

Infrastructure & Operations

REQUEST FOR CONSTRUCTION

Enfield Water Treatment Plant Capacity Upgrade - RFC50573

Release date: April 21, 2023

Tenders will be received up to
3:00:00 pm local time on Friday, May 26, 2023

Contact: Michael Hatfield
Procurement Officer
Municipality of East Hants
Telephone: (902) 883-6232
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EAST HANTS
We live it!

PREFACE

THESE PROJECT DOCUMENTS HAVE BEEN PREPARED FOR USE WITH AND REQUIRE BEING READ IN CONJUNCTION WITH THE **STANDARD SPECIFICATION FOR MUNICIPAL SERVICES** AS PUBLISHED BY THE NOVA SCOTIA ROAD BUILDERS' ASSOCIATION - CONSULTING ENGINEERS OF NOVA SCOTIA **JOINT COMMITTEE ON CONTRACT DOCUMENTS**. COPIES OF THE STANDARD SPECIFICATION ARE AVAILABLE FROM THE JOINT COMMITTEE ON CONTRACT DOCUMENTS, 18 LAURIER STREET, DARTMOUTH, NOVA SCOTIA B3A 2G7; TELEPHONE: (902) 233-9362 OR e-mail at nsmunicipalservices@gmail.com

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ENFIELD WATER TREATMENT PLANT CAPACITY UPGRADE

- Owner -

MUNICIPALITY OF EAST HANTS

Box 230, Suite 170

15 Commerce Court

Elmsdale, NS B2S 3K5

- Engineer –

DILLON CONSULTING LIMITED

137 Chain Lake Drive,

Suite 100

Halifax, NS B3S 1B3

1.1 Tender Submission

- .1 Tenders will be received up to 3:00:00 p.m. local Nova Scotia time on May 26, 2023 by **electronic submission only**, in accordance with the [Electronic Submission Protocol](#) on the East Hants website.
- .2 East Hants will be sole authority on whether a bid is received on time.

1.2 Safety Certification

- .1 Submit with tender a copy of tenderer's current and valid safety accreditation issued by Nova Scotia Workers' Compensation Board or Certificate of Recognition (COR) issued by Construction Safety Nova Scotia.
- .2 Out-of-province tenderers with a current and valid COR from a Canadian Federation of Construction Safety Associations member shall obtain and submit, with tender, a current and valid letter of Good Standing from Construction Safety Nova Scotia.

1.3 Workers' Compensation

- .1 Submit with tender a copy of tenderer's current and valid clearance letter issued by the Workers' Compensation Board of Nova Scotia.
- .2 Out-of-province tenderers shall submit, with tender, a current and valid clearance letter from a government workers' compensation board but must register with the Nova Scotia Workers' Compensation Board prior to being awarded the Contract.

1.4 Tender Opening

- .1 The East Hants' Procurement Officer will open all submissions. There will be no public opening. The intent is to post the results on the Nova Scotia procurement website.

1.5 Accuracy of Referencing

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

1.6 Conditions of Tendering

- .1 Take full cognizance of content of all Contract Documents in preparation of tender.

1.7 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.

1.8 Clarification and Addenda

- .1 Notify Owner by 3:00:00 p.m. local Nova Scotia time, on May 18, 2023, of omissions, errors or ambiguities found in Contract Documents. If Owner considers that correction, explanation or interpretation is necessary, a written addendum will be issued. All addenda will form part of Contract Documents.
- .2 The Owner reserves the right to amend the Contract Documents at any time and for any reason prior to tender closing by way of written addenda.
- .3 Confirm in the tender form that all addenda have been received. Tenderers are solely responsible to obtain and acknowledge the receipt of addenda at time of tender closing.

1.9 Preparation of Tender

- .1 Legibly complete tender form provided with Project Documents. Tender all items and fill in all blanks. Have corrections initialed by person signing tender.

1.10 Taxes

- .1 Include all taxes in prices except Harmonized Sales Tax (HST).

1.11 Tender Security

- .1 Provide tender security in the minimum amount of ten percent (10%) of total price including HST. The security must be submitted with the tender and must be in the form of a digital e-bond produced by a reputable e-bond provider. East Hants reserves the right to verify bonds.

1.12 Contract Security

- .1 Refer to Section 00 60 00 – Supplementary Specifications – GC11.2 – Contract Security - for form and amount of contract security. Refer to Project Documents for amount of contract security. East Hants will only accept digital bonds produced by a reputable e-bond provider and sent via email, in lieu of a paper bond. East Hants reserves the right to verify bonds.

1.13 Insurance

- .1 Refer to Section 00 72 45 - General Conditions, subsection GC 11.1 – INSURANCE, and CCDC 41 for insurance requirements.

1.14 Form of Agreement

- .1 Form of Agreement is attached for information purposes only until the execution of the Contract.

1.15 [Not used]**1.16 Amendment or Withdrawal of Tender**

- .1 New or replacement tenders must be submitted before the Tender Submission deadline.
- .2 Once a tender has been submitted, it cannot be modified. The tenderer must submit a replacement tender and then (or concurrently) contact the Procurement Officer to withdraw the tender which is no longer valid.
- .3 Tenders can only be withdrawn by contacting the Procurement Officer. In order to verify that the person contacting East Hants is authorized to withdraw the tender, the tenderer must provide the unique identifying number they received when the tender was uploaded.
- .4 The request to withdraw a tender should occur prior to the Tender Submission deadline to avoid any Contract A obligations which may arise.

1.17 Offer, Acceptance, Rejection

- .1 All Tenders become the property of the Owner once submitted.
- .2 Late Tenders will be rejected.
- .3 Any Tender that does not include all of the information required in this Tender will be considered incomplete and may be rejected. The Owner will, in their sole discretion, determine if the missing information is material to their ability to evaluate a response; if the Owner believes they have sufficient information to evaluate, it may proceed to do so.
- .4 The Owner may cancel the Tender process at any time, for any reason, in its sole discretion. In the event that the Tender process is cancelled, the Owner will not be obligated to pay any costs, damages, or claims of any type to any Tenderer or potential Contractor or Tenderer.

- .5 Tenderers undertake any expenditure related to the submission of a Tender at their own risk and the Tenderer is solely responsible for all costs associated with preparing and submitting this Tender.
- .6 This Request for Tenders neither expresses nor implies any obligation on the part of the Owner to enter into a contract with any party submitting a response or responses.
- .7 The Owner reserves the right to waive formality, informality or technicality in any Tender. This includes the right to accept a Tender that is not strictly compliant with these instructions.
- .8 The Owner reserves the right to amend this Tender document at any time before the Tender's Closing Date and will issue an addendum in the event of a change.
- .9 The owner reserves the right to negotiate, after the Tender Closing Date, with any Tenderer for services and to finalize service arrangements in the best interests of the Owner.
- .10 In applying this privilege clause, the Owner shall not be bound by trade or custom in dealing with and/or evaluating the Tenders.
- .11 The Owner reserves the right to interpret any and all aspects of this Tender as may be most favourable to the Owner.
- .12 It is the responsibility of the Tenderer to be sure they understand the requirements prior to submitting a Tender and before the deadline for questions has passed. Should a Tenderer find any discrepancies, errors, or omissions in the Tender documents, or if a Tenderer is unsure as to the meaning of anything in this Tender, they are to advise the Owner in writing; the Owner may, in its sole discretion, respond to such written inquiry, to all Tenderers, in an addendum.
- .13 In providing a Tender, the Tenderer warrants that their Tender is in all respects fair and is provided without collusion or fraud. No representative of the company from which a Tender is to be provided may extend entertainment, gifts, gratuities, discounts, or special services, regardless of value, to any employee of the Owner. Tenderers must also advise the Owner, in writing, of any potential conflict of interest that may affect, or appear to affect, the Tender process, including the influence of award.
- .14 Vendors or suppliers who have been disqualified from bidding on contracts with East Hants may not respond to this Tender and any Tender which features a subcontractor who is disqualified from bidding may also be rejected.
- .15 Tenderers are advised that no commitment to purchase Goods or Services shall exist until the successful Tenderer is advised by the owner, in writing, of an award.
- .16 In the event that all compliant tenders exceed the estimated price budgeted to complete the Work, the Owner may, in their sole discretion, utilize one or more methods specified in the *Construction Contract Guidelines*, Nova Scotia, 2017, Section 6.7 "*Effect of Bids Higher than the Estimated Contract Value*", in determining how to proceed.

