WHT
 - .3 Dual-Lite, Lumacell, Stanpro and Ready Lite shall be considered acceptable alternate manufacturers provided they comply.

2.2 WIRING OF UNIT EQUIPMENT

- .1 Conduit: Type EMT, to Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors: RW90 Type to Section 26 05 21 Wires and Cables 0 - 1000V, sized as indicated and in accordance with manufacturer's recommendations.

3 Execution

3.1 INSTALLATION

- .1 Install unit equipment and remote mounted fixtures.
 - .2 Direct heads on to egress path.
-

- .3 Connect exit lights to unit equipment.
- .4 Connect battery terminals.
- .5 Test battery units by switching off breaker feeding battery unit. Record date, as well as start and end time of test.

End of Section

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Division 03 for concrete work.
- .2 Section 31 22 13 – Rough Grading.
- .3 Section 32 91 21 – Topsoil Placement and Grading.
- .4 Section 32 11 16.01 - Granular Sub-Base
- .5 Section 32 11 23 - Aggregate Base Courses
- .6 Section 32 12 16 - Asphalt Paving
- .7 Section 32 16 00 - Curbs, Gutters and Sidewalks
- .8 Electrical, Mechanical and Civil disciplines for services

1.2 REFERENCE STANDARDS

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .2 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), Current Edition, and as herein specified.

1.3 DEFINITIONS

- .1 Backfill: Soil material or controlled low strength material used to fill excavations.
 - .1 Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - .2 Final Backfill: Backfill placed over initial backfill to fill a trench.
- .2 Base Course: Course placed between the sub-base course and hot mix asphalt paving.
- .3 Bedding Course: Course placed over the excavated sub grade in a trench before laying pipe.
- .4 Borrow Soil: Satisfactory soil imported from off site for use as fill or backfill.
- .5 Capillary Break: Course supporting slab on grade that also minimizes upward capillary flow of pore water.
- .6 Common Excavation:
 - .1 The excavation of materials, including hardpan, quicksand, and frozen earth; also rock, concrete or masonry less than 1.0 m³ in volume shall be classified as common excavation.
- .7 Fill: Soil materials used to raise existing grades.
- .8 Rock:
 - .1 The excavation of rock, concrete or masonry exceeding 1.0 m³ in volume; and solid ledge rock, concrete or masonry that requires for its removal drilling, blasting, wedging, sledging, barring or breaking with a power operated hand tool shall be classified as rock excavation. Soft or disintegrated rock, concrete or masonry that can be removed with a

hand pick, power operated excavator or shovel; and loose, shaken or previously blasted rock will not be classified as rock excavation.

- .9 Site Excavated Materials: Site excavated soil is considered as only site material removed by required excavation and grading.
- .10 Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- .11 Sub-Base Course: Course placed between the sub-grade and base course for hot mix asphalt pavement, and cement concrete pads, pavement or sidewalks.
- .12 Sub-Grade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- .13 Utilities: On site underground pipes, conduits, ducts, and cables including, but not limited to underground services within buildings.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Submit product data for the following:
 - .1 Geotextile cloth.
 - .2 Controlled low-strength material, including design mixture.
- .3 Conduct condition survey of adjoining construction and site improvements, including finish surfaces, survey benchmarks, and monuments that may be affected by work:
- .4 Submit pre-excavation photographs or videotape before starting any earthwork indicating existing conditions of adjoining construction and site improvements, including finish surfaces that may be misconstrued as damage caused by earthwork operations for this Project
- .5 Identify any interferences that could affect the Work and notify the Departmental Representative for additional information.
- .6 Sustainable Design Submittals:
 - .1 Erosion and Sedimentation Control: submit erosion and sedimentation control plan in accordance with authorities having jurisdiction.
 - .2 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.5 QUALITY ASSURANCE

- .1 Departmental Representative will approve Contractor's plan for testing of materials and compaction of backfill, fill and unshrinkable fill using a testing agency approved by the Departmental Representative. Testing and sampling shall be to NBDOT guidelines.
- .2 Notify Departmental Representative minimum one week before backfilling or filling operations; if requested, provide a 20 kg sample of backfill, fill and unshrinkable fill material proposed for use to confirm properties; start backfilling or filling operations when material has been accepted by Departmental Representative for intended use.
- .3 Notify Departmental Representative no later than 48 hours before backfilling or filling operations. Contractor to coordinate inspections and compaction tests by testing agency; inspect footing excavations before placing footings; results of compaction tests to be provided to Parks Canada. Contractor to pay for all costs of inspection and testing.

- .4 Correct deficiencies noted in field testing reports as directed by Departmental Representative.

1.6 PROTECTION

- .1 The Contractor shall be responsible for locating and protecting all existing underground and surface structures, utility pipelines, overhead lines and poles, fences, water and sewer mains, building services, cables, culverts, sidewalks and other works. All damage incurred shall be repaired by the Contractor at its expense.
- .2 Protect newly graded areas from traffic, freezing, and erosion; keep free of trash and debris.
- .3 Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- .4 Remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing where settling occurs before Project correction period elapses; restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

1.7 MEASUREMENT FOR PAYMENT

- .1 The work of this section is part of Contract and included in Bid Price, which shall be full compensation for all labour, materials and equipment necessary to complete the work, including all subsidiary and incidental items.

Part 2 Products

2.1 GENERAL

- .1 Supply all labour, materials and equipment required for site grading.

2.2 SOURCE OF SUPPLY

- .1 Imported Fill Materials: Consider only fill materials that fully meet specified requirements, including gradations.

2.3 SOIL FILL MATERIALS

- .1 General Engineered Fill: Comprised of clean, inorganic granular or clay soils.
- .2 Select Engineered Fill: Comprised of clean, well graded granular soils or inorganic low plastic clay soils:
- .1 Granular soils used for select engineered fill shall consist of relatively clean, well graded, sand or mixture of sand and gravel (maximum size 75 mm).
 - .2 Low plastic clay used for select engineered fill shall have the following range of Atterberg limits:
 - .1 Liquid Limit = 20 to 40%
 - .2 Plastic Limit = 10 to 20%
 - .3 Plasticity Index = 10 to 30%
- .3 Structural Fill: Comprised of clean, well graded inorganic granular soils.
- .4 Lean Mix Concrete: Self-compacting, low-strength concrete having a minimum 28-day compressive strength of 3.5 MPa

2.4 GRANULAR FILL MATERIALS – AROUND STRUCTURES

- .1 Class A backfill for structures: shall be a well graded granular material of clean, uncoated particles free of lumps of clay or other deleterious material, to NBDOT, Division 100 – Grading, item 167.2.
- .2 Class B backfill for structures: shall be a well graded granular material, to NBDOT, Division 100 – Grading, item 167.2.

2.5 GRANULAR FILL MATERIALS – PAVEMENT STRUCTURES

- .1 Aggregate materials shall conform to the requirements of NSDPW, Division 200 – Pavement Structures, articles 201.2, 201.3 and 201.4, inclusive.
- .2 Properties of Rock and Gravel Aggregate: to NSDPW Table 201-1.
- .3 Crushed Rock Base/Subbase: Granular Sub-Base: to NSDPW Table 201-2.
- .4 Grading Limits – Crushed Stone Base/Subbase: to NSDPW Table 201-3.
- .5 Grading Limits – Pit Run Gravel Subbase: to NSDPW Table 201-4.
- .6 Grading Limits – Crushed Sandstone Subbase: to NSDPW Table 201-5.
- .7 Grading Limits – Crushed Shoulder Material: to NSDPW Table 201-6.
- .8 Grading Limits – Cover Material: to NSDPW Table 201-7.
- .9 Select Backfill Material: from excavations or other sources, approved by Departmental Representative for use intended, dry, unfrozen and free from ricks larger than 80 mm, cinders, ashes, sods, refuse or other deleterious or unsuitable materials.
- .10 Unshrinkable Fill: proportioned and mixed to provide:
 - .1 Maximum Portland cement content: 25 kg/m³.
 - .2 Minimum strength of 0.7 MPa at 24 hours.
 - .3 Concrete aggregates: to CAN/CSA A23.1.
 - .4 Portland cement: Type GU.
 - .5 Slump: 150 mm minimum.

2.6 GEOTEXTILE MATERIALS

- .1 Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, manufactured from polyolefin or polyester and having elongation less than 50% in accordance with AASHTO M288 and as follows:
 - .1 Survivability: Class 2.
 - .2 Apparent Opening Size: 0.250 mm sieve, maximum in accordance with ASTM D4751.
 - .3 Permittivity: 0.02 per second, minimum in accordance with ASTM D4491.
 - .4 UV Stability: 50% after 500 hours' exposure in accordance with ASTM D4355.

2.7 ACCESSORIES

- .1 Warning Tape for Buried Utilities: Acid and alkali resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 150 mm wide (Identoline or approved equivalent), continuously inscribed with a description of the utility; coloured as follows:
 - .1 Red: Electric.
 - .2 Yellow: Gas, oil, steam, and dangerous materials.
 - .3 Orange: Telephone and other communications.

- .4 Blue: Water systems.
- .5 Green: Sewer systems

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions:
 - .1 Before commencing work establish and verify locations of buried services on and adjacent to site.
- .2 Evaluation and Assessment:
 - .1 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.
 - .2 Testing of materials and compaction of backfill, unshrinkable fill, and fill will be carried out by qualified testing agency. Pay costs of testing. Departmental Representative to review and approve testing agency and testing schedule.
 - .3 Before commencing work, conduct, with Departmental Representative, condition survey of existing structures, trees and plants, lawns, fencing, service poles, wires, rail tracks and paving, survey benchmarks and monuments which may be affected by work.

3.2 PREPARATION

- .1 Notify Departmental Representative minimum two days before beginning excavating operations.
- .2 Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations:
- .3 Contact all affected utility companies regarding exact location and status of all utilities, voltage of underground and overhead power lines and pressure of natural gas lines.
- .4 Notify Departmental Representative if any utility lines have been omitted from or incorrectly indicated on Drawings.
- .5 Identify known underground utilities. Stake and flag locations. Identify and flag surface and aerial utilities.
- .6 Notify utility company to remove and relocate utility lines.
- .7 Coordinate preparation of sub-grade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface as required.
- .8 Fence open excavations in accordance with Section 01 11 00 – General Requirements: Temporary Barriers and Enclosures
- .9 Coordinate and maintain erosion and sedimentation controls in accordance with Section 01 34 43 - Environmental Procedures during earthwork operations.
- .10 Temporary Erosion and Sedimentation Control:
 - .1 Use temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, in accordance with sediment and erosion control plan, specific to site requirements of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .11 Provide protective insulating materials to protect sub-grades and foundation soils against freezing temperatures or frost
- .12 Protection of in-place conditions:
 - .1 Protect excavations from freezing.
 - .2 Keep excavations clean, free of standing water, and loose soil.
 - .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
 - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
 - .5 Protect buried services that are to remain undisturbed.
- .13 Removal:
 - .1 Remove obsolete buried services within 2 m of foundations. Cap cut-offs.
 - .2 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
 - .3 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
 - .4 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
 - .5 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.

3.3 DEWATERING

- .1 Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding Project site and surrounding area.
- .2 Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.
- .3 Reroute surface water runoff away from excavated areas; do not allow water to accumulate in excavations; do not use excavated trenches as temporary drainage ditches.

3.4 SHORING AND UNDERPINNING

- .1 Coordinate and maintain shoring and underpinning as required.

3.5 EXCAVATION: GENERAL

- .1 Excavation work shall meet or exceed NSDPW guidelines.
- .2 Excavate when conditions are dry; avoid excavating under wet conditions or when wet conditions are anticipated.
- .3 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations.
- .4 Perform work by hand and cut roots with a sharp axe when excavating is necessary through roots of plant materials identified to remain.

- .5 Protect excavations for bearing surfaces from freezing, excessive wetting or drying; recondition or replace bearing surfaces that have been wetted, dried or frozen using non-shrink fill; notify the Departmental Representative for additional criteria before proceeding with reconditioning.
- .6 Place spoil piles a minimum of 1000 mm back from edge of excavations; place any other material capable of causing injury or sliding into excavation on the back side of spoil piles; do not operate machinery in close proximity to edge of excavation, and as follows:
 - .1 Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing.
 - .2 Place, grade, and shape stockpiles to drain surface water.
 - .3 Cover to prevent windblown dust.
 - .4 Keep spoil materials outside of drip line of remaining trees.
- .7 Provide sufficient ventilation to excavations where gas powered compaction equipment will be used in accordance with Section 01 11 00 – General Requirements: Health and Safety.
- .8 Expose service connections and utilities to be crossed to confirm horizontal and vertical alignment of existing utilities.
 - .1 Expose existing utility lines by hand excavation to confirm location before machine digging within 600 mm of lines.
 - .2 Maintain and protect existing above and below grade utilities that pass through work area.
 - .3 Protect active utility lines exposed by excavation, from damage.
 - .4 Hand excavate to final elevations and dimensions.
 - .5 Support trench in a manner approved by utility where existing pipes, ducts or other underground services intersect a trench.
- .9 Use safe operating practices and maintain safe working distances where existing overhead lines are in traffic areas, or where equipment will be operating in close proximity to overhead lines:
 - .1 Temporarily support poles in a manner approved by utility where existing overhead line poles are adjacent to excavations.
 - .2 Tag safe operating distance with fluorescent flagging or other highly visible means.
 - .3 Post signs to identify overhead line voltage.
- .10 Excavate to sub-grade elevations indicated, and as follows:
 - .1 Replace unsatisfactory soil materials with satisfactory soil materials where excavated materials intended for fill and backfill include unsatisfactory soil materials and Rock.
 - .2 Remove Rock to lines and grades indicated to permit installation of permanent construction to the following tolerances:
 - .1 Minimum of 600 mm from outside of concrete forms other than at footings.
 - .2 Minimum of 300 mm from outside of concrete forms at footings.
 - .3 Minimum of 150 mm from outside of minimum required dimensions of concrete cast against grade.
 - .4 Outside dimensions of concrete walls indicated as cast against Rock without forms or exterior waterproofing treatments.
 - .5 Minimum of 300 mm from beneath bottom of concrete slabs on grade.
 - .6 Minimum of 450 mm from beneath pipe in trenches, and the greater of 600 mm wider than pipe or 1065 mm wide.

- .11 Do blasting in accordance with Provincial and Municipal regulations. Repair damage to approval of Departmental Representative. No blasting will be permitted within 3 m of any building and where damage would result.
- .12 Topsoil stripping:
 - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
 - .2 Strip topsoil to depths as directed by Departmental Representative. Avoid mixing topsoil with subsoil.
 - .3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
 - .4 Stockpile in locations as directed by Departmental Representative.
- .13 Excavate as required to carry out work, in all materials met.
 - .1 Do not disturb soil or rock below bearing surfaces. Notify Departmental Representative when excavations are complete.
 - .2 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
 - .3 Fill excavation taken below depths shown without Departmental Representative's written authorization with concrete of same strength as for footings.
- .14 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground. Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .15 Excavate for slabs and paving to subgrade levels.
 - .1 Remove topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.6 EXCAVATION: STRUCTURES

- .1 Excavate to indicated elevations and dimensions within a tolerance of 25 mm; extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and to allow for site reviews and inspections.
- .2 Take care not to disturb bottom of excavation for load bearing foundations and footings; excavate by hand to final grade just before placing concrete reinforcement; trim bottoms to required lines and grades to leave solid base to receive other work.
- .3 Stop excavations 150 mm to 300 mm above bottom of pile cap before piles are placed; remove loose and displaced material after piles are driven; excavate to final grade, leaving solid base to receive concrete pile caps.
- .4 Excavate for underground utility structures to elevations and dimensions indicated within a tolerance of 25 mm; prevent disturbance to bottom of excavations intended as bearing surfaces.