- .17 The Owner may, in its sole discretion, accept or reject any tender which relies on alternatives or counter proposals which were not approved, in a written addendum, prior to the tender closing. The Owner may consider alternatives or equivalents for approval after award of the Contract. Only alternatives or equivalents that provide a benefit to the Owner, such as, but not limited to, reduced cost or improved schedule, will be considered.
- .18 Where there is a conflict between the unit prices and the extended price in a tender, the Owner will rely on the unit price in evaluating the tender.
- .19 The Owner may accept any Tender or any portion of any Tender that may be considered to be in the best interests of the Owner. The Owner reserves the right to reject any Tenders that, in its sole discretion, are not in the Owner's best interests.
- .20 The Owner does not bind itself to accept any Tender, but may accept any Tender, in whole or in part, or discuss with any Tenderer different or additional terms to those described in the Tender documents or in such Tenderer's Tender. The owner may:
- reject any or all of the Tenders;
 - accept any Tender;
 - if only one Tender is received, choose to accept or reject it;
 - chose not to accept the lowest tender price; or
 - alter the schedule, process, or any other aspect of the Tender, as it may determine in its sole and absolute discretion.
- .21 One or more of the following trade agreements may apply to this solicitation:
- Canada Free Trade Agreement (CFTA)
- .22 Tenderers are advised that the Owner may make public the names and the values of the tenders submitted by any or all Tenderers and intends to publish the name of the successful Tenderer and the total value of any contract entered into with the successful Tenderer.
- .23 Tenderers are advised that the Owner is governed by Nova Scotia's Freedom of Information and Protection of Privacy Act (FOIPOP) and any information submitted to the Owner in response to this Tender may be subject to disclosure under FOIPOP. Tenderers may identify any confidential information in their quotations or any accompanying documentation and are advised to consult with their own legal advisors regarding the appropriate way to identify such information. The Owner will make reasonable efforts to safeguard confidential information, subject to its disclosure requirements under FOIPOP or any disclosure requirements imposed bylaw or by order of a court or tribunal. Tenderers are advised that their Tenders will, as necessary, be disclosed, on a confidential basis, to advisers retained by the Owner to advise or assist with the Tender process, including the evaluation of Tenders. Tenderers are further advised that the Owner may make public the names of any or all Tenderers and intends to publish the name of the successful Tenderer and the total value of any contract entered into with the successful Tenderer. If a Tenderer has any questions about the collection and use of information pursuant to this Tender, questions are to be submitted to the Procurement Officer.
- .23 In submitting a Tender, the Tenderer has accepted the reservation of rights (privilege clause) as set out herein and agrees to be bound by same. Except as expressly and specifically permitted in these Instructions to Tenderers, no Tenderer shall have any claim for

compensation of any kind whatsoever as a result of participating in this Tender and by submitting a Tender each Tenderer shall be deemed to have agreed that it has no claim.

- .24 Submitting a Tender shall be deemed proof that the Tenderer was aware of and understood the requirements, the terms and conditions, and all other provisions of the Tender. The Owner will not be liable for any claims made by a Tenderer that they were uninformed or unaware of the requirements, terms or conditions of this Tender.

1.18 Approvals

- .1 The Work requires the approval of the Nova Scotia Utility and Review Board. Such approval has not been received as of the date of publication of this tender. Award of the Contract is subject to receiving approval from this regulatory agency.
- .2 Award of the Contract is subject to the approval of Municipal Council and/or the Chief Administrative Officer.

1.19 Site Meeting

- .1 Tenderers are encouraged to attend a non-mandatory site meeting, held at the Site at 10:00am on Wednesday, May 3, 2023. Questions may be asked, and description of the Work may be discussed during this meeting, however no minutes of the meeting will be distributed. Modifications made by way of addenda, to tendering requirements or the Contract Documents, shall be binding.

END OF SECTION

1. SALUTATION

- .1 To: Municipality of East Hants
15 Commerce Court
Elmsdale, NS, B2S 3K5
- .2 For: East Hants Regional Water Treatment Facility

- .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 the Tenderer has reviewed all Tender Documents in conjunction with the Municipal Services Specification.

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 prices stated in Subsection 4 hereunder.
- .2 That the total tendered price shall be the sum of the products of the tendered unit prices times the estimated quantities in Subsection 4 hereunder.

- .3 That this Tender is valid for acceptance for thirty (30) days from the time of Tender Closing.
- .4 That measurement and payment for items listed in Subsection 4 hereunder shall be in accordance with corresponding items in Section 01 20 00 Measurement and Payment.
- .5 To provide evidence of ability and experience within seven (7) days of request, including: experience in similar work, work currently under contract, senior supervisory staff available for the project, equipment available for use on project, and financial resources.
- .6 To execute the Form of Agreement and forward same together with the specified contract security and insurance documents to the Owner within 14 days of written notice of award.
- .7 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 Tender Security.
- .8 That the Contract Documents include:
 - .1 Project Documents
 - .1 Specifications
 - .2 CCDC 2 Stipulated Price Contract (2020)
 - .3 Drawings
 - .4 Addenda as issued and as confirmed in subsection 2.4 of this section.

4. CONTRACT PRICE

CONTRACT PRICE	\$ _____
H.S.T. (15% of Total Tendered Price)	\$ _____
TENDERER'S HST REGISTRATION No.	_____
TOTAL ESTIMATED CONTRACT PRICE (incl. all taxes)	\$ _____

5. COMPLETION TIME

- .1 Tenderer agrees to substantially complete the work within ___ weeks following award.
- .2 Tenderer agrees to mobilize and start work no later than within ___ weeks following award.

6. CONSTRUCTION EQUIPMENT

- .1 Tenderer is to provide a complete list of equipment to be used during this project (provide a separate sheet if necessary to identify all equipment). The unit rates provided will be used

in calculating the value of “cost plus” work without any additional mark-up. Rates are subject to review and will not be accepted unless they are consistent with industry standards for rental of similar equipment.

Equipment/Model	Hourly Rate Including Operator

7. PERSONNEL

- .1 Tenderer is to provide a complete list of personnel to be used during this project (provide a separate sheet if necessary to identify all staff). The unit rates provided will be used in calculating the value of “cost plus” work without any additional mark-up. Rates are subject to review and will not be accepted unless they are consistent with industry standards for fees for similar labour.

Personnel	Hourly Rate
Project Manager	
Superintendent	
Foreman	
Electrician	
Pipefitter	
General Labourer	
Other (Specify)	
Other (Specify)	
Other (Specify)	

8. SUBCONTRACTORS

- .1 Tenderer agrees to use the following sub-contractors on the following portions of the work:
(If the work is not being sub-contracted, it should be noted "Our Forces"). Please indicate
Subcontractor name and address in the space below.

Electrical/Controls

Installation of Owner Supplied Equipment

Structural & Miscellaneous Metals

Other

Other

Other

Other

and agrees that such sub-contractors will be adhered to unless otherwise directed or permitted, in writing, by the Engineer. **If this is NOT completed, the bid shall be a non-compliant bid.**

9. SUPPLIERS AND MANUFACTURERS

- .1 Not applicable to this Contract.

10. BONDS

- .1

which is willing to become bound with the Tenderer, as Surety, in the amounts and under the conditions stipulated in the Contract Documents. A "Consent of Surety" is included with this Tender, executed under corporate seal by the above Surety and stating its intention to provide the required Performance, and Labour and Materials, Bonds.

11. SIGNATURE*

DATED THIS _____ DAY OF _____, 2023.

(Seal)

Name of Firm Tendering

Witness

Signature of Signing Office

Name and Title (Printed)

Signature of Signing Officer

Witness

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 OF SECTION

CCDC 2

Stipulated Price Contract

2 0 2 0

Name of Project

Apply a CCDC 2 copyright seal here. The application of the seal demonstrates the intention of the party proposing the use of this document that it be an accurate and unamended form of CCDC 2 – 2020 except to the extent that any alterations, additions or modifications are set forth in supplementary conditions.

CANADIAN CONSTRUCTION DOCUMENTS COMMITTEE
CANADIAN CONSTRUCTION DOCUMENTS COMMITTEE
CANADIAN CONSTRUCTION DOCUMENTS COMMITTEE

CCDC 2 STIPULATED PRICE CONTRACT

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CCDC 2 is the product of a consensus-building process aimed at balancing the interests of all parties on the construction project. It reflects recommended industry practices. The CCDC and its constituent member organizations do not accept any responsibility or liability for loss or damage which may be suffered as a result of the use or interpretation of CCDC 2.

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AGREEMENT BETWEEN OWNER AND CONTRACTOR

For use when a stipulated price is the basis of payment.

This Agreement made on _____ day of _____ in the year _____.
by and between the parties

hereinafter called the "Owner"

and

hereinafter called the "Contractor"

The Owner and the Contractor agree as follows:

ARTICLE A-1 THE WORK

The Contractor shall:

1.1 perform the *Work* required by the *Contract Documents* for (insert below the description or title of the Work)

located at (insert below the Place of the Work)

for which the Agreement has been signed by the parties, and for which (insert below the name of the Consultant)

is acting as and is hereinafter called the "Consultant" and

1.2 do and fulfill everything indicated by the *Contract Documents*, and

1.3 commence the *Work* by the _____ day of _____ in the year _____ and, subject to adjustment in *Contract Time* as provided for in the *Contract Documents*, attain *Ready-for-Takeover*, by the _____ day of _____ in the year _____.

ARTICLE A-2 AGREEMENTS AND AMENDMENTS

2.1 The *Contract* supersedes all prior negotiations, representations or agreements, either written or oral, relating in any manner to the *Work*, including the bid documents that are not expressly listed in Article A-3 of the Agreement – CONTRACT DOCUMENTS.