3.7 EXCAVATION: SIDEWALKS AND PAVEMENTS

- .1 Excavate surfaces at intended sidewalk and pavement areas to indicated lines, cross sections, elevations, and sub-grades.

3.8 EXCAVATION: UTILITY TRENCHES

- .1 Excavate trenches to indicated gradients, lines, depths, and elevations; excavate trenches beyond building perimeter to allow for installation of top of pipe below frost line.

- .2 Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit and as follows:
 - .1 Excavate trench walls vertically from trench bottom to 300 mm higher than top of pipe or conduit.
 - .2 Allow for 300 mm clearance on each side of pipe or conduit.
- .3 Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit; shape sub grade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits; remove projecting stones and sharp objects along trench sub grade, and as follows:
 - .1 Hand excavate trench bottoms and support pipe and conduit on undisturbed sub grade for pipes and conduit less than 150 mm in nominal diameter and flat bottomed, multiple duct conduit units.
 - .2 Shape bottom of trench to support bottom 90 mm of pipe circumference for pipes and conduit greater than 150 mm in nominal diameter; fill depressions with tamped sand backfill.
 - .3 Excavate trenches 150 mm deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.9 SUB-GRADE REVIEW

- .1 Notify Departmental Representative when excavations have reached required sub-grade.
- .2 Continue excavation and replace with compacted backfill or fill material as directed where Departmental Representative determines that unsatisfactory soil is present.
- .3 Proof roll sub grade below the building slabs and pavements using heavy pneumatic tired equipment to identify soft pockets and areas of excess yielding; proof roll dry sub-grades having optimal moisture content, and as follows:
- .4 Completely proof roll sub grade in one direction, repeating proof rolling in direction perpendicular to first direction; limit vehicle speed to 5 km/h.
- .5 Proof roll using a loaded 10 wheel, tandem axle dump truck weighing not less than 14 tonnes.
- .6 Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting as determined by Departmental Representative and replace with compacted backfill or fill as directed.
- .7 Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Departmental Representative, without additional compensation.

3.10 UNAUTHORIZED EXCAVATION

- .1 Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation using lean concrete fill having 28-day compressive strength of 17.2 MPa.
- .2 Fill unauthorized excavations under other construction or utility pipe as directed by Departmental Representative.

3.11 BACKFILL

- .1 Place backfill on sub-grades free of mud, frost, snow, or ice.
- .2 Place and compact backfill in excavations promptly after the completion of the following:
 - .1 Construction below finish grade.

- .2 Surveying locations of underground utilities for Project Record Documents.
- .3 Testing and inspecting of underground utilities.
- .4 Removal of concrete formwork.
- .5 Removal of trash and debris.
- .6 Removal of temporary shoring and bracing, and sheeting.
- .7 Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.12 UTILITY TRENCH BACKFILL

- .1 Place backfill on sub-grades free of mud, frost, snow, or ice.
- .2 Place and compact bedding course on trench bottoms; shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- .3 Backfill trenches excavated under footings and within 450 mm of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.
- .4 Place and compact initial soil backfill, free of particles larger than 25 mm in any dimension to a height of 300 mm over utility pipe or conduit.
- .5 Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit; coordinate backfilling with utilities testing.
- .6 Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- .7 Place and compact final backfill of satisfactory soil to final sub grade elevation.
- .8 Install warning tape directly above utilities 300 mm below finished grade in landscaped areas and 150 mm below sub grade under pavements and slabs.

3.13 SOIL FILL

- .1 Plough, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- .2 Place soil fill on sub-grades free of mud, frost, snow, or ice.
- .3 Place and compact fill material in layers to required elevations as follows:
 - .1 Under grass and planted areas: use satisfactory soil material.
 - .2 Under walks and pavements: use satisfactory soil material.
 - .3 Under steps and ramps: use engineered fill.
 - .4 Under building slabs: use engineered fill.
 - .5 Under footings and foundations: use engineered fill.

3.14 SOIL MOISTURE CONTROL

- .1 Uniformly moisten or aerate sub grade and each subsequent fill or backfill soil layer before compaction to within 2% of optimum moisture content.
- .2 Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
- .3 Remove and replace or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2% and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- .1 Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

- .2 Compact soil materials to not less than 98% Standard Proctor Density to ASTM D698.
- .3 Compact areas inaccessible to consolidation by mechanical rollers, and areas within 1500 mm of exterior walls by hand tampers or rollers operated to avoid any damage to existing work.
- .4 Sprinkle material with water where necessary to bring to optimum moisture content so that specified density is achieved.
- .5 Proof roll sub grade for exterior slabs and paving prior to placing any granular material.

3.16 GRADING

- .1 Grading work shall meet or exceed NSDPW specifications and guidelines.
- .2 Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated, and as follows:
 - .1 Provide a smooth transition between adjacent existing grades and new grades.
 - .2 Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- .3 Slope grades to direct water away from buildings and to prevent ponding; finish subgrades to required elevations within the following tolerances:
 - .1 Lawn or Unpaved Areas: ± 35 mm.
 - .2 Walks: ± 25 mm.
 - .3 Pavements: ± 13 mm.
 - .4 Finish sub grade on interior of building to a tolerance of 13 mm when tested with a 3 metre straightedge.

3.17 SUBSURFACE DRAINAGE

- .1 Coordinate and install subsurface drainage systems if subsurface drainage is indicated for the project.

3.18 SUB-BASE AND BASE COURSES

- .1 Placement and compaction of sub-base and base shall meet or exceed NSDPW guidelines.
- .2 Place sub-base and base course on sub-grades free of mud, frost, snow, or ice.
- .3 Place sub-base and base course under pavements and walks on prepared sub grade as follows:
 - .1 Install separation geotextile on prepared sub grade in accordance with manufacturer's written instructions, overlapping sides and ends.
 - .2 Place base course material over subbase course under hot mix asphalt pavement.
 - .3 Shape sub-base and base course to required crown elevations and cross slope grades.
 - .4 Place sub-base and base course 150 mm or less in compacted thickness in a single layer.
 - .5 Place sub-base and base course that exceeds 150 mm in compacted thickness in layers of equal thickness, with no compacted layer more than 150 mm thick or less than 75 mm thick.
 - .6 Compact sub-base and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98% of maximum dry unit weight in accordance with ASTM D698.

3.19 CAPILLARY BREAK

- .1 Place capillary break on sub-grades free of mud, frost, snow, or ice.

- .2 On prepared sub-grade, place and compact capillary break under cast in place concrete slabs on grade as follows:
 - .1 Install geotextile on prepared sub-grade in accordance with manufacturer's written instructions, overlapping sides and ends.
 - .2 Place capillary break 150 mm or less in compacted thickness in a single layer.
 - .3 Place capillary break that exceeds 150 mm in compacted thickness in layers of equal thickness, with no compacted layer more than 150 mm thick or less than 75 mm thick.
 - .4 Compact each layer of capillary break to required cross sections and thicknesses to not less than 95% of maximum dry unit weight in accordance with ASTM D698.

3.20 FIELD QUALITY CONTROL

- .1 Testing agency to inspect and test all subgrade, bedding materials, granular bases, asphalt and concrete, and each fill or backfill layer; proceed with subsequent earthwork only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
- .2 Make compaction tests at following frequencies:
 - .1 Exterior side of perimeter walls: One test/100 lineal m of compacted lift of backfill.
 - .2 Within building area under basement and sub-basement floating slabs on grade: one test/1,000 m² of compacted lift of backfill.
 - .3 Within building area under main floor structural slabs: one test/2,500 m² of compacted lift of backfill.
 - .4 Under exterior floating concrete slabs and sidewalks: one test/1,000 m² of compacted lift of backfill.
 - .5 Under exterior structural slabs: one test/2,500 m² of compacted lift of backfill.
 - .6 Retaining walls: one test/100 lineal m of compacted lift of backfill.
 - .7 Asphalt pavement subbase: one test/1000 m² of compacted lift of backfill or re-compacted lift of native material.
 - .8 Asphalt pavement aggregate granular sub-base and base: one test/1000 m² of compacted lift.
 - .9 Asphalt pavement: one test/1000 m² of compacted lift.
 - .10 Trenches more than 15 metres in length: 2 density tests per 600 mm of trench depth per 100 m of trench length.
 - .11 Trenches 15 m or less in length: minimum of 3 density test evenly spaced through the depth and length of trench.
 - .12 Landscaped areas: One test/2,500 m² of compacted lift of backfill.
 - .13 Water, Sanitary, and Storm Pipe bedding: One test per 50 m of pipe trench. Minimum one test per pipe run.
- .3 Scarify and moisten or aerate or remove and replace soil to depth required; re-compact and re-test until specified compaction is obtained when testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified.
- .4 Contractor to provide certification report from testing agency for all inspections and test results. Report to be certified by qualified Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.

3.21 RESTORATION

- .1 Remove surplus materials and debris, trim slopes, and correct defects noted by Departmental Representative upon completion of work.

- .2 Replace topsoil as indicated.
- .3 Reinstate pavement, sidewalks, and landscaping to condition and elevation that existed before excavation.
- .4 Clean and reinstate areas affected by work as directed by Departmental Representative

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- .1 Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off property in conformance with province of New Brunswick requirements.

3.23 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.24 GRADING

- .1 Grade to ensure that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative. Grade to be gradual between finished spot elevations as indicated.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.

1.2 REFERENCE STANDARDS

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of stumps and roots and boulders and rock fragments of specified size to not less than specified depth below existing ground surface.
- .6 Existing trees are to be protected where possible.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Samples:
 - .1 Submit one (1) sample of each material listed below for approval prior to delivery of materials to project site.
 - .1 Tree wound paint: one litre can with manufacturer's label.
- .3 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Provide manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- .1 Do construction occupational health and safety in accordance with Section 01 11 00 – General Requirements: Health and Safety.
- .2 Safety Requirements: worker protection.
 - .1 At a minimum, workers must wear protective hard hat, clothing, eye protection, gloves, safety boots, long sleeved clothing, safety vests when clearing and grubbing.
 - .2 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.6 STORAGE AND PROTECTION

- .1 Prevent damage to natural features, utility lines, shrubs, existing buildings, site appurtenances, landscaping, benchmarks, existing pavement, watercourses, root systems of trees, trees, fencing which are to remain.
 - .1 Repair damaged items to approval of Departmental Representative.
 - .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
- .2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
 - .1 Trim limbs and tops and saw into saleable lengths.
 - .2 Stockpile adjacent to site.
- .3 Ash wood mixed with the wood of other species is to all be managed and disposed of as ash wood.

Part 2 Products

2.1 MATERIALS

- .1 Bituminous based paint of standard manufacture specially formulated for tree wounds.
- .2 Soil Material for Fill:
 - .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
 - .2 Remove and store soil material for reuse.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
 - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

- .2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

3.3 APPLICATION

- .1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.4 CLEARING

- .1 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, brush, rubbish, snags occurring within cleared areas.
- .2 Clear as directed or indicated by Departmental Representative, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- .3 Cut off branches overhanging area cleared as directed by Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.
- .5 All cutting of white pine trees to be reviewed and approved by Departmental Representative prior to cutting.

3.5 CLOSE CUT CLEARING

- .1 Close cut clearing to ground level.
- .2 Perform close cut clearing by hand.
- .3 Cut off branches overhanging area cleared as directed by Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.6 ISOLATED TREES

- .1 Cut off isolated trees as indicated or directed by Departmental Representative at height of not more than 300 mm above ground surface.
- .2 Grub out isolated tree stumps.
- .3 Prune individual trees as indicated.
- .4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.
- .5 Cut limbs and branches to be trimmed close to bole of tree or main branches.
- .6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

3.7 UNDERBRUSH CLEARING

- .1 Clear underbrush from areas as indicated at ground level.

3.8 GRUBBING

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m³.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.9 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site to disposal area designated by Departmental Representative.
- .2 Cut timber greater than 125 mm diameter to approved lengths and stockpile as indicated. Stockpiled timber becomes property of Departmental Representative.
- .3 Dispose of cleared and grubbed materials by methods approved by authority having jurisdiction and Departmental Representative.
- .4 Bury to approval of Departmental Representative by:
 - .1 Consolidating.
 - .2 Covering with minimum 500mm of mineral soil.
 - .3 Finishing surface.
- .5 Mulch or chip and stockpile cleared and grubbed vegetative material on site as directed by Departmental Representative.
- .6 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

3.10 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations to approval of Departmental Representative.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, flagging tape, tools and equipment.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .4 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks
- .2 Section 31 11 00 – Clearing and grubbing.

1.2 REFERENCE STANDARDS

- .1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), current edition, and as herein specified.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.

1.4 EXISTING CONDITIONS

- .1 Known underground and surface utility lines and buried objects are as indicated on site plan and are approximate only. Contractor to confirm locations on site.
- .2 Refer to dewatering in Section 31 23 33.01- Excavating, Trenching and Backfilling.

Part 2 Products

2.1 MATERIALS

- .1 Fill material: to Section 31 23 33.01- Excavating, Trenching and Backfilling.
- .2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.

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 rough grading installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Slope rough grade away from building (provide positive drainage).
- .3 Grade ditches to depth required for maximum run-off.
- .4 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .5 Compact filled and disturbed areas to corrected maximum dry density to ASTM D698, as follows:
 - .1 85% under landscaped areas.
 - .2 95% under paved and walk areas.
- .6 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 TESTING

- .1 Inspection and testing of soil compaction will be carried out by qualified testing agency in accordance with Section 31 00 99 – Common Work Results for Earthworks. Pay cost for testing.
- .2 Submit testing procedure, frequency of tests, testing laboratory as designated by ULC or certified testing personnel to Departmental Representative for review and approval.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .4 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Protect existing trees, fencing, landscaping, natural features, benchmarks, buildings, pavement, surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads to prevent accumulation of construction related debris on roads.

END OF SECTION

Part 1 General

1.1 MEASUREMENT PROCEDURES

- .1 The work of this section is part of Contract and included in Bid Price, which shall be full compensation for all labour, materials and equipment necessary to complete the work, including all subsidiary and incidental items.

1.2 REFERENCE STANDARDS

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
 - .2 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: solid material in excess of 1.00 m³ and which cannot be removed by means of heavy-duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 mm in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit for review by Departmental Representative proposed dewatering and heave prevention methods as described in PART 3 of this Section.
 - .3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
 - .4 Submit to Departmental Representative written notice when bottom of excavation is reached.
 - .5 Submit to Departmental Representative testing and inspection results as described in PART 3 of this Section.
- .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
 - .2 Submit records of underground utility locates, location plan of relocated and abandoned services, as required, and location plan of existing utilities as found in field.

1.5 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the Province of Nova Scotia, Canada.
- .4 Keep design and supporting data on site.
- .5 Engage services of qualified professional Engineer who is registered or licensed in the Province of Nova Scotia, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .6 Testing agency to inspect and test all subgrade, bedding materials, granular bases, asphalt and concrete, and each fill or backfill layer; proceed with subsequent earthwork only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
- .7 Contractor to provide certification report from testing agency for all inspections and test results. Report to be certified by qualified Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.
- .8 Do not use soil material until written report of soil test results are reviewed by Departmental Representative.
- .9 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 11 00 – General Requirements: Health and Safety.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert excess aggregate materials from landfill to local quarry for reuse as directed by Departmental Representative.