2.2 The *Contract* may be amended only as provided in the *Contract Documents*.

ARTICLE A-3 CONTRACT DOCUMENTS

3.1 The following are the *Contract Documents* referred to in Article A-1 of the Agreement – THE WORK:

- Agreement between *Owner* and *Contractor*
- Definitions
- General Conditions

*

** (Insert here, attaching additional pages if required, a list identifying all other Contract Documents e.g. supplementary conditions; Division 01 of the Specifications – GENERAL REQUIREMENTS; Project information that the Contractor may rely upon; technical Specifications, giving a list of contents with section numbers and titles, number of pages and date; material finishing schedules; Drawings, giving drawing number, title, date, revision date or mark; addenda, giving title, number, date; time schedule)*

ARTICLE A-4 CONTRACT PRICE

4.1 The *Contract Price*, which excludes *Value Added Taxes*, is:

/100 dollars \$

4.2 *Value Added Taxes* (of _____ %) payable by the *Owner* to the *Contractor* are:

/100 dollars \$

4.3 Total amount payable by the *Owner* to the *Contractor* for the *Work* is:

/100 dollars \$

4.4 These amounts shall be subject to adjustments as provided in the *Contract Documents*.

4.5 All amounts are in Canadian funds.

ARTICLE A-5 PAYMENT

5.1 Subject to the provisions of the *Contract Documents* and *Payment Legislation*, and in accordance with legislation and statutory regulations respecting holdback percentages, the *Owner* shall:

- .1 make progress payments to the *Contractor* on account of the *Contract Price* when due in the amount certified by the *Consultant* unless otherwise prescribed by *Payment Legislation* together with such *Value Added Taxes* as may be applicable to such payments,
- .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.

5.2 Interest

- .1 Should either party fail to make payments as they become due under the terms of the *Contract* or in an award by adjudication, arbitration or court, interest at the following rates on such unpaid amounts shall also become due and payable until payment:
 - (1) 2% per annum above the prime rate for the first 60 days.
 - (2) 4% per annum above the prime rate after the first 60 days.

Such interest shall be compounded on a monthly basis. The prime rate shall be the rate of interest quoted by
(Insert name of chartered lending institution whose prime rate is to be used)

for prime business loans as it may change from time to time.

- .2 Interest shall apply at the rate and in the manner prescribed by paragraph 5.2.1 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 the date it is paid.

ARTICLE A-6 RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING

6.1 *Notices in Writing* will be addressed to the recipient at the address set out below.

6.2 The delivery of a *Notice in Writing* will be by hand, by courier, by prepaid first class mail, or by other form of electronic communication during the transmission of which no indication of failure of receipt is communicated to the sender.

6.3 A *Notice in Writing* delivered by one party in accordance with this *Contract* will be deemed to have been received by the other party on the date of delivery if delivered by hand or courier, or if sent by mail it will be deemed to have been received five calendar days after the date on which it was mailed, provided that if either such day is not a *Working Day*, then the *Notice in Writing* will be deemed to have been received on the *Working Day* next following such day.

6.4 A *Notice in Writing* sent by any form of electronic communication will be deemed to have been received on the date of its transmission provided that if such day is not a *Working Day* or if it is received after the end of normal business hours on the date of its transmission at the place of receipt, then it will be deemed to have been received at the opening of business at the place of receipt on the first *Working Day* next following the transmission thereof.

6.5 An address for a party may be changed by *Notice in Writing* to the other party setting out the new address in accordance with this Article.

Owner

*name of Owner**

address

email address

Contractor

*name of Contractor**

address

email address

Consultant

*name of Consultant**

address

email address

** If it is intended that a specific individual must receive the notice, that individual's name shall be indicated.*

ARTICLE A-7 LANGUAGE OF THE CONTRACT

- 7.1 When the *Contract Documents* are prepared in both the English and French languages, it is agreed that in the event of any apparent discrepancy between the English and French versions, the English / French # language shall prevail.
Complete this statement by striking out inapplicable term.
- 7.2 This Agreement is drawn in English at the request of the parties hereto. La présente convention est rédigée en anglais à la demande des parties.

ARTICLE A-8 SUCCESSION

- 8.1 The *Contract* shall enure to the benefit of and be binding upon the parties hereto, their respective heirs, legal representatives, successors, and assigns.

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

SIGNED AND DELIVERED
in the presence of:

WITNESS

OWNER

name of Owner

signature

signature

name of person signing

name and title of person signing

WITNESS

CONTRACTOR

name of Contractor

signature

signature

name of person signing

name and title of person signing

- N.B. Where legal jurisdiction, local practice or Owner or Contractor requirement 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.*

DEFINITIONS

The following Definitions shall apply to all *Contract Documents*.

Change Directive

A *Change Directive* is a written instruction prepared by the *Consultant* and signed by the *Owner* directing the *Contractor* to proceed with a change in the *Work* within the general scope of the *Contract Documents* prior to the *Owner* and the *Contractor* agreeing upon adjustments in the *Contract Price* and the *Contract Time*.

Change Order

A *Change Order* is a written amendment to the *Contract* prepared by the *Consultant* and signed by the *Owner* and the *Contractor* stating their agreement upon:

- a change in the *Work*;
- the method of adjustment or the amount of the adjustment in the *Contract Price*, if any; and
- the extent of the adjustment in the *Contract Time*, if any.

Construction Equipment

Construction Equipment means all machinery and equipment, either operated or not operated, that is required for preparing, fabricating, conveying, erecting, or otherwise performing the *Work* but is not incorporated into the *Work*.

Consultant

The *Consultant* is the person or entity engaged by the *Owner* and identified as such in the Agreement. The *Consultant* is the Architect, the Engineer or entity licensed to practise in the province or territory of the *Place of the Work*.

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.

Contract Documents

The *Contract Documents* consist of those documents listed in Article A-3 of the Agreement – CONTRACT DOCUMENTS and amendments agreed upon between the parties.

Contract Price

The *Contract Price* is the amount stipulated in Article A-4 of the Agreement – CONTRACT PRICE.

Contract Time

The *Contract Time* is the time from commencement of the *Work* to the date of *Ready-for-Takeover* as stipulated in paragraph 1.3 of Article A-1 of the Agreement – THE WORK.

Contractor

The *Contractor* is the person or entity identified as such in the Agreement.

Drawings

The *Drawings* are the graphic and pictorial portions of the *Contract Documents*, wherever located and whenever issued, showing the design, location and dimensions of the *Work*, generally including plans, elevations, sections, details, and diagrams.

Notice in Writing

A *Notice in Writing*, where identified in the *Contract Documents*, is a written communication between the parties or between them and the *Consultant* that is transmitted in accordance with the provisions of Article A-6 of the Agreement – RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING.

Owner

The *Owner* is the person or entity identified as such in the Agreement.

Other Contractor

Other Contractor means a contractor, other than the *Contractor* or a *Subcontractor*, engaged by the *Owner* for the *Project*.

Payment Legislation

Payment Legislation means such legislation in effect at the *Place of the Work* which governs payment under construction contracts.

Place of the Work

The *Place of the Work* is the designated site or location of the *Work* identified in the *Contract Documents*.

Product

Product or Products means material, machinery, equipment, and fixtures forming part of the *Work*, but does not include *Construction Equipment*.

Project

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

Ready-for-Takeover

Ready-for-Takeover shall have been attained when the conditions set out in paragraph 12.1.1 of GC 12.1 – READY-FOR-TAKEOVER have been met, as verified by the *Consultant* pursuant to paragraph 12.1.4.2 of GC 12.1 – READY-FOR-TAKEOVER.

Shop Drawings

Shop Drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures, *Product* data, and other data which the *Contractor* provides to illustrate details of portions of the *Work*.

Specifications

The *Specifications* are that portion of the *Contract Documents*, wherever located and whenever issued, consisting of the written requirements and standards for *Products*, systems, workmanship, quality, and the services necessary for the performance of the *Work*.

Subcontractor

A *Subcontractor* is a person or entity having a direct contract with the *Contractor* to perform a part or parts of the *Work* at the *Place of the Work*.

Substantial Performance of the Work

Substantial Performance of the Work is as defined in the lien legislation applicable to the *Place of the Work*.

Supplemental Instruction

A *Supplemental Instruction* is an instruction, not involving adjustment in the *Contract Price* or *Contract Time*, in the form of *Specifications*, *Drawings*, schedules, samples, models, or written instructions, consistent with the intent of the *Contract Documents*. It is to be issued by the *Consultant* to supplement the *Contract Documents* as required for the performance of the *Work*.

Supplier

A *Supplier* is a person or entity having a direct contract with the *Contractor* to supply *Products*.

Temporary Work

Temporary Work means temporary supports, structures, facilities, services, and other temporary items, excluding *Construction Equipment*, required for the execution of the *Work* but not incorporated into the *Work*.

Value Added Taxes

Value Added Taxes means such sum as shall be levied upon the *Contract Price* by the Federal or any Provincial or Territorial Government and is computed as a percentage of the *Contract Price* and includes the Goods and Services Tax, the Quebec Sales Tax, the Harmonized Sales Tax, and any similar tax, the collection and payment of which have been imposed on the *Contractor* by tax legislation.

Work

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

Working Day

Working Day means a day other than a Saturday, Sunday, statutory holiday, or statutory vacation day that is observed by the construction industry in the area of the *Place of the Work*.

GENERAL CONDITIONS

PART 1 GENERAL PROVISIONS

GC 1.1 CONTRACT DOCUMENTS

- 1.1.1 The intent of the *Contract Documents* is to include the labour, *Products* and services necessary for the performance of the *Work* by the *Contractor* in accordance with these documents. It is not intended, however, that the *Contractor* shall supply products or perform work not consistent with, not covered by, or not properly inferable from the *Contract Documents*.
- 1.1.2 The *Contract Documents* are complementary, and what is required by one shall be as binding as if required by all. Performance by the *Contractor* shall be required only to the extent consistent with the *Contract Documents*.
- 1.1.3 The *Contractor* shall review the *Contract Documents* for the purpose of facilitating co-ordination and execution of the *Work* by the *Contractor*.
- 1.1.4 The *Contractor* is not responsible for errors, omissions or inconsistencies in the *Contract Documents*. If there are perceived errors, omissions or inconsistencies discovered by or made known to the *Contractor*, the *Contractor* shall promptly report to the *Consultant* and shall not proceed with the work affected until the *Contractor* has received corrected or additional information from the *Consultant*.
- 1.1.5 If there is a conflict within the *Contract Documents*:
- .1 the order of priority of documents, from highest to lowest, shall be
 - the Agreement between *Owner* and *Contractor*,
 - the Definitions,
 - Supplementary Conditions,
 - the General Conditions,
 - Division 01 of the *Specifications*,
 - technical *Specifications*,
 - material and finishing schedules,
 - the *Drawings*.
 - .2 *Drawings* of larger scale shall govern over those of smaller scale of the same date.
 - .3 dimensions shown on *Drawings* shall govern over dimensions scaled from *Drawings*.
 - .4 amended or later dated documents shall govern over earlier documents of the same type.
 - .5 noted materials and annotations shall govern over graphic indications.
- 1.1.6 Nothing contained in the *Contract Documents* shall create any contractual relationship between:
- .1 the *Owner* and a *Subcontractor*, a *Supplier*, or their agent, employee, or other person performing any portion of the *Work*.
 - .2 the *Consultant* and the *Contractor*, a *Subcontractor*, a *Supplier*, or their agent, employee, or other person performing any portion of the *Work*.
- 1.1.7 Words and abbreviations which have well known technical or trade meanings are used in the *Contract Documents* in accordance with such recognized meanings.
- 1.1.8 References in the *Contract Documents* to the singular shall be considered to include the plural as the context requires.
- 1.1.9 Neither the organization of the *Specifications* nor the arrangement of *Drawings* shall control the *Contractor* in dividing the work among *Subcontractors* and *Suppliers*.
- 1.1.10 *Specifications*, *Drawings*, models, and copies thereof furnished by the *Consultant* are and shall remain the *Consultant's* property, with the exception of the signed *Contract* sets, which shall belong to each party to the *Contract*. All *Specifications*, *Drawings* and models furnished by the *Consultant* are to be used only with respect to the *Work* and are not to be used on other work. These *Specifications*, *Drawings* and models are not to be copied or altered in any manner without the written authorization of the *Consultant*.
- 1.1.11 Physical models furnished by the *Contractor* at the *Owner's* expense are the property of the *Owner*.

GC 1.2 LAW OF THE CONTRACT

- 1.2.1 The law of the *Place of the Work* shall govern the interpretation of the *Contract*.

GC 1.3 RIGHTS AND REMEDIES

- 1.3.1 Except as expressly provided in the *Contract Documents*, the duties and obligations imposed by the *Contract Documents* and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights, and remedies otherwise imposed or available by law.

- 1.3.2 No action or failure to act by the *Owner*, the *Consultant* or the *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.

GC 1.4 ASSIGNMENT

- 1.4.1 Neither party to the *Contract* shall assign the *Contract* or a portion thereof without the written consent of the other, which consent shall not be unreasonably withheld.

PART 2 ADMINISTRATION OF THE CONTRACT

GC 2.1 AUTHORITY OF THE CONSULTANT

- 2.1.1 The *Consultant* will have authority to act on behalf of the *Owner* only to the extent provided in the *Contract Documents*, unless otherwise modified by written agreement as provided in paragraph 2.1.2.
- 2.1.2 The duties, responsibilities and limitations of authority of the *Consultant* as set forth in the *Contract Documents* shall be modified or extended only with the written consent of the *Owner*, the *Consultant* and the *Contractor*.

GC 2.2 ROLE OF THE CONSULTANT

- 2.2.1 The *Consultant* will provide administration of the *Contract* as described in the *Contract Documents*.
- 2.2.2 The *Consultant* will visit the *Place of the Work* at intervals appropriate to the progress of construction to become familiar with the progress and quality of the work and to determine if the *Work* is proceeding in general conformity with the *Contract Documents*.
- 2.2.3 If the *Owner* and the *Consultant* agree, the *Consultant* will provide at the *Place of the Work*, one or more project representatives to assist in carrying out the *Consultant's* responsibilities. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in writing to the *Contractor*.
- 2.2.4 Based on the *Consultant's* observations and evaluation of the *Contractor's* applications for payment, the *Consultant* will determine the amounts owing to the *Contractor* under the *Contract* and will issue certificates for payment as provided in Article A-5 of the Agreement – PAYMENT, GC 5.3 – PAYMENT and GC 5.5 – FINAL PAYMENT.
- 2.2.5 The *Consultant* will not be responsible for and will not have control, charge or supervision of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs required in connection with the *Work* in accordance with the applicable construction safety legislation, other regulations or general construction practice. The *Consultant* will not be responsible for the *Contractor's* failure to perform the *Work* in accordance with the *Contract Documents*.
- 2.2.6 Except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER, the *Consultant* will be, in the first instance, the interpreter of the requirements of the *Contract Documents*.
- 2.2.7 Matters in question relating to the performance of the *Work* or the interpretation of the *Contract Documents* shall be initially referred in writing to the *Consultant* by the party raising the question for interpretations and findings and copied to the other party.
- 2.2.8 Interpretations and findings of the *Consultant* shall be consistent with the intent of the *Contract Documents*. In making such interpretations and findings the *Consultant* will not show partiality to either the *Owner* or the *Contractor*.
- 2.2.9 The *Consultant's* interpretations and findings will be given in writing to the parties within a reasonable time.
- 2.2.10 With respect to claims for a change in *Contract Price*, the *Consultant* will make findings as set out in GC 6.6 – CLAIMS FOR A CHANGE IN CONTRACT PRICE.
- 2.2.11 The *Consultant* will have authority to reject work which in the *Consultant's* opinion does not conform to the requirements of the *Contract Documents*. Whenever the *Consultant* considers it necessary or advisable, the *Consultant* will have authority to require inspection or testing of work, whether or not such work is fabricated, installed or completed. However, neither the authority of the *Consultant* to act nor any decision either to exercise or not to exercise such authority shall give rise to any duty or responsibility of the *Consultant* to the *Contractor*, *Subcontractors*, *Suppliers*, or their agents, employees, or other persons performing any of the *Work*.
- 2.2.12 During the progress of the *Work* the *Consultant* will furnish *Supplemental Instructions* to the *Contractor* with reasonable promptness or in accordance with a schedule for such instructions agreed to by the *Consultant* and the *Contractor*.
- 2.2.13 The *Consultant* will review and take appropriate action upon *Shop Drawings*, samples and other submittals by the *Contractor*, in accordance with the *Contract Documents*.

- 2.2.14 The *Consultant* will prepare *Change Orders* and *Change Directives* as provided in GC 6.2 – CHANGE ORDER and GC 6.3 – CHANGE DIRECTIVE.
- 2.2.15 The *Consultant* will conduct reviews of the *Work* to determine the date of *Substantial Performance of the Work* and verify that *Ready-for-Takeover* has been attained.
- 2.2.16 All certificates issued by the *Consultant* will be to the best of the *Consultant's* knowledge, information and belief. By issuing any certificate, the *Consultant* does not guarantee the *Work* is correct or complete.
- 2.2.17 The *Consultant* will receive and review written warranties and related documents required by the *Contract* and provided by the *Contractor* and will forward such warranties and documents to the *Owner* for the *Owner's* acceptance.
- 2.2.18 If the *Consultant's* engagement is terminated, the *Owner* shall immediately engage a *Consultant* against whom the *Contractor* makes no reasonable objection and whose duties and responsibilities under the *Contract Documents* will be that of the former *Consultant*.