- .2 Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

1.7 EXISTING CONDITIONS

- .1 Buried services:
- .1 Before commencing work establish location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify applicable authorities having jurisdiction and Departmental Representative establish location and state of use of buried utilities and structures. Authorities having jurisdiction and Departmental Representative to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful test excavations and report findings to Departmental Representative.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before re-routing or removing. Costs for such Work to be paid by Departmental Representative.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
- .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey benchmarks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
 - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Granular/Gravel bedding: in accordance with ITEM 415 - Pipe Zone Material of the Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction.
- .2 Fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Clear stone: crushed and screened, hard, durable stone, free from clay and organic matter, and graded as follows:

Sieve Designation	% Passing
112mm	100
80mm	90-100
28mm	0-10

- .4 Unshrinkable Fill: proportioned and mixed to provide:
 - .1 Maximum Portland cement content: 25 kg/m³.
 - .2 Minimum strength of 0.7 MPa at 24 hours.
 - .3 Concrete aggregates: to CAN/CSA A23.1.
 - .4 Portland cement: Type GU.
 - .5 Slump: 150 mm minimum
- .5 Geotextile: Type W1 in accordance with ITEM 601 - Geotextile of the Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.4 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared of grasses and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
 - .1 Do not mix topsoil with subsoil.

- .3 Stockpile in locations as directed by Departmental Representative.
- .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil off site as directed by Departmental Representative.

3.5 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative.
- .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative review and approval details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
- .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water to approved runoff areas and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
- .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.7 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Remove paving, concrete, walks and other obstructions encountered during excavation as directed by Departmental Representative. Existing kiosk building and park entrance to remain operational until new kiosk is operating.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
- .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .8 Restrict vehicle operations directly adjacent to open trenches.

- .9 Dispose of surplus and unsuitable excavated material in approved location on site.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Departmental Representative when bottom of excavation is reached.
- .13 Obtain Departmental Representative approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under other areas with Type B material compacted to not less than 95% of corrected Standard Proctor maximum dry density to ASTM D698.
- .16 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
- .17 Install geotextiles as indicated.

3.8 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or as directed by Departmental Representative. Compaction densities are percentages of maximum densities obtained from ASTM D698.
 - .1 Exterior side of perimeter walls: Compact to 95% of corrected maximum dry density.
 - .2 Within building area: Compact to 100% of corrected maximum dry density.
 - .3 Under concrete slabs: provide minimum 150 mm compacted thickness base course to underside of slab. Compact base course to 100%.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified.
- .2 Place bedding and surround material in unfrozen condition.

3.10 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative and testing agency have inspected and approved installations.
 - .2 Departmental Representative and testing agency have inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

3.11 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as indicated.
- .3 Reinstate pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .4 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 32 11 23 – Aggregate Base Courses.

1.2 REFERENCE STANDARDS

- .1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NDPW), and as herein specified.
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Section 01 11 00 – General Requirements: Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements.
- .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with erosion and sedimentation control plan and manufacturer's recommendations.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Obtain materials locally to extent possible.
- .2 Granular/gravel sub-base material: in accordance with the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.
- .4 Testing agency to review and certify granular/gravel sub-base. Pay cost of testing agency.

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PLACING

- .1 Place granular sub-base after aggregate base course is inspected and approved by Departmental Representative.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Begin spreading sub-base material on crown line or high side of one-way slope.
- .6 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
 - .1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .10 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.
- .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compact to 100% of Standard Proctor maximum dry density.
- .5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .6 Apply water as necessary during compaction to obtain specified density.

- .7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.
- .8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

- .1 Locations: proof roll only at areas receiving asphalt or concrete pavement.
- .2 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.
- .3 Obtain written approval from Departmental Representative to use nonstandard proof rolling equipment.
- .4 Proof roll at level in sub-base as indicated.
 - .1 If nonstandard proof rolling equipment is approved, Departmental Representative will determine level of proof rolling.
- .5 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .6 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.
 - .2 Backfill excavated subgrade with common material and compact in accordance with Section 31 00 99 – Common Work Results for Earthworks sub-base material and compact in accordance with this section.
 - .3 Replace sub-base material and compact.

Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.6 QUALITY CONTROL

- .1 Testing agency to inspect and test all subgrade, granular bases, and each layer; proceed with subsequent work only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
- .2 Contractor to provide certification report from testing agency for all inspections and test results. Report to be certified by qualified Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 SITE TOLERANCES

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.9 PROTECTION

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 32 11 16.01 – Granular Sub-Base.

1.2 REFERENCE STANDARDS

- .1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Section 01 11 00 – General Requirements: Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements and with manufacturer's written instructions
- .2 Storage and Handling Requirements:
 - .1 Stockpile minimum 50% of total aggregate required prior to beginning operation.
 - .2 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .3 Replace defective or damaged materials with new.
 - .4 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

Part 2 Products

2.1 MATERIALS

- .1 Granular base: material in accordance with Section 31 00 99 – Common Work Results for Earthworks and the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.

Part 3 Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

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

3.2 PLACEMENT AND INSTALLATION

- .1 Place aggregate base course after subgrade surface is inspected and approved in writing by Departmental Representative.
- .2 Placing:
 - .1 Construct granular base to depth and grade in areas indicated.
 - .2 Ensure no frozen material is placed.
 - .3 Place material only on clean unfrozen surface, free from snow and ice.
 - .4 Begin spreading base material on crown line or on high side of one-way slope.
 - .5 Place material using methods which do not lead to segregation or degradation of aggregate.
 - .6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
 - .7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
 - .1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
 - .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .9 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment:
 - .1 Ensure compaction equipment is capable of obtaining required material densities.
 - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.
 - .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compacting:
 - .1 Compact to 100% of Standard Proctor maximum dry density.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.
 - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .5 Proof Rolling:
 - .1 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.
 - .2 Obtain written approval from Departmental Representative to use non standard proof rolling equipment.
 - .3 Proof roll at level in granular base as indicated.

- .1 If use of non standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.
- .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .5 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove base, sub-base and subgrade material to depth and extent as directed by Departmental Representative.
 - .2 Backfill excavated subgrade with common material and compact in accordance with Section 31 00 99 – Common Work Results for Earthworks.
 - .3 Replace sub-base material and compact in accordance with Section 32 11 16.01- Granular Sub-Base.
 - .4 Replace base material and compact in accordance with this Section.
- .6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with Section 32 11 16.01- Granular Sub-Base and this section at no extra cost.
- .6 Quality Control
 - .1 Testing agency to inspect and test all granular bases, and each layer; proceed with subsequent work only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
 - .2 Contractor to provide certification report from testing agency for all inspections and test results. Report to be certified by qualified Professional Engineer (licensed to practice in NB) that all work was completed in accordance with specifications.

3.3 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Divert unused granular material from landfill to local quarry approved by Departmental Representative.

3.5 PROTECTION

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 11 16.01 - Granular Sub-Base
- .2 Section 32 11 23 - Aggregate Base Courses.

1.2 REFERENCE STANDARDS

- .1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.
- .2 Submit product datasheets and specifications for materials specified.
- .3 Submit asphalt concrete mix design and trial mix test results and list of equipment and materials proposed for use to Departmental Representative for review.
- .4 Submit a certificate of compliance indicating that the asphalt meets the requirements of the specifications, standards listed above and good local construction practices.

Part 2 Products

2.1 MATERIALS

- .1 Asphalt concrete to Division 200 of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW)

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 asphalt paving in accordance with the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW):
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PAVEMENT CONSTRUCTION

- .1 Obtain Departmental Representative's approval of existing surface, base, prime coat, and/or tack coat prior to placing asphalt.
- .2 Asphalt paving be compacted to 92% Marshall theoretical maximum density.
- .3 Place asphalt concrete to thicknesses, grades and lines as indicated and directed by Departmental Representative in accordance with Division 200 of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW).

3.4 QUALITY CONTROL TESTING

- .1 Inspection and testing shall be carried out by the Contractor. The cost of geotechnical inspection and testing is the responsibility of the contractor.
- .2 Quality control testing to be in accordance with the Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW).
- .3 Testing agency to inspect and test all granular bases, asphalt, and each layer; proceed with subsequent work only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
- .4 Contractor to provide certification report from testing agency for all inspections and test results. Report to be certified by qualified Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.

3.5 FINISH TOLERANCES

- .1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.
- .2 Finished asphalt surface not to have irregularities exceeding 5 mm when checked with 4.5 m straight edge placed in any direction.

3.6 DEFECTIVE WORK

- .1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.
 - .1 If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.
- .2 Repair areas showing checking, rippling, or segregation.
- .3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.7

CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 32 11 16.01 – Granular Sub-Base.
- .3 Section 32 11 23 – Aggregate Base Courses.
- .4 Section 32 12 16 – Asphalt Pavement.
- .5 Structural Drawings and specifications: cast-in-place concrete, reinforcement, shoring, curing.

1.2 REFERENCE STANDARDS

- .1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW) and as herein specified.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, and limitations.
- .3 Inform Departmental Representative of proposed source of materials and provide access for sampling minimum 4 weeks prior to commencing work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.
- .2 Concrete to be minimum Class C-2 and have minimum compressive strength of 35 mPa at 28 days with air content of 6%.

Part 3 Execution

3.1 GRADE PREPARATION

- .1 Do grade preparation work in accordance with Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction and Section 31 23 33.01- Excavating, Trenching and Backfilling.

3.2 GRANULAR BASE

- .1 Obtain Departmental Representative's approval of subgrade before placing granular base.
- .2 Place granular base material to lines, widths, and depths as indicated and in accordance with Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction.

3.3 CONCRETE

- .1 Obtain Departmental Representative approval of granular base and reinforcing steel prior to placing concrete.
- .2 Do concrete work in accordance with Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction

3.4 TOLERANCES

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 EXPANSION AND CONTRACTION JOINTS

- .1 Install expansion joints as indicated and in accordance with Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction and as directed by Departmental Representative.
- .2 When sidewalk adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.6 ISOLATION JOINTS

- .1 Install isolation joints in accordance with Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction and around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.
- .2 Install joint filler in isolation joints as directed by Departmental Representative.
- .3 Seal isolation joints with sealant approved by Departmental Representative.

3.7 TACTILE WALKING SURFACE INDICATORS

- .1 Install tactile walking surface indicators at curb ramp edges, where indicated on drawings and in accordance with local municipal by-laws.

3.8 CURING

- .1 Cure concrete in accordance with Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction

3.9 BACKFILL

- .1 Allow concrete to cure for 7 days prior to backfilling.
- .2 Backfill to designated elevations with material as directed by Departmental Representative.
 - .1 Compact and shape to required contours as directed by Departmental Representative.

3.10 LINSEED OIL TREATMENT

- .1 Apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters, after concrete has cured for specified curing time and when surface of concrete clean and dry.
- .2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.

- .3 Apply treatment when air temperature above 10 degrees C.
- .4 Apply first coat at 135 mL/m².
- .5 Apply second coat at 90 mL/m² when first coat has dried.

3.11 Quality Control

- .1 Notify testing agency to inspect and test subgrade, granular bases, concrete, and each layer; proceed with subsequent work only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
- .2 Contractor to provide certification report from testing agency for all inspections and test results. Report to be certified by Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.

3.12 CLEANING

- .1 Proceed in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 12 16 – Asphalt Pavement

1.2 REFERENCE STANDARDS

- .1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.
- .2 Environment Canada (EC)
 - .1 Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations, SOR/2009-264.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature and data sheets for pavement markings and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 11 00 – General Requirements: Health and Safety.
- .3 Samples:
 - .1 Submit to Departmental Representative following material sample quantities at least 4 weeks prior to commencing work.
 - .1 Two 1 L samples of each type of paint.
 - .2 One 1 kg sample of glass beads.
 - .3 Sampling to MPI Painting Manual.
 - .2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, MPI specification number and formulation number and batch number.

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, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect materials 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 and in accordance with local regulations.

1.5 SITE CONDITIONS

- .1 Sustainable Design Provisions:
 - .1 Seasonal restriction for high VOC content traffic marking coatings.
 - .1 Traffic marking coating application between May 1st and October 15th subject to seasonal use restriction and have VOC concentration maximum 150 g/L.

Part 2 Products

2.1 MATERIALS

- .1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings acceptable for product installation in accordance with MPI instructions prior to pavement markings application.
 - .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.
- .3 Proceed with Work only after unacceptable conditions rectified.

3.2 EQUIPMENT REQUIREMENTS

- .1 Paint applicator: approved pressure type with positive shut-off distributor capable of applying paint in single, double and dashed lines and capable of applying marking components uniformly, at rates specified, and to dimensions as indicated.
- .2 Distributor: capable of applying reflective glass beads as overlay on freshly applied paint.

3.3 TRAFFIC CONTROL

- .1 In accordance with the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.

3.4 APPLICATION

- .1 Pavement markings: lay out pavement markings for review and approval by Departmental Representative.
- .2 Unless otherwise approved by Departmental Representative, apply paint when air temperature minimum 10 degrees C, wind speed maximum 60 km/h and no rain forecast within next 4 hours.
- .3 Apply traffic paint evenly at rate of 3 m²/L to form minimum 8 mil dry film thickness, in accordance with MPI Architectural Painting Specification Manual "Preparation of Surfaces" and "Application" for "Approved Product" listing.
- .4 Do not thin paint unless approved by Departmental Representative.
- .5 Symbols and letters to dimensions indicated.

- .6 Paint lines of uniform colour and density with sharp edges.
- .7 Thoroughly clean distributor tank before refilling with paint of different colour.
- .8 Apply glass beads at rate of 0.5 kg/L of painted area immediately after application of paint.

3.5 TOLERANCE

- .1 Paint markings: within plus or minus 12 mm of dimensions indicated.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

- .1 Protect pavement markings until dry.
- .2 Repair damage to adjacent materials caused by pavement marking application.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01 Excavating, Trenching and Backfilling
- .2 Section 33 31 11 Public Sanitary Sewerage Gravity Piping

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A48/A48M-03(2016), Standard Specification for Grey Iron Castings.
 - .2 ASTM C478M-15a, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
- .2 CSA Group
 - .1 CAN/CSA A257 Series-14, Standards for Concrete Pipe and Manhole Sections.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for maintenance holes and catch basin structures 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 Nova Scotia, Canada.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer content, and total cost of materials for project.

1.4 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Quality Control.
- .2 Certifications:
 - .1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

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 accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect maintenance holes and catch basin structures 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 and in accordance local regulations.
- .5 Packaging Waste Management: remove for reuse and return packaging materials to manufacturer where possible and in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Cement: to CAN/CSA-A3000, Type GU, Normal and CSA A23.1, Table 6.
- .2 Concrete mix design to produce 35 MPa minimum compressive strength at 28 days and containing 25 mm maximum size coarse aggregate, with water/cement ratio to CSA A23.1, Tables 1, 2, and 4 as required for exposure conditions.
 - .1 Air entrainment to CSA A23.1, Tables 1, 2, and 4.
- .3 Supplementary cementing materials:
 - .1 Low Calcium Fly Ash (Class F): to CSA A3000 and CSA 23.1, Table 8. Provide confirmation of compliance to CSA A3000 for the fly ash used in the concrete.
- .4 Concrete reinforcement:
 - .1 Bars: to CSA G30.18, carbon steel, grade 400, deformed.
 - .2 Welded Steel Wire Fabric: to ASTM A933/A933M.
 - .3 Bar Supports and Spacers: to CSA A23.1.
- .2 Precast maintenance hole units: to ASTM C478M or CSA A257, circular or oval.
 - .1 Top sections to be flat slab top type with opening offset.
 - .2 Monolithic bases to be approved by Departmental Representative and set on concrete slabs cast in place.
- .3 Joints: made watertight using o-rings: to manufacturer's standard and bituminous tape.
- .4 Waterproofing: Bakor Blueskin WP200 or approved equivalent.
- .5 Mortar:
 - .1 Masonry Cement: to CAN/CSA-A3002.
- .6 Adjusting rings: to ASTM C478M.
- .7 Concrete Brick: to CAN/CSA-A165 Series.
- .8 Drop maintenance hole pipe: same as sewer pipe.
- .9 Galvanized iron sheet: approximately 2 mm thick.

- .10 Steel gratings, I-beams and fasteners: as indicated.
- .11 Frames, gratings, covers to dimensions as indicated and following requirements:
 - .1 Metal gratings and covers to bear evenly on frames.
 - .1 Frame with grating or cover to constitute one unit.
 - .2 Assemble and mark unit components before shipment.
 - .3 Top of manhole guide frame to be set level to top of crushed rock subgrade.
 - .4 Adjustable manhole frames and covers shall be ductile iron.
 - .2 Ductile iron castings: to ASTM A536.
 - .3 Castings: coated with two applications of asphalt varnish, sand blasted or cleaned and ground to eliminate surface imperfections.
 - .4 Maintenance hole frames and covers: cover cast with two 25 mm round lifting holes. Minimum opening to be 600mm diameter. Cover to include Parks Canada logo (logo details and size to be approved by Parks Canada). Sanitary system covers to also include the label "SANITARY".
- .12 Granular/Gravel bedding: in accordance with ITEM 415 - Pipe Zone Material of the Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction .
- .13 Fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75mm, cinders, ashes, sods, refuse or other deleterious materials.
- .14 Unshrinkable fill: in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

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 maintenance holes and catch basin structures installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

3.2

EXCAVATION AND BACKFILL

- .1 Excavate and backfill in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling and as indicated.
- .2 Obtain approval of Departmental Representative before installing outfall structures, maintenance holes, or catch basins.

3.3

CONCRETE WORK

- .1 Do concrete work in accordance with project specifications and local requirements.
- .2 Place concrete reinforcement in accordance with project specifications and local requirements.
- .3 Position metal inserts in accordance with dimensions and details as indicated.

3.4 INSTALLATION

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses.
 - .1 Maximum of 3 units behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.
- .4 Set precast concrete base on 150 mm minimum of granular/gravel bedding compacted to 100% maximum density to ASTM D698.
- .5 Precast units:
 - .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base.
 - .2 Make each successive joint watertight with Departmental Representative's approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination of these materials.
 - .3 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .4 Plug lifting holes with concrete plugs set in cement mortar or mastic compound.
- .6 For sewers:
 - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
 - .2 Bench to provide smooth U-shaped channel.
 - .1 Side height of channel to be 0.75 times full diameter of sewer.
 - .2 Slope adjacent floor at 1 in 20.
 - .3 Curve channels smoothly.
 - .4 Slope invert to establish sewer grade.
- .7 Compact granular backfill to 95% maximum density to ASTM D698.
- .8 Place unshrinkable backfill in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.
- .9 Installing units in existing systems:
 - .1 Where new unit is installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.
 - .2 Make joints watertight between new unit and existing pipe.
 - .3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.
- .10 Set frame and cover to required elevation using adjusting rings as required. Adjusting ring maximum height is 300 mm.
 - .1 Parge and make smooth and watertight.
- .11 Place frame and cover on top section to elevation as indicated.
 - .1 If adjustment required use concrete ring.
- .12 Clean units of debris and foreign materials.

- .1 Remove fins and sharp projections.
- .2 Prevent debris from entering system.
- .13 Install safety platforms in maintenance holes having depth of 5 m or greater, as indicated.

3.5 FIELD QUALITY CONTROL

- .1 Manhole vacuum testing:
 - .1 Plug all inlet and outlet pipes. Restrain plugs.
 - .2 Place and seal vacuum tester head to the precast section.
 - .3 Draw vacuum of 250 mm Hg on the manhole and measure the time for the vacuum to drop to 225 mm Hg.
 - .4 Time to be not less than 45, 50, 65, and 80 seconds for manhole diameters of 1050 mm, 1200 mm, 1500 mm, and 1800 mm respectively.
 - .5 For maintenance holes deeper than 6 meters, increase test times by 2 seconds per 300 mm of additional manhole depth.
 - .6 Locate and repair defects if test fails. Retest using same methodology.
 - .7 Repair leaks regardless of test results.
- .2 Departmental Representative will issue Test Certificate for each maintenance hole passing test.
- .3 Testing agency to inspect and test all bedding materials and each fill or backfill layer; proceed with subsequent work only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
- .4 Provide certification report from testing agency for all test results. Report to be certified by qualified Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 22 05 00 – Common Work Results for Plumbing.
- .2 Section 22 42 01 - Plumbing Specialties and Accessories.
- .3 Section 23 05 53 - Mechanical Identification.
- .4 Section 31 23 33.01- Excavating, Trenching and Backfilling

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA B300 -10, Standard for Hypochlorites.
 - .2 ANSI/AWWA B301- 10, Standard for Liquid Chlorine.
 - .3 ANSI/AWWA C651- 14, Standard for Disinfecting Water Mains.
 - .4 ANSI/AWWA C800- 14, Standard for Underground Service Line Valves and Fittings.
- .2 ASTM International (ASTM)
 - .1 ASTM B88M- 16, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia, and as herein specified.
- .4 Atlantic Canada Guidelines for the Supply, Treatment, Storage, Distribution and Operation of Drinking Water Supply Systems, September 2004.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for distribution piping materials and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Pipe certification to be on pipe.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia, Canada.
- .4 Samples:
 - .1 Inform Departmental Representative of proposed source of bedding materials and provide access for sampling at least 4 weeks prior to commencing work.
 - .2 Submit manufacturer's test data and certification that pipe materials meet requirements of this section 4 weeks minimum prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 General Requirements: Closeout Submittals.

- .2 Submit data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves.
 - .1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.
- .3 Operation and Maintenance Data: submit operation and maintenance data for pipe, valves, and valve boxes for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 General Requirements: Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect water distribution piping from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.6 SCHEDULING OF WORK

- .1 Schedule Work to minimize interruptions to existing services.
- .2 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.
- .3 Notify Departmental Representative minimum of 24 hours in advance of interruption in service.
- .4 Do not interrupt water service for more than 3 hours and confine this period between 10:00 and 16:00 hours local time unless otherwise authorized.

Part 2 Products

2.1 SERVICE CONNECTIONS

- .1 Copper tubing: to ASTM B88M Type K, annealed. Minimum pressure rating of 1045 kPa.
- .2 Copper tubing joints: compression type suitable for 1045 kPa working pressure.
- .3 Brass corporation stops: red brass to ASTM B62 compression type, inlet having threads to AWWA C800. Minimum pressure rating of 1045 kPa. Mueller B25008N (ball valve) or approved equivalent.
- .4 Brass inverted key-type curb stops: red brass to ASTM B62, compression type and O-ring seal without drains unless directed otherwise by Departmental Representative. Minimum pressure rating of 1045 kPa. Mueller H15219N (Oriseal) or approved equivalent.
 - .1 Curb stops to have adjustable bituminous coated cast iron service box with stem to suit depth of bury.
 - .2 Top of cast iron box marked "WATER"/"EAU".
 - .3 Zinc anodes (ZN24-48) to ASTM B418, complete with clamps, as directed.
 - .4 Pipe sleeve: PVC DR18 complete with sealed ends.
- .5 All water service infrastructure to be have 2.0 m (min) for frost cover.

2.2 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular/Gravel bedding: in accordance with ITEM 415 - Pipe Zone Material of the Nova Scotia Department of Transportation and Infrastructure Standard Specifications for Highway Construction

2.3 BACKFILL MATERIAL

- .1 In accordance with 31 23 33.01 - Excavating, Trenching and Backfilling.

2.4 PIPE DISINFECTION

- .1 Liquid chlorine to AWWA B301-18 to disinfect water mains.
- .2 Disinfect water mains in accordance with AWWA C651 only after system has been successfully pressure tested.

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 distribution piping installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Clean pipes, fittings, valves, and appurtenances of accumulated debris and water before installation.
 - .1 Inspect materials for defects to approval of Departmental Representative.
 - .2 Remove defective materials from site as directed by Departmental Representative.

3.3 TRENCHING

- .1 Do trenching work in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.
- .2 Ensure trench depth allows coverage over pipe of 1.6 m or as indicated.
- .3 Trench alignment and depth require Departmental Representative's approval prior to placing bedding material and pipe.

3.4 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to 95% maximum density to ASTM D698.

- .6 Fill authorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling with compacted bedding material.
- .7 Testing agency to inspect and test all bedding materials and each fill or backfill layer; proceed with subsequent earthwork only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
- .8 Provide certification report from testing agency for all test results. Report to be certified by qualified Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.

3.5 SERVICE PIPE INSTALLATION

- .1 Terminate building water service 1 m outside building wall opposite point of connection to main.
 - .1 Confirm location of water connection at building with Departmental Representative prior to installation.
 - .2 Install coupling necessary for connection to building plumbing.
 - .3 If plumbing is already installed, make connection; otherwise cap or seal end of pipe and place temporary marker to locate pipe end.
- .2 Lay pipes to AWWA C600 and C800 and as per manufacturer's standard instructions and specifications.
 - .1 Do not use blocks except as specified.
- .3 Do not connect service to building until satisfactory completion of hydrostatic and leakage tests of water service.
- .4 Leave corporation stop valves fully open.
- .5 Install rigid stainless steel liners in small diameter plastic pipes with compression fittings.
- .6 Install curb stop with corporation box on services NPS 2 (50mm) or less in diameter.
 - .1 Equip larger services with gate valve and cast iron box.
 - .2 Set box plumb over stop and adjust top flush with final grade elevation.
 - .3 Leave curb stop valves fully closed.
- .7 Place temporary location marker at ends of plugged or capped unconnected water lines.
 - .1 Each marker to consist of 38 x 89 mm stake extending from pipe end at pipe level to 600 mm above grade.
 - .2 Paint exposed portion of stake with designation "WATER SERVICE LINE" in blue
- .8 Handle pipe by methods recommended by pipe manufacturer approved by Departmental Representative.
- .9 Lay pipes on prepared bed, true to line and grade.
 - .1 Take up and replace defective pipe.
 - .2 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
- .10 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
 - .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .11 Position and join pipes with equipment and methods approved Departmental Representative.

- .12 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe and to leave smooth end at right angles to axis of pipe.
- .13 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .14 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Departmental Representative.
- .15 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .16 Do not lay pipe on frozen bedding.
- .17 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.
- .18 Backfill remainder of trench.

3.6 VALVE INSTALLATION

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Support valves located in valve boxes by means of bedding same as adjacent pipe. Maximum length of pipe on each end of valve shall be 1 m. Valves not to be supported by pipe.
- .3 Install underground post-type indicator valves as indicated.

3.7 HYDROSTATIC AND LEAKAGE TESTING

- .1 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .2 Notify Departmental Representative at least 24 hours in advance of proposed tests.
 - .1 Perform tests in presence of Departmental Representative.
- .3 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- .4 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Departmental Representative.
- .5 Upon completion of pipe laying and after Departmental Representative has inspected work in place, surround and cover pipes between joints with approved granular material placed as directed by Departmental Representative.
- .6 Leave valves, joints and fittings exposed.
- .7 When testing is done during freezing weather ensure that valves, joints and fittings are protected from freezing.
- .8 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- .9 Open valves.
- .10 Expel air from main by slowly filling main with potable water.
- .11 Thoroughly examine exposed parts and correct for leakage as necessary.
- .12 Apply hydrostatic test pressure 1035 kPa or pressure equal to 1.5 times working pressure, whichever is greater measured, at the lowest point in the test section.
- .13 Conduct the test over a full two (2) hour period, maintaining the constant initial test pressure.
- .14 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.

- .15 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .16 Repeat hydrostatic test until defects have been corrected.

3.8 PIPE SURROUND

- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
 - .1 Do not dump material within 1000 mm.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact pipe bedding to at least 95% maximum density to ASTM D698.
- .6 Testing agency to inspect and test all bedding materials and each fill or backfill layer; proceed with subsequent work only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection and testing.
- .7 Provide certification report from testing agency for all test results. Report to be certified by qualified Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.

3.9 BACKFILL

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698.
 - .1 In other areas, compact to at least 90% maximum density to ASTM D698.

3.10 FLUSHING AND DISINFECTING

- .1 Flushing and disinfecting operations to be carried out by specialist contractor witnessed by Departmental Representative.
 - .1 Notify Departmental Representative at least 4 days in advance of proposed date when disinfecting operations will begin.
- .2 Flush water mains and water service through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.
- .3 Provide connections and pumps for flushing as required.
- .4 Open and close valves and service connections to ensure thorough flushing.
- .5 When flushing has been completed to Departmental Representative approval, introduce strong solution of chlorine as approved Departmental Representative into water service and ensure that it is distributed throughout entire system.
- .6 Specialist contractor to perform disinfection. Disinfect water mains to the requirements of local authority.
- .7 Rate of chlorine application to be proportional to rate of water entering pipe.

- .8 Chlorine application to be close to point of filling water service and to occur at same time.
- .9 Operate valves and appurtenances while main or service contains chlorine solution.
- .10 Flush line to remove chlorine solution after 24 hours.
- .11 Measure chlorine residuals at extreme end of pipe-line being tested.
- .12 Perform bacteriological tests on water main, after chlorine solution has been flushed out.
 - .1 Take samples daily for minimum of 2 days.
 - .2 Should contamination remain or recur during this period, repeat disinfecting procedure.
 - .3 Specialist contractor to submit certified copy of test results.
- .13 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.
- .14 After adequate chlorine residual not less than 50 ppm has been obtained leave system charged with chlorine solution for 24 hours.
 - .1 After 24 hours, take further samples to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

3.11 SURFACE RESTORATION

- .1 After installing and backfilling over water mains, restore surface to original condition as directed by Departmental Representative.

3.12 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01- Excavating, Trenching and Backfilling

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM D2680- 01(2014), Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- .2 CSA Group (CSA)
 - .1 CSA B1800- 15, Thermoplastic Non-pressure Pipe Compendium.
- .3 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .4 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.
- .5 Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment, and Disposal, 2006.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
 - .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
 - .3 Notify Departmental Representative 24 hours minimum in advance of any interruption in service.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes 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 NS, Canada.
 - .2 Indicate on drawings proposed method for installing carrier pipe or pipe sleeving if required.
- .4 Samples:
 - .1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.

- .5 Certificates:
 - .1 Certification to be marked on pipe.
- .6 Test and Evaluation Reports:
 - .1 Submit manufacturer's test data and certification 2 weeks minimum before beginning Work.
- .7 Sustainable Design Submittals:
 - .1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with EPA 832/R-92-2005 and authorities having jurisdiction.
- .8 Deliver, store and handle materials in accordance with Section 01 11 00 General Requirements: Common Product Requirements.
- .9 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .10 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect pipes from damage.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PLASTIC PIPE

- .1 Type PSM Polyvinyl Chloride (PVC): to CSA B1800
 - .1 Standard Dimensional Ratio (SDR): 28 unless specified otherwise.
 - .2 Bell and spigot with locked-in rubber gasket.
 - .3 Nominal lengths: 4 m.

2.2 PIPE BEDDING AND SURROUND MATERIALS

- .1 Granular/Gravel bedding: in accordance with ITEM 415 - Pipe Zone Material of the NS Department of Transportation and Infrastructure Standard Specifications for Highway Construction .

2.3 BACKFILL MATERIAL

- .1 In accordance with 31 23 33.01 - Excavating, Trenching and Backfilling.

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 sewer pipe installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control drawings and requirements of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Clean pipes and fittings of debris and water before installation and remove defective materials from site to approval of Departmental Representative.
- .3 Clean and dry pipes and fittings before installation.
- .4 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

3.3 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.
- .2 Protect trench from contents of sewer or sewer connection.
- .3 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.

3.4 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to 95% maximum density to ASTM D698.
- .6 Fill authorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling with compacted bedding material.
- .7 Testing agency to inspect and test all bedding materials and each fill or backfill layer; proceed with subsequent work only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
- .8 Provide certification report from testing agency for all test results. Report to be certified by qualified Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.