GC 2.3 REVIEW AND INSPECTION OF THE WORK

- 2.3.1 The *Owner* and the *Consultant* shall have access to the *Work* at all times. The *Contractor* shall provide sufficient, safe and proper facilities at all times for the review of the *Work* by the *Consultant* and the inspection of the *Work* by authorized agencies. If parts of the *Work* are in preparation at locations other than the *Place of the Work*, the *Owner* and the *Consultant* shall be given access to such work whenever it is in progress.
- 2.3.2 If work is designated for tests, inspections or approvals in the *Contract Documents*, by the *Consultant's* instructions, or by the laws or ordinances of the *Place of the Work*, the *Contractor* shall give the *Consultant* reasonable notification of when the work will be ready for review and inspection. The *Contractor* shall arrange for and shall give the *Consultant* reasonable notification of the date and time of inspections by other authorities.
- 2.3.3 The *Contractor* shall furnish promptly to the *Consultant* two copies of certificates and inspection reports relating to the *Work*.
- 2.3.4 If the *Contractor* covers, or permits to be covered, work that has been designated for special tests, inspections or approvals before such special tests, inspections or approvals are made, given or completed, the *Contractor* shall, if so directed, uncover such work, have the inspections or tests satisfactorily completed, and make good covering work at the *Contractor's* expense.
- 2.3.5 The *Consultant* may order any portion or portions of the *Work* to be examined to confirm that such work is in accordance with the requirements of the *Contract Documents*. If the work is not in accordance with the requirements of the *Contract Documents*, the *Contractor* shall correct the work and pay the cost of examination and correction. If the work is in accordance with the requirements of the *Contract Documents*, the *Owner* shall pay the cost of examination and restoration.
- 2.3.6 The *Contractor* shall pay the cost of making any test or inspection, including the cost of samples required for such test or inspection, if such test or inspection is designated in the *Contract Documents* to be performed by the *Contractor* or is required by the laws or ordinances applicable to the *Place of the Work*.
- 2.3.7 The *Contractor* shall pay the cost of samples required for any test or inspection to be performed by others if such test or inspection is designated in the *Contract Documents*.

GC 2.4 DEFECTIVE WORK

- 2.4.1 The *Contractor* shall promptly correct defective work that has been rejected by the *Consultant* as failing to conform to the *Contract Documents* whether or not the defective work was incorporated in the *Work* or the defect is the result of poor workmanship, use of defective products or damage through carelessness or other act or omission of the *Contractor*.
- 2.4.2 The *Contractor* shall make good promptly *Other Contractors' work* destroyed or damaged by such corrections at the *Contractor's* expense.
- 2.4.3 If in the opinion of the *Consultant* it is not expedient to correct defective work or work not performed as provided in the *Contract Documents*, the *Owner* may deduct from the amount otherwise due to the *Contractor* the difference in value between the work as performed and that called for by the *Contract Documents*. If the *Owner* and the *Contractor* do not agree on the difference in value, they shall refer the matter to the *Consultant* for a finding.

PART 3 EXECUTION OF THE WORK

GC 3.1 CONTROL OF THE WORK

- 3.1.1 The *Contractor* shall have total control of the *Work* and shall effectively direct and supervise the *Work* so as to ensure conformity with the *Contract Documents*.

- 3.1.2 The *Contractor* shall be solely responsible for construction means, methods, techniques, sequences, and procedures and for co-ordinating the various parts of the *Work* under the *Contract*.

GC 3.2 CONSTRUCTION BY THE OWNER OR OTHER CONTRACTORS

- 3.2.1 The *Owner* reserves the right to award separate contracts in connection with other parts of the *Project* to *Other Contractors* and to perform work with own forces.
- 3.2.2 When separate contracts are awarded for other parts of the *Project*, or when work is performed by the *Owner*'s own forces, the *Owner* shall:
- .1 provide for the co-ordination of the activities and work of *Other Contractors* and the *Owner*'s own forces with the *Work* of the *Contract*;
 - .2 enter into separate contracts with *Other Contractors* under conditions of contract which are compatible with the conditions of the *Contract*;
 - .3 ensure that insurance coverage is provided to the same requirements as are called for in GC 11.1 – INSURANCE and co-ordinate such insurance with the insurance coverage of the *Contractor* as it affects the *Work*; and
 - .4 take all reasonable precautions to avoid labour disputes or other disputes on the *Project* arising from the work of *Other Contractors* or the *Owner*'s own forces.
- 3.2.3 When separate contracts are awarded for other parts of the *Project*, or when work is performed by the *Owner*'s own forces, the *Contractor* shall:
- .1 afford the *Owner* and *Other Contractors* reasonable opportunity to store their products and execute their work;
 - .2 co-ordinate and schedule the *Work* with the work of *Other Contractors* or the *Owner*'s own forces that are identified in the *Contract Documents*;
 - .3 participate with *Other Contractors* and the *Owner* in reviewing their construction schedules when directed to do so; and
 - .4 report promptly to the *Consultant* in writing any apparent deficiencies in the work of *Other Contractors* or of the *Owner*'s own forces, where such work affects the proper execution of any portion of the *Work*, prior to proceeding with that portion of the *Work*.
- 3.2.4 Where a change in the *Work* is required as a result of the co-ordination and integration of the work of *Other Contractors* or *Owner*'s own forces with the *Work*, the changes shall be authorized and valued as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 – CHANGE ORDER and GC 6.3 – CHANGE DIRECTIVE.
- 3.2.5 Disputes and other matters in question between the *Contractor* and *Other Contractors* shall be dealt with as provided in Part 8 of the General Conditions – DISPUTE RESOLUTION provided the *Other Contractors* have reciprocal obligations. The *Contractor* shall be deemed to have consented to arbitration of any dispute with any *Other Contractor* whose contract with the *Owner* contains a similar agreement to arbitrate. In the absence of *Other Contractors* having reciprocal obligations, disputes and other matters in question initiated by the *Contractor* against *Other Contractors* will be considered disputes and other matters in question between the *Contractor* and the *Owner*.
- 3.2.6 Should the *Owner*, the *Consultant*, *Other Contractors*, or anyone employed by them directly or indirectly be responsible for ill-timed work necessitating cutting or remedial work to be performed, the cost of such cutting or remedial work shall be valued as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 – CHANGE ORDER and GC 6.3 – CHANGE DIRECTIVE.

GC 3.3 TEMPORARY WORK

- 3.3.1 The *Contractor* shall have the sole responsibility for the design, erection, operation, maintenance, and removal of *Temporary Work* unless otherwise specified in the *Contract Documents*.
- 3.3.2 The *Contractor* shall engage and pay for registered professional engineering personnel skilled in the appropriate disciplines to perform those functions referred to in paragraph 3.3.1 where required by law or by the *Contract Documents* and in all cases where such *Temporary Work* is of such a nature that professional engineering skill is required to produce safe and satisfactory results.
- 3.3.3 Notwithstanding the provisions of GC 3.1 – CONTROL OF THE WORK, paragraphs 3.3.1 and 3.3.2 or provisions to the contrary elsewhere in the *Contract Documents* where such *Contract Documents* include designs for *Temporary Work* or specify a method of construction in whole or in part, such designs or methods of construction shall be considered to be part of the design of the *Work* and the *Contractor* shall not be held responsible for that part of the design or the specified method of construction. The *Contractor* shall, however, be responsible for the execution of such design or specified method of construction in the same manner as for the execution of the *Work*.

GC 3.4 CONSTRUCTION SCHEDULE

3.4.1 The *Contractor* shall:

- .1 prepare and submit to the *Owner* and the *Consultant* prior to the first application for payment, a construction schedule that indicates the timing of the major activities of the *Work* and provides sufficient detail of the critical events and their inter-relationship to demonstrate the *Work* will be performed in conformity with the *Contract Time*;
- .2 monitor the progress of the *Work* relative to the construction schedule and update the schedule on a monthly basis or as stipulated by the *Contract Documents*; and
- .3 advise the *Consultant* of any revisions required to the schedule as the result of extensions of the *Contract Time* as provided in Part 6 of the General Conditions – CHANGES IN THE WORK.

GC 3.5 SUPERVISION

3.5.1 The *Contractor* shall provide all necessary supervision and appoint a competent representative who shall be in attendance at the *Place of the Work* while the *Work* is being performed. The appointed representative shall not be changed except for valid reason.

3.5.2 The appointed representative shall represent the *Contractor* at the *Place of the Work*. Information and instructions provided by the *Consultant* to the *Contractor*'s appointed representative shall be deemed to have been received by the *Contractor*, except with respect to Article A-6 of the Agreement – RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING.

GC 3.6 SUBCONTRACTORS AND SUPPLIERS

3.6.1 The *Contractor* shall preserve and protect the rights of the parties under the *Contract* with respect to work to be performed under subcontract, and shall:

- .1 enter into contracts or written agreements with *Subcontractors* and *Suppliers* to require them to perform their work as provided in the *Contract Documents*;
- .2 incorporate the applicable terms and conditions of the *Contract Documents* into all contracts or written agreements with *Subcontractors* and *Suppliers*; and
- .3 be as fully responsible to the *Owner* for acts and omissions of *Subcontractors*, *Suppliers* and any persons directly or indirectly employed by them as for acts and omissions of persons directly employed by the *Contractor*.