3.5 INSTALLATION

- .1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .2 Handle pipe using methods approved by Departmental Representative.
 - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Joint deflection permitted within limits recommended by pipe manufacturer.
- .6 Water to flow through pipe during construction, only as permitted by Departmental Representative.
- .7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CSA B182.11.
- .9 Pipe jointing:
 - .1 Install gaskets as indicated in accordance with manufacturer's written recommendations.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel and foreign material.
 - .5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.
 - .6 Complete each joint before laying next length of pipe.
 - .7 Minimize joint deflection after joint has been made to avoid joint damage.
 - .8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
 - .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .10 When stoppage of Work occurs, block pipes as directed by Departmental Representative to prevent creep during down time.
- .11 Plug lifting holes with pre-fabricated plugs approved by Departmental Representative, set in shrinkage compensating grout.
- .12 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .13 Make watertight connections to maintenance holes.
 - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .14 Use prefabricated saddles or field connections approved by Departmental Representative for connecting pipes to existing sewer pipes.
 - .1 Joints to be structurally sound and watertight.

3.6 PIPE SURROUND

- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
 - .1 Do not dump material within 1000 mm.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact pipe bedding to at least 95% maximum density to ASTM D698.

3.7 BACKFILL

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698.
 - .1 In other areas, compact to at least 90% maximum density to ASTM D698.

3.8 SERVICE CONNECTIONS

- .1 Install pipe to CSA B182.11 manufacturer's instructions and specifications.
- .2 Maintain grade for 100 mm diameter sewers at 1 vertical to 50 horizontal unless indicated otherwise by Departmental Representative.
- .3 Make up required horizontal and vertical bends from 45 degrees bends or less, separated by straight section of pipe with minimum length of 4 pipe diameters.
 - .1 Use long sweep bends, unless approved otherwise.
- .4 Plug service laterals with watertight caps or plugs as approved by Departmental Representative.
- .5 Place location marker at ends of plugged or capped unconnected sewer lines (if not connected to building).
 - .1 Each marker: 38 x 89 mm stake extending from pipe end at pipe level to 0.6 m above grade.
 - .2 Paint exposed portion of stake with designation SAN SWR LINE in green.
- .6 Confirm and coordinate building connection prior to installation.

3.9 FIELD TESTING

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Departmental Representative, draw tapered wooden plug or mandrel with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Perform low pressure air and maintenance hole vacuum testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
- .5 Do low pressure air and maintenance vacuum testing as specified herein and as directed by Departmental Representative.

- .1 Perform tests in presence of Departmental Representative.
- .2 Notify Departmental Representative 24 hours minimum in advance of proposed tests.
- .6 Carry out tests on each section of sewer between successive maintenance holes including service connections.
- .7 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.
- .8 Repair and retest sewer line as required, until test results are within limits specified.
- .9 Repair visible leaks regardless of test results.
- .10 Television and photographic inspections:
 - .1 Carry out inspection of installed sewers by video camera, digital camera or by other related means.
 - .2 Provide means of access to permit Departmental Representative to do inspections.
- .11 Low pressure air testing:
 - .1 Locate and repair defects if test fails. Retest. Have repair method reviewed by Engineer prior to retesting.
 - .2 Repair visible leaks regardless of test results.
 - .3 **CAUTION: FOR SAFETY OF PERSONNEL AND PUBLIC, OBSERVE PROPER PRECAUTIONS DURING AIR TESTING. USE TEST EQUIPMENT DESIGNED TO OPERATE ABOVE GROUND. DO NOT PERMIT PERSONNEL IN TRENCH DURING TESTING. DO NOT AIR TEST PIPE WITH DIAMETER GREATER THAN 600 mm.**
 - .4 Provide air testing equipment meeting the following requirements:
 - .1 Air Blower: 14 litres/sec, maximum pressure 70 kPa continuous.
 - .2 Pressure Relief Valve: Sized to relieve full blower capacity at maximum blower pressure. Range 20 - 70 kPa, adjustable.
 - .3 Pressure Gauges: Range 0 to 70 kPa with accuracy +/- 0.25 kPa.
 - .5 Provide plugs at each end of section, with one plug equipped for air inlet connection.
 - .6 Fill test section slowly until a constant pressure of 28 kPa is reached. If ground water is above section being tested, Engineer may recommend increase in air pressure.
 - .7 Allow minimum 2 minutes for air temperature to stabilize, adding only amount of air required to maintain pressure.
 - .8 After 2 minute period, shut off air supply.
 - .9 Decrease pressure to 24 kPa. Measure time required for pressure to reach 17 kPa. Minimum time allowed for pressure drop is as follows:

Pipe Diameter (mm)	Minimum Time (Min:Sec)
100	1:53
150	2:50
200	3:47
250	4:43
300	5:40
375	7:05
450	8:30

3.10

CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33.01- Excavating, Trenching and Backfilling

1.2 REFERENCE STANDARDS

- .1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, Nova Scotia (NSDPW), and as herein specified.
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 SCHEDULING

- .1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Shop drawings to indicate proposed method for installing carrier pipe or pipe sleeving if required.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed NS, Canada.
- .4 Samples:
 - .1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .5 Certification to be marked on pipe.
- .6 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.
- .7 Manufacturer's Instructions: submit to Departmental Representative and 1 copy of manufacturer's installation instructions.
- .8 Sustainable Design Submittals:
 - .1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction and EPA 832/R-92-2005.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 11 00 - General Requirements: 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 accordance with manufacturer's recommendations.
 - .2 Store and protect pipes from damage.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PLASTIC PIPE

- .1 Type PSM Polyvinyl Chloride (PVC): to CAN/CSA-B1800.
 - .1 Standard Dimensional Ratio (SDR): 35 unless specified otherwise.
 - .2 Bell and spigot with locked-in rubber gasket.
 - .3 Nominal lengths: 4 m.

2.2 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular/Gravel bedding: in accordance with ITEM 415 - Pipe Zone Material of the NS Department of Transportation and Infrastructure Standard Specifications for Highway Construction .

2.3 BACKFILL MATERIAL

- .1 In accordance with 31 23 33.01 - Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction and sediment and erosion control plan.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Clean pipes and fittings of debris and water before installation and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling.

- .2 Protect trench from contents of sewer.
- .3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

3.3 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to 95% maximum density to ASTM D698.
- .6 Fill authorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling with compacted bedding material.
- .7 Testing agency to inspect and test all bedding materials and each fill or backfill layer; proceed with subsequent work only after test results for previously completed work comply with requirements. Contractor to pay costs of inspection, testing, and certification.
- .8 Provide certification report from testing agency for all test results. Report to be certified by qualified Professional Engineer (licensed to practice in NS) that all work was completed in accordance with specifications.

3.4 INSTALLATION

- .1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .2 Handle pipe using methods approved by Departmental Representative.
 - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Joint deflection permitted within limits recommended by pipe manufacturer.
- .6 Water to flow through pipes during construction only as permitted by Departmental Representative.
- .7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CAN/CSA-B1800.
- .9 When any stoppage of Work occurs, restrain pipes as directed by Departmental Representative, to prevent "creep" during down time.
- .10 Make watertight connections to manholes and catch basins.
 - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .11 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.

- .1 Joint to be structurally sound and watertight.
- .12 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

3.5 PIPE SURROUND

- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 1000 mm.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact pipe bedding to at least 95% maximum density to ASTM D698.

3.6 BACKFILL

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698.
 - .1 In other areas, compact to at least 90% maximum density to ASTM D698.

3.7 FIELD TESTS AND INSPECTIONS

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Draw tapered wooden plug or mandrel with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction directed by Departmental Representative.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Television and photographic inspections:
 - .1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.
 - .2 Provide means of access to permit Departmental Representative to do inspections.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Appendix A – Aylesford Lake Beach Well Water Quality Test

**CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168**

ATTENTION TO: Janice MacDonald

PROJECT: AD beach

AGAT WORK ORDER: 20X635434

WATER ANALYSIS REVIEWED BY: Marta Manka, Data Reporter

DATE REPORTED: Aug 13, 2020

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 20X635434

PROJECT: AD beach

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - Mn, As

DATE RECEIVED: 2020-08-10

DATE REPORTED: 2020-08-13

Parameter	Unit	G / S	RDL	AD beach	
				before filter	after filter
				1339103	1339104
Total Arsenic	ug/L		2	17	<2
Total Manganese	ug/L		2	372	50

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Marla Manka

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PROJECT: AD beach
SAMPLING SITE:

AGAT WORK ORDER: 20X635434
ATTENTION TO: Janice MacDonald
SAMPLED BY:

Water Analysis															
RPT Date: Aug 13, 2020			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Metals - Mn, As

Total Arsenic	1339104	1339104	<2	<2	NA	< 2	95%	80%	120%	93%	80%	120%	103%	70%	130%
Total Manganese	1339104	1339104	50	50	1.9%	< 2	101%	80%	120%	103%	80%	120%	NA	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: Marla Manka



Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 20X635434

PROJECT: AD beach

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

Unit 122 - 11 Morris Dr.
Dartmouth, Nova Scotia
B3B 1M2
http://webearth.agatlabs.com

Phone: 902-468-8718
Fax: 902-468-8924
www.agatlabs.com

Laboratory use Only
 Arrival Condition: Good Poor (complete 'notes')
 Arrival Temperature: 17.2, 16.1, 16.2 AGAT Job Number: 20X635434
 Notes: _____

Drinking Water Sample (y/n): _____ Reg. No. _____
 Waterworks Number: _____

Report To: Company: Municipality of the County of Kings Contact: Janice MacDonald Address: 221 Jones Rd New Minas Phone: 902-690-6168 FAX: _____ PO #: 28063 AGAT Quotation: _____ Client Project #: AD beach	Report Information 1. Name: Janice MacDonald Email: jmacdonald@county.kings.ns.ca 2. Name: _____ Email: _____	Report Format <input type="checkbox"/> Single PDF sample per page <input checked="" type="checkbox"/> Multiple PDF samples per page <input checked="" type="checkbox"/> Excel Format Included	Turnaround Time (TAT) Business Days Regular TAT: <input checked="" type="checkbox"/> 5 - 7 days Rush TAT: <input type="checkbox"/> 1 day <input type="checkbox"/> 2 days <input type="checkbox"/> 3 - 4 days Date Required: _____ Time Required: _____
	Regulatory Requirements (Check): <input checked="" type="checkbox"/> List Guidelines on Report <input type="checkbox"/> Do Not List Guidelines on Report <input type="checkbox"/> PIRI Site Info (check all that apply): <input type="checkbox"/> Tier 1 <input type="checkbox"/> Res. <input checked="" type="checkbox"/> Pot. <input type="checkbox"/> Coarse <input type="checkbox"/> Tier 2 <input type="checkbox"/> Com <input type="checkbox"/> N/Pot. <input type="checkbox"/> Fine <input type="checkbox"/> Gas <input type="checkbox"/> Fuel <input type="checkbox"/> Lube <input type="checkbox"/> CCME <input type="checkbox"/> CDWQ <input type="checkbox"/> Ind <input type="checkbox"/> NSDFOSP <input type="checkbox"/> Com <input type="checkbox"/> HRM 101 <input type="checkbox"/> Res/P <input type="checkbox"/> Storm Water <input type="checkbox"/> Ag <input type="checkbox"/> HRM 101 <input type="checkbox"/> FWAL <input type="checkbox"/> Waste Water <input type="checkbox"/> Sediment <input type="checkbox"/> Other: _____		

SAMPLE IDENTIFICATION	DATE / TIME SAMPLED	SAMPLE MATRIX	# OF CONTAINERS	COMMENTS - Site/Sample Info, Sample Containment	Field Filtered/ Preserved	Standard Water Analysis +MS	Metals (Circle Total, Diss or Available)	Mercury	alkalinity, Ca	BOD	PH	TSS	TKN	Ammonia	HAA	THM	Total Coliforms and E. coli (MPN)	Fecal Coliforms (Coliort)	Nova Scotia Landfill Column 1	Nova Scotia Landfill Column 3	Nova Scotia Septage Column 1	Nova Scotia Septage Column 3	Other LEAD	Manganese, arsenic	Lab Sample #
AD beach before filter	Aug 10 10:30	H ₂ O	2	Mn, Arsnic																					
after filter	10:35	H ₂ O	2	Mn, Arsnic																					

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time	Special Instructions
John Schafeld	Aug 10/12:50	[Signature]	Aug 10	
Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time	
John Schafeld	Aug 10/12:50	[Signature]	12:59	

**CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168**

ATTENTION TO: Janice MacDonald

PROJECT: AD beach filters before and after

AGAT WORK ORDER: 21X781997

WATER ANALYSIS REVIEWED BY: Ashley Dussault, Report Writer

DATE REPORTED: Aug 05, 2021

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
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- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - As, Mn

DATE RECEIVED: 2021-07-30

DATE REPORTED: 2021-08-05

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	
				before filter	after filter
				SAMPLE TYPE: Water	
				DATE SAMPLED: 2021-07-29	
				10:30	10:20
				2800415	2800416
Total Arsenic	ug/L	10	2	16	<2
Total Manganese	ug/L	120, 20 AO	2	319	196

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Guideline Violation

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
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CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
2800415	before filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Arsenic	ug/L	10	16
2800415	before filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Manganese	ug/L	120, 20 AO	319
2800416	after filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Manganese	ug/L	120, 20 AO	196

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
AGAT WORK ORDER: 21X781997
PROJECT: AD beach filters before and after
ATTENTION TO: Janice MacDonald
SAMPLING SITE:
SAMPLED BY:

Water Analysis															
RPT Date: Aug 05, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Metals - As, Mn

Total Arsenic	2801346	4	4	NA	< 2	96%	80%	120%	94%	80%	120%	102%	70%	130%
Total Manganese	2801346	<2	<2	NA	< 2	94%	80%	120%	98%	80%	120%	99%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:




Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

Laboratory Use Only

Arrival Condition: Good Poor (see notes)
 Arrival Temperature: 9.5, 9.6
 Hold Time: _____
 AGAT Job Number: 21x781997

Notes: _____

Turnaround Time Required (TAT)

Regular TAT 5 to 7 working days
 Same day 1 day
 2 days 3 days

Date Required: _____

Drinking Water Sample: Yes No Salt Water Sample Yes No
 Reg. No.: _____

Chain of Custody Record

P: 902.468.8718 • F: 902.468.8924

Report Information

Company: Mun. co. Kings
 Contact: Janice MacDonald
 Address: _____
 Phone: 9026906168 Fax: _____
 Client Project #: AD beach filters before and after
 AGAT Quotation: _____
 Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):

1. Name: Janice MacDonald
 Email: jmacdonald@county.kings.ns.ca
 2. Name: _____
 Email: _____

Report Format

Single Sample per page
 Multiple Samples per page
 Excel Format included
 Export

Regulatory Requirements (Check):

List Guidelines on Report Do not list Guidelines on Report
 PIRI
 Tier 1 Res Pot Coarse
 Tier 2 Com N/Pot Fine
 Gas Fuel Lube
 CCME CDWQ
 Industrial NSEQS-Cont Sites
 Commercial HRM 101
 Res/Park Storm Water
 Agricultural Waste Water
 FWAL Sediment Other _____

Invoice To Same Yes / No

Company: Teresa Mahoney
 Contact: _____
 Address: accountspayable@countyofkings.ca
 Phone: _____ Fax: _____
 PO/Credit Card#: 28848