3.6.2 The *Contractor* shall indicate in writing, if requested by the *Owner*, those *Subcontractors* or *Suppliers* whose bids have been received by the *Contractor* which the *Contractor* would be prepared to accept for the performance of a portion of the *Work*. Should the *Owner* not object before signing the *Contract*, the *Contractor* shall employ those *Subcontractors* or *Suppliers* so identified by the *Contractor* in writing for the performance of that portion of the *Work* to which their bid applies.

3.6.3 The *Owner* may, for reasonable cause, at any time before the *Owner* has signed the *Contract*, object to the use of a proposed *Subcontractor* or *Supplier* and require the *Contractor* to employ one of the other subcontract bidders.

3.6.4 If the *Owner* requires the *Contractor* to change a proposed *Subcontractor* or *Supplier*, the *Contract Price* and *Contract Time* shall be adjusted by the difference occasioned by such required change.

3.6.5 The *Contractor* shall not be required to employ as a *Subcontractor* or *Supplier*, a person or firm to which the *Contractor* may reasonably object.

3.6.6 The *Owner*, through the *Consultant*, may provide to a *Subcontractor* or *Supplier* information as to the percentage of the *Subcontractor*'s or *Supplier*'s work which has been certified for payment.

GC 3.7 LABOUR AND PRODUCTS

3.7.1 The *Contractor* shall maintain good order and discipline among the *Contractor*'s employees engaged on the *Work* and employ only workers that are skilled in the tasks assigned.

3.7.2 The *Contractor* shall provide and pay for labour, *Products*, tools, *Construction Equipment*, water, heat, light, power, transportation, and other facilities and services necessary for the performance of the *Work* in accordance with the *Contract*.

3.7.3 Unless otherwise specified in the *Contract Documents*, *Products* provided shall be new. *Products* which are not specified shall be of a quality consistent with those specified and their use acceptable to the *Consultant*.

GC 3.8 SHOP DRAWINGS

3.8.1 The *Contractor* shall provide *Shop Drawings* as required in the *Contract Documents*.

3.8.2 The *Contractor* shall provide *Shop Drawings* to the *Consultant* to review in accordance with an agreed schedule, or in the absence of an agreed schedule, in orderly sequence and sufficiently in advance so as to cause no delay in the *Work* or in the work of *Other Contractors* or the *Owner*'s own forces.

- 3.8.3 The *Contractor* shall review all *Shop Drawings* before providing them to the *Consultant*. The *Contractor* represents by this review that:
- .1 the *Contractor* has determined and verified all applicable field measurements, field construction conditions, *Product* requirements, catalogue numbers and similar data, or will do so, and
 - .2 the *Contractor* has checked and co-ordinated each *Shop Drawing* with the requirements of the *Work* and of the *Contract Documents*.
- 3.8.4 The *Consultant's* review is for conformity to the design concept and for general arrangement only.
- 3.8.5 At the time of providing *Shop Drawings*, the *Contractor* shall expressly advise the *Consultant* in writing of any deviations in a *Shop Drawing* from the requirements of the *Contract Documents*. The *Consultant* shall indicate the acceptance or rejection of such deviation expressly in writing.
- 3.8.6 The *Consultant's* review shall not relieve the *Contractor* of responsibility for errors or omissions in the *Shop Drawings* or for meeting all requirements of the *Contract Documents*.
- 3.8.7 The *Consultant* will review and return *Shop Drawings* in accordance with the schedule agreed upon, or, in the absence of such schedule, with reasonable promptness so as to cause no delay in the performance of the *Work*.

PART 4 ALLOWANCES

GC 4.1 CASH ALLOWANCES

- 4.1.1 The *Contract Price* includes the cash allowances, if any, stated in the *Contract Documents*. The scope of the *Work* or costs included in such cash allowances shall be as described in the *Contract Documents*.
- 4.1.2 The *Contract Price*, and not the cash allowances, includes the *Contractor's* overhead and profit in connection with such cash allowances.
- 4.1.3 Expenditures under cash allowances shall be authorized by the *Owner* through the *Consultant*.
- 4.1.4 Where the actual cost of the *Work* under any cash allowance exceeds the amount of the allowance, any unexpended amounts from other cash allowances shall be reallocated, at the *Consultant's* direction, to cover the shortfall, and, in that case, there shall be no additional amount added to the *Contract Price* for overhead and profit. Only where the actual cost of the *Work* under all cash allowances exceeds the total amount of all cash allowances shall the *Contractor* be compensated for the excess incurred and substantiated, plus an amount for overhead and profit on the excess only, as set out in the *Contract Documents*.
- 4.1.5 The net amount of any unexpended cash allowances, after providing for any reallocations as contemplated in paragraph 4.1.4, shall be deducted from the *Contract Price* by *Change Order* without any adjustment for the *Contractor's* overhead and profit on such amount.
- 4.1.6 The value of the *Work* performed under a cash allowance is eligible to be included in progress payments.
- 4.1.7 The *Contractor* and the *Consultant* shall jointly prepare a schedule that shows when the items called for under cash allowances must be ordered to avoid delaying the progress of the *Work*.

GC 4.2 CONTINGENCY ALLOWANCE

- 4.2.1 The *Contract Price* includes the contingency allowance, if any, stated in the *Contract Documents*.
- 4.2.2 The contingency allowance includes the *Contractor's* overhead and profit in connection with such contingency allowance.
- 4.2.3 Expenditures under the contingency allowance shall be authorized and valued as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 – CHANGE ORDER and GC 6.3 – CHANGE DIRECTIVE.
- 4.2.4 The *Contract Price* shall be adjusted by *Change Order* to provide for any difference between the expenditures authorized under paragraph 4.2.3 and the contingency allowance.

PART 5 PAYMENT

GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

- 5.1.1 The *Owner* shall, at the request of the *Contractor*, before signing the *Contract*, and promptly from time to time thereafter, furnish to the *Contractor* reasonable evidence that financial arrangements have been made to fulfill the *Owner's* obligations under the *Contract*.
- 5.1.2 The *Owner* shall give the *Contractor Notice in Writing* of any material change in the *Owner's* financial arrangements to fulfil the *Owner's* obligations under the *Contract* during the performance of the *Contract*.

GC 5.2 APPLICATIONS FOR PAYMENT

- 5.2.1 Applications for payment on account as provided in Article A-5 of the Agreement – PAYMENT shall be submitted monthly to the *Owner* and the *Consultant* simultaneously as the *Work* progresses.
- 5.2.2 Applications for payment shall be dated the last day of each payment period, which is the last day of the month or an alternative day of the month agreed in writing by the parties.
- 5.2.3 The amount claimed shall be for the value, proportionate to the amount of the *Contract*, of *Work* performed and *Products* delivered to the *Place of the Work* as of the last day of the payment period.
- 5.2.4 The *Contractor* shall submit to the *Consultant*, at least 15 calendar days before the first application for payment, a schedule of values for the parts of the *Work*, aggregating the total amount of the *Contract Price*, so as to facilitate evaluation of applications for payment.
- 5.2.5 The schedule of values shall be made out in such form as specified in the *Contract* and supported by such evidence as the *Consultant* may reasonably require.
- 5.2.6 Applications for payment shall be based on the schedule of values accepted by the *Consultant* and shall comply with the provisions of *Payment Legislation*.
- 5.2.7 Each application for payment shall include evidence of compliance with workers' compensation legislation at the *Place of the Work* and after the first payment, a declaration by the *Contractor* as to the distribution made of the amounts previously received using document CCDC 9A 'Statutory Declaration'.
- 5.2.8 Applications for payment for *Products* delivered to the *Place of the Work* but not yet incorporated into the *Work* shall be supported by such evidence as the *Consultant* may reasonably require to establish the value and delivery of the *Products*.

GC 5.3 PAYMENT

- 5.3.1 After receipt by the *Consultant* and the *Owner* of an application for payment submitted by the *Contractor* in accordance with GC 5.2 – APPLICATIONS FOR PAYMENT:
 - .1 The *Consultant* will issue to the *Owner* and copy to the *Contractor*, no later than 10 calendar days after the receipt of the application for payment, a certificate for payment in the amount applied for, or in such other amount as the *Consultant* determines to be properly due. If the *Consultant* certifies a different amount, or rejects the application or part thereof, the *Owner* shall promptly issue a written notice to the *Contractor* giving reasons for the revision or rejection, such written notice to be in compliance with *Payment Legislation*.
 - .2 The *Owner* shall make payment to the *Contractor* on account as provided in Article A-5 of the Agreement – PAYMENT on or before 28 calendar days after the receipt by the *Owner* and the *Consultant* of the application for payment, and in any event, in compliance with *Payment Legislation*.

GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK

- 5.4.1 The *Consultant* will review the *Work* to certify or verify the validity of the application for *Substantial Performance of the Work* and will promptly, and in any event, no later than 20 calendar days after receipt of the *Contractors* application:
 - .1 advise the *Contractor* in writing that the *Work* or the designated portion of the *Work* is not substantially performed and give reasons why, or
 - .2 state the date of *Substantial Performance of the Work* or a designated portion of the *Work* in a certificate and issue a copy of that certificate to each of the *Owner* and the *Contractor*.
- 5.4.2 Where the holdback amount required by the applicable lien legislation has not been placed in a separate lien holdback account, the *Owner* shall, no later than 10 calendar days prior to the expiry of the holdback period stipulated in the lien legislation applicable to the *Place of the Work*, place the holdback amount in a bank account in the joint names of the *Owner* and the *Contractor*.
- 5.4.3 Subject to the requirements of any *Payment Legislation*, all holdback amount prescribed by the applicable lien legislation for the *Work* shall become due and payable to the *Contractor* no later than 10 *Working Days* following the expiration of the holdback period stipulated in the lien legislation applicable to the *Place of the Work*.
- 5.4.4 The *Contractor* shall submit an application for payment of the lien holdback amount in accordance with GC 5.3 – PAYMENT.
- 5.4.5 Where legislation permits progressive release of the holdback for a portion of the *Work* and the *Consultant* has certified or verified that the part of the *Work* has been performed prior to *Substantial Performance of the Work*, the *Owner* hereby agrees to release, and shall release, such portion to the *Contractor* in accordance with such legislation.

- 5.4.6 Notwithstanding any progressive release of the holdback, the *Contractor* shall ensure that such parts of the *Work* are protected pending the issuance of a final certificate for payment and be responsible for the correction of defects or work not performed regardless of whether or not such was apparent when the holdback was released.

GC 5.5 FINAL PAYMENT

- 5.5.1 When the *Contractor* considers that the *Work* is completed, the *Contractor* shall submit an application for final payment.
- 5.5.2 The *Consultant* will, no later than 10 calendar days after the receipt of an application from the *Contractor* for final payment, review the *Work* to verify the validity of the application and when the *Consultant* finds the *Contractor's* application for final payment valid, the *Consultant* will promptly issue a final certificate for payment to the *Owner*, with a copy to the *Contractor*.
- 5.5.3 If the *Consultant* rejects the application or part thereof, the *Owner* will promptly issue a written notice to the *Contractor* giving reasons for the revision or rejection, such written notice to be in compliance with *Payment Legislation*.
- 5.5.4 Subject to the provision of paragraph 10.4.1 of GC 10.4 – WORKERS' COMPENSATION, and any legislation applicable to the *Place of the Work*, the *Owner* shall, no later than 5 calendar days after the issuance of a final certificate for payment, pay the *Contractor* as provided in Article A-5 of the Agreement – PAYMENT and in any event, in compliance with *Payment Legislation*.

GC 5.6 DEFERRED WORK

- 5.6.1 If because of climatic or other conditions reasonably beyond the control of the *Contractor*, or if the *Owner* and the *Contractor* agree that, there are items of work that must be deferred, payment in full for that portion of the *Work* which has been performed as certified by the *Consultant* shall not be withheld or delayed by the *Owner* on account thereof, but the *Owner* may withhold, until the remaining portion of the *Work* is finished, only such an amount that the *Consultant* determines is sufficient and reasonable to cover the cost of performing such deferred *Work*.

GC 5.7 NON-CONFORMING WORK

- 5.7.1 No payment by the *Owner* under the *Contract* nor partial or entire use or occupancy of the *Work* by the *Owner* shall constitute an acceptance of any portion of the *Work* or *Products* which are not in accordance with the requirements of the *Contract Documents*.

PART 6 CHANGES IN THE WORK

GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

- 6.1.1 The *Owner*, through the *Consultant*, without invalidating the *Contract*, may make:
- .1 changes in the *Work* consisting of additions, deletions or other revisions to the *Work* by *Change Order* or *Change Directive*, and
 - .2 changes to the *Contract Time* for the *Work*, or any part thereof, by *Change Order*.
- 6.1.2 The *Contractor* shall not perform a change in the *Work* without a *Change Order* or a *Change Directive*.

GC 6.2 CHANGE ORDER

- 6.2.1 When a change in the *Work* is proposed or required, the *Consultant* will provide the *Contractor* with a written description of the proposed change in the *Work*. The *Contractor* shall promptly present to the *Consultant*, in a form that can be reasonably evaluated, a method of adjustment or an amount of adjustment for the *Contract Price*, if any, and the adjustment in the *Contract Time*, if any, for the proposed change in the *Work*.
- 6.2.2 When the *Owner* and the *Contractor* agree to the adjustments in the *Contract Price* and *Contract Time* or to the method to be used to determine the adjustments, such agreement shall be effective immediately and shall be recorded in a *Change Order*. The value of the work performed as the result of a *Change Order* shall be included in the applications for progress payment.

GC 6.3 CHANGE DIRECTIVE

- 6.3.1 If the *Owner* requires the *Contractor* to proceed with a change in the *Work* prior to the *Owner* and the *Contractor* agreeing upon the corresponding adjustment in *Contract Price* and *Contract Time*, the *Owner*, through the *Consultant*, shall issue a *Change Directive*.
- 6.3.2 A *Change Directive* shall only be used to direct a change in the *Work* which is within the general scope of the *Contract Documents*.
- 6.3.3 A *Change Directive* shall not be used to direct a change in the *Contract Time* only.

- 6.3.4 Upon receipt of a *Change Directive*, the *Contractor* shall proceed promptly with the change in the *Work*.
- 6.3.5 For the purpose of valuing *Change Directives*, changes in the *Work* that are not substitutions or otherwise related to each other shall not be grouped together in the same *Change Directive*.
- 6.3.6 The adjustment in the *Contract Price* for a change carried out by way of a *Change Directive* shall be determined on the basis of the cost of the *Contractor's* actual expenditures and savings attributable to the *Change Directive*, valued in accordance with paragraph 6.3.7 and as follows:
- 1 If the change results in a net increase in the *Contractor's* cost, the *Contract Price* shall be increased by the amount of the net increase in the *Contractor's* cost, plus the *Contractor's* percentage fee on such net increase.
 - 2 If the change results in a net decrease in the *Contractor's* cost, the *Contract Price* shall be decreased by the amount of the net decrease in the *Contractor's* cost, without adjustment for the *Contractor's* percentage fee.
 - 3 The *Contractor's* fee shall be as specified in the *Contract Documents* or as otherwise agreed by the parties.
- 6.3.7 The cost of performing the work attributable to the *Change Directive* shall be limited to the actual cost of the following in as much as it contributes directly to the implementation of the *Change Directive*:

Labour

- 1 rates that are listed in the schedule or as agreed by the *Owner* and the *Contractor* including wages, benefits, compensation, contributions, assessments, or taxes incurred for such items as employment insurance, provincial or territorial health insurance, workers' compensation, and Canada or Quebec Pension Plan for:
 - (1) trade labour in the direct employ of the *Contractor*;
 - (2) the *Contractor's* personnel when stationed at the field office;
 - (3) the *Contractor's* personnel engaged at shops or on the road, in expediting the production or transportation of materials or equipment; and
 - (4) the *Contractor's* office personnel engaged in a technical capacity, or other personnel identified in Article A-3 of the Agreement – CONTRACT DOCUMENTS for the time spent in the performance of the *Work*;

Products, Construction Equipment and Temporary Work

- 2 cost of all *Products* including cost of transportation thereof;
- 3 in the absence of agreed rates, cost less salvage value of *Construction Equipment*, *Temporary Work* and tools, exclusive of hand tools under \$1,000 owned by the *Contractor*;
- 4 rental cost of *Construction Equipment*, *Temporary Work* and tools, exclusive of hand tools under \$1,000;
- 5 cost of all equipment and services required for the *Contractor's* field office;

Subcontract

- 6 subcontract amounts of Subcontractor with pricing mechanism approved by the *Owner*;

Others

- 7 travel and subsistence expenses of the *Contractor's* personnel described in paragraph 6.3.7.1;
- 8 deposits lost provided that they are not caused by negligent acts or omissions of the *Contractor*;
- 9 cost of quality assurance such as independent inspection and testing services;
- 10 charges levied by authorities having jurisdiction at the *Place of the Work*;
- 11 royalties, patent license fees, and damages for infringement of patents and cost of defending suits therefor subject always to the *Contractor's* obligations to indemnify the *Owner* as provided in paragraph 10.3.1 of GC 10.3 – PATENT FEES;
- 12 premium for all contract securities and insurance for which the *Contractor* is required, by the *Contract Documents*, to provide, maintain and pay in relation to the performance of the *Work*;
- 13 losses and expenses sustained by the *Contractor* for matters which are the subject of insurance under the policies prescribed in GC 11.1 – INSURANCE when such losses and expenses are not recoverable because the amounts are in excess of collectible amounts or within the deductible amounts;
- 14 taxes and duties, other than *Value Added Taxes*, income, capital, or property taxes, relating to the *Work* for which the *Contractor* is liable;
- 15 charges for voice and data communications, courier services, expressage, transmittal and reproduction of documents, and petty cash items;
- 16 cost for removal and disposal of waste products and debris;
- 17 legal costs, incurred by the *Contractor*, in relation to the performance of the *Work* provided that they are not:
 - (1) relating to a dispute between the *Owner* and the *Contractor* unless such costs are part of a settlement or awarded by arbitration or court,
 - (2) the result of the negligent acts or omissions of the *Contractor*, or
 - (3) the result of a breach of this *Contract* by the *Contractor*;
- 18 cost of auditing when requested by the *Owner*; and
- 19 cost of *Project* specific information technology in accordance with the method determined by the parties.