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments - Site/Sample Info. Sample Containment	Field Filtered/Preserved	Standard Water Analysis	Metals: <input type="checkbox"/> Total <input type="checkbox"/> Diss <input type="checkbox"/> Available	Mercury	<input type="checkbox"/> BOD <input type="checkbox"/> COD	pH	<input type="checkbox"/> TSS <input type="checkbox"/> TDS <input type="checkbox"/> VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (P/I) <input type="checkbox"/> low level	Tier 2: TPH/BTEX Fractionation	CCME-CNS TPH/BTEX	VOC	THM	HAA	PAH	PCB	TC+EC <input type="checkbox"/> P/A <input type="checkbox"/> MPN <input type="checkbox"/> MF	<input type="checkbox"/> HPC <input type="checkbox"/> Pseudomonas	Fecal Coliform <input type="checkbox"/> MPN <input type="checkbox"/> MF	Other: Mn T	Other: arsenic T	Hazardous (Y/N)	
before filter	july 29 10:30	H2O	1	manganese and arsenic																						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
after filter	july 29 10:20 am	H2O	1	manganese and arsenic																						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Samples Relinquished By (Print Name): Janice MacDonald Date/Time: July 29, 2:30 Samples Received By (Print Name): _____ Date/Time: _____
 Samples Relinquished By (Sign): Date/Time: _____ Samples Received By (Sign): Date/Time: _____

Pink Copy - Client
 Yellow Copy - AGAT
 White Copy - AGAT
 Page of
 No: _____

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168

ATTENTION TO: Janice MacDonald
PROJECT: Aylesford Beach Canteen

AGAT WORK ORDER: 19X490320

WATER ANALYSIS REVIEWED BY: Courtney O Brien, Data Reporter, B.Eng., EIT

DATE REPORTED: Jul 17, 2019

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
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- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 19X490320
PROJECT: Aylesford Beach Canteen

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2019-07-09

DATE REPORTED: 2019-07-17

Parameter	Unit	Aylesford	
		G / S	RDL
		335686	
pH			7.46
Reactive Silica as SiO2	mg/L	0.5	6.5
Chloride	mg/L	1	4
Fluoride	mg/L	0.12	<0.12
Sulphate	mg/L	2	3
Alkalinity	mg/L	5	59
True Color	TCU	5	<5
Turbidity	NTU	0.1	0.6
Electrical Conductivity	umho/cm	1	136
Nitrate + Nitrite as N	mg/L	0.05	<0.05
Nitrate as N	mg/L	0.05	<0.05
Nitrite as N	mg/L	0.05	<0.05
Ammonia as N	mg/L	0.03	1.07
Total Organic Carbon	mg/L	0.5	0.6
Ortho-Phosphate as P	mg/L	0.01	<0.01
Total Sodium	mg/L	0.1	7.5
Total Potassium	mg/L	0.1	1.9
Total Calcium	mg/L	0.1	17.4
Total Magnesium	mg/L	0.1	2.1
Bicarb. Alkalinity (as CaCO3)	mg/L	5	59
Carb. Alkalinity (as CaCO3)	mg/L	10	<10
Hydroxide	mg/L	5	<5
Calculated TDS	mg/L	1	74
Hardness	mg/L		52.1
Langelier Index (@20C)	NA		-1.10
Langelier Index (@ 4C)	NA		-1.42
Saturation pH (@ 20C)	NA		8.56
Saturation pH (@ 4C)	NA		8.88
Anion Sum	me/L		1.36

Certified By:

Cobrien



Certificate of Analysis

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SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2019-07-09

DATE REPORTED: 2019-07-17

		Aylesford		
		SAMPLE DESCRIPTION: Beach Canteen		
		SAMPLE TYPE: Water		
		DATE SAMPLED: 2019-07-09		
Parameter	Unit	G / S	RDL	335686
Cation sum	me/L			1.53
% Difference/ Ion Balance	%			6.0
Total Aluminum	ug/L		5	7
Total Antimony	ug/L		2	<2
Total Arsenic	ug/L		2	<2
Total Barium	ug/L		5	<5
Total Beryllium	ug/L		2	<2
Total Bismuth	ug/L		2	<2
Total Boron	ug/L		5	9
Total Cadmium	ug/L		0.017	<0.017
Total Chromium	ug/L		1	<1
Total Cobalt	ug/L		1	<1
Total Copper	ug/L		1	12
Total Iron	ug/L		50	<50
Total Lead	ug/L		0.5	<0.5
Total Manganese	ug/L		2	908
Total Molybdenum	ug/L		2	<2
Total Nickel	ug/L		2	<2
Total Phosphorous	mg/L		0.02	<0.02
Total Selenium	ug/L		1	<1
Total Silver	ug/L		0.1	<0.1
Total Strontium	ug/L		5	88
Total Thallium	ug/L		0.1	<0.1
Total Tin	ug/L		2	<2
Total Titanium	ug/L		2	<2
Total Uranium	ug/L		0.1	<0.1
Total Vanadium	ug/L		2	<2
Total Zinc	ug/L		5	8

Certified By:

Cobrien



Certificate of Analysis

AGAT WORK ORDER: 19X490320
PROJECT: Aylesford Beach Canteen

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
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<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Standard Water Analysis + Total Metals

DATE RECEIVED: 2019-07-09

DATE REPORTED: 2019-07-17

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Cobrien

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PROJECT: Aylesford Beach Canteen
SAMPLING SITE:

AGAT WORK ORDER: 19X490320
ATTENTION TO: Janice MacDonald
SAMPLED BY:

Water Analysis																
RPT Date: Jul 17, 2019			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
							Lower	Upper	Lower		Upper	Lower		Upper		

Standard Water Analysis + Total Metals

pH	335502		7.13	7.13	0.0%	<	101%	80%	120%	NA	80%	120%	NA	80%	120%
Reactive Silica as SiO2	334897		3.7	3.9	5%	< 0.5	99%	80%	120%	98%	80%	120%	104%	80%	120%
Chloride	335180		11	11	2%	< 1	94%	80%	120%	NA	80%	120%	NA	80%	120%
Fluoride	335180		<0.12	<0.12	NA	< 0.12	114%	80%	120%	NA	80%	120%	82%	80%	120%
Sulphate	335180		4	4	NA	< 2	115%	80%	120%	NA	80%	120%	91%	80%	120%
Alkalinity	335502		112	113	0.3%	< 5	97%	80%	120%	NA	80%	120%	NA	80%	120%
True Color	334693		9	7	NA	< 5	85%	80%	120%	NA			NA		
Turbidity	334693		1.2	1.0	14.4%	< 0.1	99%	80%	120%	NA			NA		
Electrical Conductivity	335502		262	260	0.8%	< 1	105%	80%	120%	NA	80%	120%	NA	80%	120%
Nitrate as N	335180		0.14	0.11	NA	< 0.05	96%	80%	120%	NA	80%	120%	93%	80%	120%
Nitrite as N	335180		<0.05	<0.05	NA	< 0.05	107%	80%	120%	NA	80%	120%	110%	80%	120%
Ammonia as N	335502		0.24	0.24	0.9%	< 0.03	100%	80%	120%	102%	80%	120%	82%	80%	120%
Total Organic Carbon	331858		4.9	4.7	5%	< 0.5	87%	80%	120%	NA	80%	120%	99%	80%	120%
Ortho-Phosphate as P	334897		<0.01	<0.01	NA	< 0.01	94%	80%	120%	100%	80%	120%	96%	80%	120%
Total Sodium	335686	335686	7.5	6.7	11.4%	< 0.1	113%	80%	120%	101%	80%	120%	NA	70%	130%
Total Potassium	335686	335686	1.9	1.7	14.1%	< 0.1	NA	80%	120%	119%	80%	120%	NA	70%	130%
Total Calcium	335686	335686	17.4	14.6	17.3%	< 0.1	120%	80%	120%	105%	80%	120%	NA	70%	130%
Total Magnesium	335686	335686	2.1	1.9	11.0%	< 0.1	119%	80%	120%	108%	80%	120%	NA	80%	120%
Bicarb. Alkalinity (as CaCO3)	335502		112	113	0.3%	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Carb. Alkalinity (as CaCO3)	335502		<10	<10	NA	< 10	NA	80%	120%	NA	80%	120%	NA	80%	120%
Hydroxide	335502		<5	<5	NA	< 5	NA	80%	120%	NA	80%	120%	NA	80%	120%
Total Aluminum	335686	335686	7	15	NA	< 5	120%	80%	120%	109%	80%	120%	112%	70%	130%
Total Antimony	335686	335686	<2	<2	NA	< 2	96%	80%	120%	NA	80%	120%	130%	70%	130%
Total Arsenic	335686	335686	<2	<2	NA	< 2	116%	80%	120%	103%	80%	120%	108%	70%	130%
Total Barium	335686	335686	<5	<5	NA	< 5	116%	80%	120%	103%	80%	120%	107%	70%	130%
Total Beryllium	335686	335686	<2	<2	NA	< 2	119%	80%	120%	111%	80%	120%	106%	70%	130%
Total Bismuth	335686	335686	<2	<2	NA	< 2	114%	80%	120%	108%	80%	120%	112%	70%	130%
Total Boron	335686	335686	9	6	NA	< 5	120%	80%	120%	114%	80%	120%	107%	70%	130%
Total Cadmium	335686	335686	<0.017	<0.017	NA	< 0.017	113%	80%	120%	104%	80%	120%	109%	70%	130%
Total Chromium	335686	335686	<1	<1	NA	< 1	106%	80%	120%	86%	80%	120%	95%	70%	130%
Total Cobalt	335686	335686	<1	<1	NA	< 1	114%	80%	120%	100%	80%	120%	104%	70%	130%
Total Copper	335686	335686	12	11	9.8%	< 1	115%	80%	120%	98%	80%	120%	NA	70%	130%
Total Iron	335686	335686	<50	<50	NA	< 50	113%	80%	120%	96%	80%	120%	109%	70%	130%
Total Lead	335686	335686	<0.5	<0.5	NA	< 0.5	118%	80%	120%	104%	80%	120%	109%	70%	130%
Total Manganese	335686	335686	908	757	18.1%	< 2	114%	80%	120%	102%	80%	120%	NA	70%	130%
Total Molybdenum	335686	335686	<2	<2	NA	< 2	116%	80%	120%	105%	80%	120%	111%	70%	130%
Total Nickel	335686	335686	<2	<2	NA	< 2	114%	80%	120%	101%	80%	120%	108%	70%	130%
Total Phosphorous	335686	335686	<0.02	<0.02	NA	< 0.02	120%	80%	120%	110%	80%	120%	110%	70%	130%
Total Selenium	335686	335686	<1	<1	NA	< 1	NA	80%	120%	120%	80%	120%	NA	70%	130%

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Results relate only to the items tested. Results apply to samples as received.

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PROJECT: Aylesford Beach Canteen
SAMPLING SITE:

AGAT WORK ORDER: 19X490320
ATTENTION TO: Janice MacDonald
SAMPLED BY:

Water Analysis (Continued)

RPT Date: Jul 17, 2019			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	
Total Silver	335686	335686	<0.1	<0.1	NA	< 0.1	118%	80%	120%	111%	80%	120%	112%	70%	130%	
Total Strontium	335686	335686	88	77	13.5%	< 5	114%	80%	120%	102%	80%	120%	NA	70%	130%	
Total Thallium	335686	335686	<0.1	<0.1	NA	< 0.1	119%	80%	120%	105%	80%	120%	109%	70%	130%	
Total Tin	335686	335686	<2	<2	NA	< 2	114%	80%	120%	103%	80%	120%	108%	70%	130%	
Total Titanium	335686	335686	<2	<2	NA	< 2	113%	80%	120%	107%	80%	120%	101%	70%	130%	
Total Uranium	335686	335686	<0.1	<0.1	NA	< 0.1	117%	80%	120%	107%	80%	120%	109%	70%	130%	
Total Vanadium	335686	335686	<2	<2	NA	< 2	112%	80%	120%	98%	80%	120%	102%	70%	130%	
Total Zinc	335686	335686	8	6	NA	< 5	115%	80%	120%	99%	80%	120%	104%	70%	130%	

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: _____

CoBrien

Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
AGAT WORK ORDER: 19X490320
PROJECT: Aylesford Beach Canteen
ATTENTION TO: Janice MacDonald
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-121-6001	SM 4500 H+B	PC TITRATE
Reactive Silica as SiO ₂	INOR-121-6027	SM 4500-SiO ₂ F	COLORIMETER
Chloride	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Fluoride	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Alkalinity	INOR-121-6001	SM 2320 B	
True Color	INOR-121-6014	SM 2120 C	NEPHELOMETER
Turbidity	INOR-121-6022	SM 2130 B	NEPHELOMETER
Electrical Conductivity	INOR-121-6001	SM 2510 B	PC TITRATE
Nitrate + Nitrite as N	INORG-121-6005	SM 4110 B	CALCULATION
Nitrate as N	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INORG-121-6005	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-121-6047	SM 4500-NH ₃ H	COLORIMETER
Total Organic Carbon	INOR-121-6026	SM 5310 B	TOC ANALYZER
Ortho-Phosphate as P	INOR-121-6012	SM 4500-P G	COLORIMETER
Total Sodium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Potassium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Calcium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Magnesium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Bicarb. Alkalinity (as CaCO ₃)	INORG-121-6001	SM 2320 B	PC TITRATE
Carb. Alkalinity (as CaCO ₃)	INORG-121-6001	SM 2320 B	PC TITRATE
Hydroxide	INORG-121-6001	SM 2320 B	PC-TITRATE
Calculated TDS	CALCULATION	SM 1030E	CALCULATION
Hardness	CALCULATION	SM 2340B	CALCULATION
Langelier Index (@20C)	CALCULATION	CALCULATION	CALCULATION
Langelier Index (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 20C)	CALCULATION	CALCULATION	CALCULATION
Saturation pH (@ 4C)	CALCULATION	CALCULATION	CALCULATION
Anion Sum	CALCULATION	SM 1030E	CALCULATION
Cation sum	CALCULATION	SM 1030E	CALCULATION
% Difference/ Ion Balance	CALCULATION	SM 1030E	CALCULATION
Total Aluminum	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Antimony	MET121-6104 & MET-121-6105	SM 3125	ICP-MS
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Barium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Beryllium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Bismuth	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Boron	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Cadmium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
AGAT WORK ORDER: 19X490320
PROJECT: Aylesford Beach Canteen
ATTENTION TO: Janice MacDonald
SAMPLING SITE:
SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Chromium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Cobalt	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Copper	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Iron	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Lead	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Molybdenum	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Nickel	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Phosphorous	MET-121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Selenium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Silver	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Strontium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Thallium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Tin	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Titanium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Uranium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Vanadium	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Zinc	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168

ATTENTION TO: Janice MacDonald
PROJECT: Aylesford Beach

AGAT WORK ORDER: 19X509714

WATER ANALYSIS REVIEWED BY: Michelle Hildebrand, Inorganics Analyst, B.Sc, P.Chem

DATE REPORTED: Aug 29, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*Notes

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Certificate of Analysis

AGAT WORK ORDER: 19X509714

PROJECT: Aylesford Beach

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - Mn

DATE RECEIVED: 2019-08-26

DATE REPORTED: 2019-08-29

Parameter	Unit	G / S: A	G / S: B	RDL	SAMPLE DESCRIPTION:	AD Beach	AD Beach
					Mn Raw	Canteen	Treated
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2019-08-26	2019-08-26
Total Manganese	ug/L	120, 20 AO	2	351		1560	1490

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to NS-CDWQ - Mn [H], B Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Michelle Hildebrand



Guideline Violation

AGAT WORK ORDER: 19X509714

PROJECT: Aylesford Beach

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
471085	Mn Raw	NS-CDWQ incl [AO]	Total Metals - Mn	Total Manganese	ug/L	120, 20 AO	351
471086	AD Beach Canteen	NS-CDWQ incl [AO]	Total Metals - Mn	Total Manganese	ug/L	120, 20 AO	1560
471087	AD Beach Treated	NS-CDWQ incl [AO]	Total Metals - Mn	Total Manganese	ug/L	120, 20 AO	1490

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 19X509714

PROJECT: Aylesford Beach

ATTENTION TO: Janice MacDonald

SAMPLING SITE:
SAMPLED BY:

Water Analysis															
RPT Date: Aug 29, 2019			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Metals - Mn

Total Manganese	473939	182	181	0.6%	< 2	86%	80%	120%	98%	80%	120%	NA	70%	130%
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Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: Michelle Hildebrand

Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 19X509714

PROJECT: Aylesford Beach

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
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(902) 690-6168

ATTENTION TO: Janice MacDonald
PROJECT: Aylesford Lake Arsenic

AGAT WORK ORDER: 19X476946

WATER ANALYSIS REVIEWED BY: Jason Coughtrey, Inorganics Supervisor

DATE REPORTED: Jun 11, 2019

PAGES (INCLUDING COVER): 4

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*Notes

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Certificate of Analysis

AGAT WORK ORDER: 19X476946
PROJECT: Aylesford Lake Arsenic

11 Morris Drive, Unit 122
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CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - Arsenic

DATE RECEIVED: 2019-06-07

DATE REPORTED: 2019-06-11

Parameter	Unit	Aylesford (Before Filter)		Aylesford (After Filter)	
		G / S	RDL	G / S	RDL
Total Arsenic	ug/L	2	21	21	<2

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PROJECT: Aylesford Lake Arsenic
SAMPLING SITE:

AGAT WORK ORDER: 19X476946
ATTENTION TO: Janice MacDonald
SAMPLED BY:

Water Analysis																
RPT Date: Jun 11, 2019			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	

Total Metals - Arsenic

Total Arsenic	255645	<2	<2	NA	< 2	108%	80%	120%	104%	80%	120%	99%	70%	130%
---------------	--------	----	----	----	-----	------	-----	------	------	-----	------	-----	-----	------

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: _____





Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 19X476946

PROJECT: Aylesford Lake Arsenic

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

**CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168**

ATTENTION TO: Janice MacDonald

PROJECT: AD beach

AGAT WORK ORDER: 20X635434

WATER ANALYSIS REVIEWED BY: Marta Manka, Data Reporter

DATE REPORTED: Aug 13, 2020

PAGES (INCLUDING COVER): 4

VERSION*: 1

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***Notes**

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Certificate of Analysis

AGAT WORK ORDER: 20X635434

PROJECT: AD beach

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CANADA B3B 1M2
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FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - Mn, As

DATE RECEIVED: 2020-08-10

DATE REPORTED: 2020-08-13

Parameter	Unit	G / S	RDL	AD beach	
				before filter	after filter
				1339103	1339104
Total Arsenic	ug/L		2	17	<2
Total Manganese	ug/L		2	372	50

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Marla Manka

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PROJECT: AD beach
SAMPLING SITE:

AGAT WORK ORDER: 20X635434
ATTENTION TO: Janice MacDonald
SAMPLED BY:

Water Analysis															
RPT Date: Aug 13, 2020			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Metals - Mn, As

Total Arsenic	1339104	1339104	<2	<2	NA	< 2	95%	80%	120%	93%	80%	120%	103%	70%	130%
Total Manganese	1339104	1339104	50	50	1.9%	< 2	101%	80%	120%	103%	80%	120%	NA	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: 



Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 20X635434

PROJECT: AD beach

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

**CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168**

ATTENTION TO: Janice MacDonald

PROJECT: Aylesford Lake Beach 2020

AGAT WORK ORDER: 20X616582

WATER ANALYSIS REVIEWED BY: Michelle Hildebrand, Inorganics Analyst, B.Sc, P.Chem

DATE REPORTED: Jul 03, 2020

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 20X616582
PROJECT: Aylesford Lake Beach 2020

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CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals: As, Mn						
DATE RECEIVED: 2020-06-23				DATE REPORTED: 2020-07-03		
AD Beach Water						
(Potable) (After AD Beach Water						
Filter) (Before Filter)						
SAMPLE DESCRIPTION:		Filter		Water		
SAMPLE TYPE:		Water		Water		
DATE SAMPLED:		2020-06-23		2020-06-23		
		10:20		10:20		
Parameter	Unit	G / S: A	G / S: B	RDL	1217786	1217787
Total Arsenic	ug/L	10		2	<2[<A]	25[>A]
Total Manganese	ug/L	120, 20 AO		2	92	401

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Canadian Drinking Water Quality - updated 2021-03, B Refers to NS-CDWQ - Mn [H]
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

Michelle Hildebrand



Guideline Violation

AGAT WORK ORDER: 20X616582

PROJECT: Aylesford Lake Beach 2020

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
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CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
1217787	AD Beach Water (Before Filter)	NS-CDWQ incl [AO]	Total Metals: As, Mn	Total Arsenic	ug/L	10	25
1217787	AD Beach Water (Before Filter)	NS-CDWQ incl [AO]	Total Metals: As, Mn	Total Manganese	ug/L	120, 20 AO	401

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 20X616582

PROJECT: Aylesford Lake Beach 2020

ATTENTION TO: Janice MacDonald

SAMPLING SITE:
SAMPLED BY:

Water Analysis																
RPT Date: Jul 03, 2020			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	

Total Metals: As, Mn

Total Arsenic	1218360		<2	<2	NA	< 2	113%	80%	120%	106%	80%	120%	93%	70%	130%
Total Manganese	1218360		3	3	NA	< 2	120%	80%	120%	120%	80%	120%	118%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: Michelle Hildebrand



Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 20X616582

PROJECT: Aylesford Lake Beach 2020

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS



**CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168**

ATTENTION TO: Janice MacDonald

PROJECT: Aylesford Beach

AGAT WORK ORDER: 21X753874

WATER ANALYSIS REVIEWED BY: Ashley Dussault, Report Writer

DATE REPORTED: Jun 07, 2021

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

Empty box for notes.

Disclaimer:

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- The test results reported herewith relate only to the samples as received by the laboratory.
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- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 21X753874

PROJECT: Aylesford Beach

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - Arsenic

DATE RECEIVED: 2021-05-31

DATE REPORTED: 2021-06-07

Parameter	Unit	G / S	RDL	Arsenic before	Arsenic after
				filter	filter
				Water	Water
				2021-05-31	2021-05-31
				11:30	11:30
				2535781	2535782
Total Arsenic	ug/L	10	2	16	<2

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 21X753874

PROJECT: Aylesford Beach

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CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - Manganese

DATE RECEIVED: 2021-05-31

DATE REPORTED: 2021-06-07

Parameter	Unit	G / S	RDL	Manganese	Manganese
				before filter	after filter
SAMPLE DESCRIPTION:				Water	Water
SAMPLE TYPE:				Water	Water
DATE SAMPLED:				2021-05-31 11:30	2021-05-31 11:30
				2535783	2535784
Total Manganese	ug/L	120, 20 AO	2	547	1100

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Canadian Drinking Water Quality - updated 2021-03
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Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Guideline Violation

AGAT WORK ORDER: 21X753874

PROJECT: Aylesford Beach

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
2535781	Arsenic before filter	NS-CDWQ incl [AO]	Total Metals - Arsenic	Total Arsenic	ug/L	10	16
2535783	Manganese before filter	NS-CDWQ incl [AO]	Total Metals - Manganese	Total Manganese	ug/L	120, 20 AO	547
2535784	Manganese after filter	NS-CDWQ incl [AO]	Total Metals - Manganese	Total Manganese	ug/L	120, 20 AO	1100

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PROJECT: Aylesford Beach
SAMPLING SITE:

AGAT WORK ORDER: 21X753874
ATTENTION TO: Janice MacDonald
SAMPLED BY:

Water Analysis															
RPT Date: Jun 07, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Metals - Arsenic

Total Arsenic	2536395		<2	<2	NA	< 2	101%	80%	120%	97%	80%	120%	103%	70%	130%
---------------	---------	--	----	----	----	-----	------	-----	------	-----	-----	------	------	-----	------

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Total Metals - Manganese

Total Manganese	2536395		<2	<2	NA	< 2	99%	80%	120%	97%	80%	120%	105%	70%	130%
-----------------	---------	--	----	----	----	-----	-----	-----	------	-----	-----	------	------	-----	------

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: 

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. RPDs calculated using raw data. The RPD may not be reflective of duplicate values shown, due to rounding of final results.

Results relate only to the items tested. Results apply to samples as received.



Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 21X753874

PROJECT: Aylesford Beach

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS



Laboratory Use Only

Arrival Condition: Good Poor (see notes)

Arrival Temperature: 7.4, 12.4/0.1

Hold Time: _____

AGAT Job Number: 21x753874

Notes:

Chain of Custody Record

P: 902.468.8718 • F: 902.468.8924

Report Information

Company: Municipality of Kings County *County of Kings (CO)*

Contact: Janice MacDonald

Address: 221 Jones Road, New Minas, NS

Phone: 902 690-6168 Fax: _____

Client Project #: Aylesford Beach

AGAT Quotation: _____
Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):

1. Name: Janice MacDoanld

Email: jmacdonald@countyofkings.ca

2. Name: _____

Email: _____

Report Format

Single Sample per page

Multiple Samples per page

Excel Format Included

Export

Regulatory Requirements (Check):

List Guidelines on Report Do not list Guidelines on Report

PIRI

Tier 1 Res Pot Coarse

Tier 2 Com N/Pot Fine

Gas Fuel Lube

CCME

CDWQ

Industrial

NSEQS-Cont Sites

Commercial

HRM 101

Res/Park

Storm Water

Agricultural

Waste Water

FWAL

Sediment Other _____

Invoice To

Same Yes / No

Company: Municipality of Kings County

Contact: Teresa Mahoney

Address: accountspayable@countyofkings.ca

Phone: _____ Fax: _____

PO/Credit Card#: 28829

Drinking Water Sample: Yes No Salt Water Sample Yes No

Reg. No.: _____

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments - Site/Sample Info. Sample Containment	Field Filtered/Preserved	Standard Water Analysis	Metals: <input type="checkbox"/> Total <input type="checkbox"/> Diss <input type="checkbox"/> Available	Mercury	<input type="checkbox"/> BOD <input type="checkbox"/> CBOD	pH	<input type="checkbox"/> TSS <input type="checkbox"/> TDS <input type="checkbox"/> VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (PIRI) <input type="checkbox"/> low level	Tier 2: TPH/BTEX Fractionation	CCME-CNS TPH/BTEX	VOC	THM	HAA	PAH	PCB	TC+EC <input type="checkbox"/> P/A <input type="checkbox"/> MPN <input type="checkbox"/> MF	<input type="checkbox"/> HPC <input type="checkbox"/> Pseudomonas	Fecal Coliform <input type="checkbox"/> MPN <input type="checkbox"/> MF	Other: arsenic (t)	Other: Mn (t)	Hazardous (Y/N)	
Arsenic before filter	<u>11:30</u>	ground H2O	1	arsenic																									
arsenic after filter	<u>11</u>	"	1	arsenic																									
Manganese before filter	<u>11</u>	"	1	Mn																									
Manganese after filter	<u>11</u>	"	1	MN																									

Samples Relinquished By (Print Name): <u>John Schofield</u>	Date/Time: <u>may 31</u>	Samples Received By (Print Name): 	Date/Time: _____	Pink Copy - Client Yellow Copy - AGAT White Copy - AGAT	Page <input type="text"/> of <input type="text"/> N ^o : _____
Samples Relinquished By (Sign): 	Date/Time: <u>may 31</u>	Samples Received By (Sign): 	Date/Time: _____		

**CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168**

ATTENTION TO: Janice MacDonald

PROJECT: AD beach filters before and after

AGAT WORK ORDER: 21X781997

WATER ANALYSIS REVIEWED BY: Ashley Dussault, Report Writer

DATE REPORTED: Aug 05, 2021

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

Disclaimer:

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- The test results reported herewith relate only to the samples as received by the laboratory.
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- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - As, Mn

DATE RECEIVED: 2021-07-30

DATE REPORTED: 2021-08-05

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	
				before filter	after filter
				SAMPLE TYPE: Water	
				DATE SAMPLED: 2021-07-29	
				10:30	10:20
				2800415	2800416
Total Arsenic	ug/L	10	2	16	<2
Total Manganese	ug/L	120, 20 AO	2	319	196

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Canadian Drinking Water Quality - updated 2021-03
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Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Guideline Violation

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
2800415	before filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Arsenic	ug/L	10	16
2800415	before filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Manganese	ug/L	120, 20 AO	319
2800416	after filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Manganese	ug/L	120, 20 AO	196

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
AGAT WORK ORDER: 21X781997
PROJECT: AD beach filters before and after
ATTENTION TO: Janice MacDonald
SAMPLING SITE:
SAMPLED BY:

Water Analysis															
RPT Date: Aug 05, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Metals - As, Mn

Total Arsenic	2801346	4	4	NA	< 2	96%	80%	120%	94%	80%	120%	102%	70%	130%
Total Manganese	2801346	<2	<2	NA	< 2	94%	80%	120%	98%	80%	120%	99%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:




Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

Laboratory Use Only
 Arrival Condition: Good Poor (see notes)
 Arrival Temperature: 9.5, 9.6
 Hold Time: _____
 AGAT Job Number: 21x781997
 Notes: _____

Chain of Custody Record

P: 902.468.8718 • F: 902.468.8924

Report Information
 Company: Mun. co. Kings
 Contact: Janice MacDonald
 Address: _____
 Phone: 9026906168 Fax: _____
 Client Project #: AD beach filters before and after
 AGAT Quotation: _____
 Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):
 1. Name: Janice MacDonald
 Email: jmacdonald@county.kings.ns.ca
 2. Name: _____
 Email: _____

Report Format
 Single Sample per page
 Multiple Samples per page
 Excel Format Included
 Export

Turnaround Time Required (TAT)
 Regular TAT 5 to 7 working days
 Same day 1 day
 2 days 3 days
 Date Required: _____

Invoice To Same Yes / No
 Company: Teresa Mahoney
 Contact: _____
 Address: accountspayable@countyofkings.ca
 Phone: _____ Fax: _____
 PO/Credit Card#: 28848

Regulatory Requirements (Check):
 List Guidelines on Report Do not list Guidelines on Report
 PIRI
 Tier 1 Res Pot Coarse
 Tier 2 Com N/Pot Fine
 Gas Fuel Lube
 CCME CDWQ
 Industrial NSEQS-Cont Sites
 Commercial HRM 101
 Res/Park Storm Water
 Agricultural Waste Water
 FWAL Sediment Other _____

Drinking Water Sample: Yes No Salt Water Sample: Yes No
 Reg. No.: _____

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments - Site/Sample Info. Sample Containment	Field Filtered/Preserved	Standard Water Analysis	Metals: <input type="checkbox"/> Total <input type="checkbox"/> Diss <input type="checkbox"/> Available	Mercury	<input type="checkbox"/> BOD <input type="checkbox"/> CBOD	pH	<input type="checkbox"/> TSS <input type="checkbox"/> TDS <input type="checkbox"/> VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (P/P) <input type="checkbox"/> low level	Tier 2: TPH/BTEX Fractionation	CCME-CNS TPH/BTEX	VOC	THM	HAA	PAH	PCB	TC+EC <input type="checkbox"/> P/A <input type="checkbox"/> MPN <input type="checkbox"/> MF	<input type="checkbox"/> HPC <input type="checkbox"/> Pseudomonas	Fecal Coliform <input type="checkbox"/> MPN <input type="checkbox"/> MF	Other: Mn T	Other: arsenic T	Hazardous (Y/N)	
before filter	july 29 10:30	H2O	1	manganese and arsenic																									
after filter	july 29 10:20 am	H2O	1	manganese and arsenic																									

Samples Relinquished By (Print Name): Janice MacDonald Date/Time: July 30, 2:30
 Samples Relinquished By (Sign): _____
 Samples Received By (Print Name): _____ Date/Time: _____
 Samples Received By (Sign): _____
 Pink Copy - Client
 Yellow Copy - AGAT
 White Copy - AGAT
 Page of
 No: _____



**CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168**

ATTENTION TO: Janice MacDonald

PROJECT: Aylesford Beach

AGAT WORK ORDER: 21X753874

WATER ANALYSIS REVIEWED BY: Ashley Dussault, Report Writer

DATE REPORTED: Jun 07, 2021

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

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Certificate of Analysis

AGAT WORK ORDER: 21X753874

PROJECT: Aylesford Beach

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - Arsenic

DATE RECEIVED: 2021-05-31

DATE REPORTED: 2021-06-07

Parameter	Unit	G / S	RDL	Arsenic before	Arsenic after
				filter	filter
				Water	Water
				2021-05-31 11:30	2021-05-31 11:30
				2535781	2535782
Total Arsenic	ug/L	10	2	16	<2

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 21X753874

PROJECT: Aylesford Beach

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Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - Manganese

DATE RECEIVED: 2021-05-31

DATE REPORTED: 2021-06-07

Parameter	Unit	G / S	RDL	Manganese	Manganese
				before filter	after filter
SAMPLE DESCRIPTION:				Water	Water
SAMPLE TYPE:				Water	Water
DATE SAMPLED:				2021-05-31 11:30	2021-05-31 11:30
				2535783	2535784
Total Manganese	ug/L	120, 20 AO	2	547	1100

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Guideline Violation

AGAT WORK ORDER: 21X753874

PROJECT: Aylesford Beach

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 Dartmouth, Nova Scotia
 CANADA B3B 1M2
 TEL (902)468-8718
 FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
2535781	Arsenic before filter	NS-CDWQ incl [AO]	Total Metals - Arsenic	Total Arsenic	ug/L	10	16
2535783	Manganese before filter	NS-CDWQ incl [AO]	Total Metals - Manganese	Total Manganese	ug/L	120, 20 AO	547
2535784	Manganese after filter	NS-CDWQ incl [AO]	Total Metals - Manganese	Total Manganese	ug/L	120, 20 AO	1100

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PROJECT: Aylesford Beach
SAMPLING SITE:

AGAT WORK ORDER: 21X753874
ATTENTION TO: Janice MacDonald
SAMPLED BY:

Water Analysis															
RPT Date: Jun 07, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Metals - Arsenic

Total Arsenic	2536395	<2	<2	NA	< 2	101%	80%	120%	97%	80%	120%	103%	70%	130%
---------------	---------	----	----	----	-----	------	-----	------	-----	-----	------	------	-----	------

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Total Metals - Manganese

Total Manganese	2536395	<2	<2	NA	< 2	99%	80%	120%	97%	80%	120%	105%	70%	130%
-----------------	---------	----	----	----	-----	-----	-----	------	-----	-----	------	------	-----	------

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By: 

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Results relate only to the items tested. Results apply to samples as received.



Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 21X753874

PROJECT: Aylesford Beach

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS



Laboratory Use Only

Arrival Condition: Good Poor (see notes)

Arrival Temperature: 7.4, 12.4/0.1

Hold Time: _____

AGAT Job Number: 21x753874

Notes:

Chain of Custody Record

P: 902.468.8718 • F: 902.468.8924

Report Information

Company: Municipality of Kings County *County of Kings*

Contact: Janice MacDonald

Address: 221 Jones Road, New Minas, NS

Phone: 902 690-6168 Fax: _____

Client Project #: Aylesford Beach

AGAT Quotation: _____
Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):

1. Name: Janice MacDoanld

Email: jmacdonald@countyofkings.ca

2. Name: _____

Email: _____

Report Format

Single Sample per page

Multiple Samples per page

Excel Format Included

Export

Regulatory Requirements (Check):

List Guidelines on Report Do not list Guidelines on Report

PIRI

Tier 1 Res Pot Coarse

Tier 2 Com N/Pot Fine

Gas Fuel Lube

CCME

CDWQ

Industrial NSEQS-Cont Sites

Commercial

HRM 101

Res/Park

Storm Water

Agricultural

Waste Water

FWAL

Sediment Other _____

Invoice To

Same Yes / No

Company: Municipality of Kings County

Contact: Teresa Mahoney

Address: accountspayable@countyofkings.ca

Phone: _____ Fax: _____

PO/Credit Card#: 28829

Drinking Water Sample: Yes No Salt Water Sample Yes No

Reg. No.: _____

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments - Site/Sample Info. Sample Containment	Field Filtered/Preserved	Standard Water Analysis	Metals: <input type="checkbox"/> Total <input type="checkbox"/> Diss <input type="checkbox"/> Available	Mercury	<input type="checkbox"/> BOD <input type="checkbox"/> CBOD	pH	<input type="checkbox"/> TSS <input type="checkbox"/> TDS <input type="checkbox"/> VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (PIRI) <input type="checkbox"/> low level	Tier 2: TPH/BTEX Fractionation	CCME-CNS TPH/BTEX	VOC	THM	HAA	PAH	PCB	TC+EC <input type="checkbox"/> P/A <input type="checkbox"/> MPN <input type="checkbox"/> MF	<input type="checkbox"/> HPC <input type="checkbox"/> Pseudomonas	Fecal Coliform <input type="checkbox"/> MPN <input type="checkbox"/> MF	Other: arsenic (t)	Other: Mn (t)	Hazardous (Y/N)	
Arsenic before filter	<u>11:30</u>	ground H2O	1	arsenic																									
arsenic after filter	<u>11</u>	"	1	arsenic																									
Manganese before filter	<u>11</u>	"	1	Mn																									
Manganese after filter	<u>11</u>	"	1	MN																									

Samples Relinquished By (Print Name): <u>John Schofield</u>	Date/Time: <u>may 31</u>	Samples Received By (Print Name): 	Date/Time: _____	Pink Copy - Client Yellow Copy - AGAT White Copy - AGAT	Page <input type="text"/> of <input type="text"/> N ^o : _____
Samples Relinquished By (Sign): 	Date/Time: <u>may 31</u>	Samples Received By (Sign): 	Date/Time: _____		

**CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168**

ATTENTION TO: Janice MacDonald

PROJECT: AD beach filters before and after

AGAT WORK ORDER: 21X781997

WATER ANALYSIS REVIEWED BY: Ashley Dussault, Report Writer

DATE REPORTED: Aug 05, 2021

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This report shall not be reproduced or distributed, in whole or in part, without the prior written consent of AGAT Laboratories.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the information contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - As, Mn

DATE RECEIVED: 2021-07-30

DATE REPORTED: 2021-08-05

Parameter	Unit	SAMPLE DESCRIPTION:		before filter	after filter
		G / S	RDL	2800415	2800416
Total Arsenic	ug/L	10	2	16	<2
Total Manganese	ug/L	120, 20 AO	2	319	196

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Guideline Violation

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
2800415	before filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Arsenic	ug/L	10	16
2800415	before filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Manganese	ug/L	120, 20 AO	319
2800416	after filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Manganese	ug/L	120, 20 AO	196

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
AGAT WORK ORDER: 21X781997
PROJECT: AD beach filters before and after
ATTENTION TO: Janice MacDonald
SAMPLING SITE:
SAMPLED BY:

Water Analysis															
RPT Date: Aug 05, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Metals - As, Mn

Total Arsenic	2801346	4	4	NA	< 2	96%	80%	120%	94%	80%	120%	102%	70%	130%
Total Manganese	2801346	<2	<2	NA	< 2	94%	80%	120%	98%	80%	120%	99%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:




Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

Laboratory Use Only
 Arrival Condition: Good Poor (see notes)
 Arrival Temperature: 9.5, 9.6
 Hold Time: _____
 AGAT Job Number: 21x781997
 Notes: _____

Chain of Custody Record

P: 902.468.8718 • F: 902.468.8924

Report Information
 Company: Mun. co. Kings
 Contact: Janice MacDonald
 Address: _____
 Phone: 9026906168 Fax: _____
 Client Project #: AD beach filters before and after
 AGAT Quotation: _____
 Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):
 1. Name: Janice MacDonald
 Email: jmacdonald@county.kings.ns.ca
 2. Name: _____
 Email: _____

Report Format
 Single Sample per page
 Multiple Samples per page
 Excel Format Included
 Export

Turnaround Time Required (TAT)
 Regular TAT 5 to 7 working days
 Same day 1 day
 2 days 3 days
 Date Required: _____

Invoice To Same Yes / No
 Company: Teresa Mahoney
 Contact: _____
 Address: accountspayable@countyofkings.ca
 Phone: _____ Fax: _____
 PO/Credit Card#: 28848

Regulatory Requirements (Check):
 List Guidelines on Report Do not list Guidelines on Report
 PIRI
 Tier 1 Res Pot Coarse
 Tier 2 Com N/Pot Fine
 Gas Fuel Lube
 CCME CDWQ
 Industrial NSEQS-Cont Sites
 Commercial HRM 101
 Res/Park Storm Water
 Agricultural Waste Water
 FWAL Sediment Other _____

Drinking Water Sample: Yes No Salt Water Sample: Yes No
 Reg. No.: _____

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments - Site/Sample Info. Sample Containment	Field Filtered/Preserved	Standard Water Analysis	Metals: <input type="checkbox"/> Total <input type="checkbox"/> Diss <input type="checkbox"/> Available	Mercury	<input type="checkbox"/> BOD <input type="checkbox"/> CBOD	pH	<input type="checkbox"/> TSS <input type="checkbox"/> TDS <input type="checkbox"/> VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (P/P) <input type="checkbox"/> low level	Tier 2: TPH/BTEX Fractionation	CCME-CNS TPH/BTEX	VOC	THM	HAA	PAH	PCB	TC+EC <input type="checkbox"/> P/A <input type="checkbox"/> MPN <input type="checkbox"/> MF	<input type="checkbox"/> HPC <input type="checkbox"/> Pseudomonas	Fecal Coliform <input type="checkbox"/> MPN <input type="checkbox"/> MF	Other: Mn T	Other: arsenic T	Hazardous (Y/N)	
before filter	july 29 10:30	H2O	1	manganese and arsenic																									
after filter	july 29 10:20 am	H2O	1	manganese and arsenic																									

Samples Relinquished By (Print Name): Janice MacDonald Date/Time: July 30, 2:30
 Samples Relinquished By (Sign): _____
 Samples Received By (Print Name): _____ Date/Time: _____
 Samples Received By (Sign): _____
 Pink Copy - Client
 Yellow Copy - AGAT
 White Copy - AGAT
 Page of
 No: _____

**CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
PO BOX 100, 87 CORNWALLIS STREET
KENTVILLE, NS B4N3W3
(902) 690-6168**

ATTENTION TO: Janice MacDonald

PROJECT: AD beach filters before and after

AGAT WORK ORDER: 21X781997

WATER ANALYSIS REVIEWED BY: Ashley Dussault, Report Writer

DATE REPORTED: Aug 05, 2021

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

***Notes**

Disclaimer:

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- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This report shall not be reproduced or distributed, in whole or in part, without the prior written consent of AGAT Laboratories.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the information contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.



Certificate of Analysis

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

Total Metals - As, Mn

DATE RECEIVED: 2021-07-30

DATE REPORTED: 2021-08-05

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION:	
				before filter	after filter
				SAMPLE TYPE: Water Water	
				DATE SAMPLED: 2021-07-29 2021-07-29	
				10:30 10:20	
				2800415 2800416	
Total Arsenic	ug/L	10	2	16	<2
Total Manganese	ug/L	120, 20 AO	2	319	196

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Canadian Drinking Water Quality - updated 2021-03
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
Analysis performed at AGAT Halifax (unless marked by *)

Certified By:



Guideline Violation

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
<http://www.agatlabs.com>

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

ATTENTION TO: Janice MacDonald

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
2800415	before filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Arsenic	ug/L	10	16
2800415	before filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Manganese	ug/L	120, 20 AO	319
2800416	after filter	NS-CDWQ incl [AO]	Total Metals - As, Mn	Total Manganese	ug/L	120, 20 AO	196

Quality Assurance

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS
AGAT WORK ORDER: 21X781997
PROJECT: AD beach filters before and after
ATTENTION TO: Janice MacDonald
SAMPLING SITE:
SAMPLED BY:

Water Analysis															
RPT Date: Aug 05, 2021			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Metals - As, Mn

Total Arsenic	2801346		4	4	NA	< 2	96%	80%	120%	94%	80%	120%	102%	70%	130%
Total Manganese	2801346		<2	<2	NA	< 2	94%	80%	120%	98%	80%	120%	99%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

Certified By:




Method Summary

CLIENT NAME: MUNICIPALITY OF THE COUNTY OF KINGS

AGAT WORK ORDER: 21X781997

PROJECT: AD beach filters before and after

ATTENTION TO: Janice MacDonald

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Arsenic	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS
Total Manganese	MET121-6104 & MET-121-6105	modified from SM 3125/SM 3030 B/SM 3030 D	ICP-MS

Laboratory Use Only
 Arrival Condition: Good Poor (see notes)
 Arrival Temperature: 9.5, 9.6
 Hold Time: _____
 AGAT Job Number: 21x781997
 Notes: _____

Chain of Custody Record

P: 902.468.8718 • F: 902.468.8924

Report Information
 Company: Mun. co. Kings
 Contact: Janice MacDonald
 Address: _____
 Phone: 9026906168 Fax: _____
 Client Project #: AD beach filters before and after
 AGAT Quotation: _____
 Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):
 1. Name: Janice MacDonald
 Email: jmacdonald@county.kings.ns.ca
 2. Name: _____
 Email: _____

Report Format
 Single Sample per page
 Multiple Samples per page
 Excel Format Included
 Export

Turnaround Time Required (TAT)
 Regular TAT 5 to 7 working days
 Same day 1 day
 2 days 3 days
 Date Required: _____

Invoice To Same Yes / No
 Company: Teresa Mahoney
 Contact: _____
 Address: accountspayable@countyofkings.ca
 Phone: _____ Fax: _____
 PO/Credit Card#: 28848

Regulatory Requirements (Check):
 List Guidelines on Report Do not list Guidelines on Report
 PIRI
 Tier 1 Res Pot Coarse
 Tier 2 Com N/Pot Fine
 Gas Fuel Lube
 CCME CDWQ
 Industrial NSEQS-Cont Sites
 Commercial HRM 101
 Res/Park Storm Water
 Agricultural Waste Water
 FWAL Sediment Other _____

Drinking Water Sample: Yes No Salt Water Sample Yes No
 Reg. No.: _____

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments - Site/Sample Info. Sample Containment	Field Filtered/Preserved	Standard Water Analysis	Metals: <input type="checkbox"/> Total <input type="checkbox"/> Diss <input type="checkbox"/> Available	Mercury	<input type="checkbox"/> BOD <input type="checkbox"/> CBOD	pH	<input type="checkbox"/> TSS <input type="checkbox"/> TDS <input type="checkbox"/> VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (P/P) <input type="checkbox"/> low level	Tier 2: TPH/BTEX Fractionation	CCME-CNS TPH/BTEX	VOC	THM	HAA	PAH	PCB	TC+EC <input type="checkbox"/> P/A <input type="checkbox"/> MPN <input type="checkbox"/> MF	<input type="checkbox"/> HPC <input type="checkbox"/> Pseudomonas	Fecal Coliform <input type="checkbox"/> MPN <input type="checkbox"/> MF	Other: Mn T	Other: arsenic T	Hazardous (Y/N)	
before filter	july 29 10:30	H2O	1	manganese and arsenic																									
after filter	july 29 10:20 am	H2O	1	manganese and arsenic																									

Samples Relinquished By (Print Name): <u>Janice MacDonald</u>	Date/Time: <u>July 31, 2020</u>	Samples Received By (Print Name): <u>[Signature]</u>	Date/Time: _____	Pink Copy - Client Yellow Copy - AGAT White Copy - AGAT	Page <input type="checkbox"/> of <input type="checkbox"/> No: _____
Samples Relinquished By (Sign): <u>[Signature]</u>	Date/Time: _____	Samples Received By (Sign): <u>[Signature]</u>	Date/Time: _____		