- 6.3.8 Notwithstanding any other provisions contained in the General Conditions of the *Contract*, it is the intention of the parties that the cost of any item under any cost element referred to in paragraph 6.3.7 shall cover and include any and all costs or liabilities attributable to the *Change Directive* other than those which are the result of or occasioned by any failure on the part of the *Contractor* to exercise reasonable care and diligence in the *Contractor's* attention to the *Work*. Any cost due to failure on the part of the *Contractor* to exercise reasonable care and diligence in the *Contractor's* performance of the *Work* attributable to the *Change Directive* shall be borne by the *Contractor*.
- 6.3.9 The *Contractor* shall keep full and detailed accounts and records necessary for the documentation of the cost of performing the *Work* attributable to the *Change Directive* and shall provide the *Consultant* with copies thereof.
- 6.3.10 For the purpose of valuing *Change Directives*, the *Owner* shall be afforded reasonable access to all of the *Contractor's* pertinent documents related to the cost of performing the *Work* attributable to the *Change Directive*.
- 6.3.11 Pending determination of the final amount of a *Change Directive*, the undisputed value of the *Work* performed as the result of a *Change Directive* is eligible to be included in progress payments.
- 6.3.12 If the *Owner* and the *Contractor* do not agree on the proposed adjustment in the *Contract Time* attributable to the change in the *Work*, or the method of determining it, the adjustment shall be referred to the *Consultant* for a finding.
- 6.3.13 When the *Owner* and the *Contractor* reach agreement on the adjustment to the *Contract Price* and to the *Contract Time*, this agreement shall be recorded in a *Change Order*.

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

- 6.4.1 If the *Owner* or the *Contractor* discover conditions at the *Place of the Work* which are:
- .1 subsurface or otherwise concealed physical conditions which existed before the commencement of the *Work* and differ materially from those indicated in the *Contract Documents*; or
 - .2 physical conditions, other than conditions due to weather, that are of a nature which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the *Contract Documents*,
- then the observing party shall give *Notice in Writing* to the other party of such conditions before they are disturbed and in no event later than 5 *Working Days* after first observance of the conditions.
- 6.4.2 The *Consultant* will promptly investigate such conditions and make a finding. If the finding is that the conditions differ materially and this would cause an increase or decrease in the *Contractor's* cost or time to perform the *Work*, the *Owner*, through the *Consultant*, shall issue appropriate instructions for a change in the *Work* as provided in GC 6.2 – CHANGE ORDER or GC 6.3 – CHANGE DIRECTIVE.
- 6.4.3 If the *Consultant* finds that the conditions at the *Place of the Work* are not materially different or that no change in the *Contract Price* or the *Contract Time* is justified, the *Consultant* will promptly inform the *Owner* and the *Contractor* in writing.
- 6.4.4 If such concealed or unknown conditions relate to toxic and hazardous substances and materials, artifacts and fossils, or mould, the parties will be governed by the provisions of GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES, GC 9.3 – ARTIFACTS AND FOSSILS and GC 9.5 – MOULD.

GC 6.5 DELAYS

- 6.5.1 If the *Contractor* is delayed in the performance of the *Work* by the *Owner*, the *Consultant*, or anyone employed or engaged by them directly or indirectly, contrary to the provisions of the *Contract Documents*, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor*. The *Contractor* shall be reimbursed by the *Owner* for reasonable costs incurred by the *Contractor* as the result of such delay.
- 6.5.2 If the *Contractor* is delayed in the performance of the *Work* by a stop work order issued by a court or other public authority and providing that such order was not issued as the result of an act or fault of the *Contractor* or any person employed or engaged by the *Contractor* directly or indirectly, resulting in the failure of the *Contractor* to attain *Ready-for-Takeover* by the date stipulated in Article A-1 of the Agreement – THE WORK, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor*. The *Contractor* shall be reimbursed by the *Owner* for reasonable costs incurred by the *Contractor* as the result of such delay.
- 6.5.3 If the *Contractor* is delayed in the performance of the *Work* by:
- .1 labour disputes, strikes, lock-outs (including lock-outs decreed or recommended for its members by a recognized contractors' association, of which the *Contractor* is a member or to which the *Contractor* is otherwise bound),
 - .2 fire, unusual delay by common carriers or unavoidable casualties,
 - .3 abnormally adverse weather conditions, or

- .4 any cause beyond the *Contractor's* control other than one resulting from a default or breach of *Contract* by the *Contractor*, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor*. The extension of time shall not be less than the time lost as the result of the event causing the delay, unless the *Contractor* agrees to a shorter extension. The *Contractor* shall not be entitled to payment for costs incurred by such delays unless such delays result from actions by the *Owner*, the *Consultant* or anyone employed or engaged by them directly or indirectly.

6.5.4 No extension shall be made for delay unless *Notice in Writing* of the cause of delay is given to the *Consultant* not later than 10 *Working Days* after the commencement of the delay. In the case of a continuing cause of delay only one *Notice in Writing* shall be necessary.

6.5.5 If no schedule is made under paragraph 2.2.12 of GC 2.2 – ROLE OF THE CONSULTANT, then no request for extension shall be made because of failure of the *Consultant* to furnish instructions until 10 *Working Days* after demand for such instructions has been made.

GC 6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

6.6.1 If the *Contractor* intends to make a claim for an increase to the *Contract Price*, or if the *Owner* intends to make a claim against the *Contractor* for a credit to the *Contract Price*, the party that intends to make the claim shall give timely *Notice in Writing* of intent to claim to the other party and to the *Consultant*.

6.6.2 Upon commencement of the event or series of events giving rise to a claim, the party intending to make the claim shall:

- .1 take all reasonable measures to mitigate any loss or expense which may be incurred as a result of such event or series of events, and
- .2 keep such records as may be necessary to support the claim.

6.6.3 The party making the claim shall submit within a reasonable time to the *Consultant* a detailed account of the amount claimed and the grounds upon which the claim is based and the *Consultant* will make a finding upon such claim.

6.6.4 Where the event or series of events giving rise to the claim has a continuing effect, the detailed account submitted under paragraph 6.6.3 shall be considered to be an interim account and the party making the claim shall, at such intervals as the *Consultant* may reasonably require, submit further interim accounts giving the accumulated amount of the claim and any further grounds upon which it is based. The party making the claim shall submit a final account after the end of the effects resulting from the event or series of events.

6.6.5 The *Consultant's* findings, with respect to a claim made by either party, will be given by *Notice in Writing* to both parties within 30 *Working Days* after receipt of the claim by the *Consultant*, or within such other time period as may be agreed by the parties.

6.6.6 If such finding is not acceptable to either party, the claim shall be settled in accordance with Part 8 of the General Conditions – DISPUTE RESOLUTION.

PART 7 DEFAULT NOTICE

GC 7.1 OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT

7.1.1 If the *Contractor* is adjudged bankrupt, or makes a general assignment for the benefit of creditors because of the *Contractor's* insolvency, or if a receiver is appointed because of the *Contractor's* insolvency, the *Owner* may, without prejudice to any other right or remedy the *Owner* may have, terminate the *Contractor's* right to continue with the *Work*, by giving the *Contractor* or receiver or trustee in bankruptcy *Notice in Writing* to that effect.

7.1.2 If the *Contractor* neglects to perform the *Work* properly or otherwise fails to comply with the requirements of the *Contract* to a substantial degree and if the *Consultant* has given a written statement to the *Owner* and *Contractor* which provides the detail of such neglect to perform the *Work* properly or such failure to comply with the requirements of the *Contract* to a substantial degree, the *Owner* may, without prejudice to any other right or remedy the *Owner* may have, give the *Contractor Notice in Writing*, containing particulars of the default including references to applicable provisions of the *Contract*, that the *Contractor* is in default of the *Contractor's* contractual obligations and instruct the *Contractor* to correct the default in the 5 *Working Days* immediately following the receipt of such *Notice in Writing*.

7.1.3 If the default cannot be corrected in the 5 *Working Days* specified or in such other time period as may be subsequently agreed in writing by the parties, the *Contractor* shall be in compliance with the *Owner's* instructions if the *Contractor*:

- .1 commences the correction of the default within the specified time,
- .2 provides the *Owner* with an acceptable schedule for such correction, and
- .3 corrects the default in accordance with the *Contract* terms and with such schedule.

- 7.1.4 If the *Contractor* fails to correct the default in the time specified or in such other time period as may be subsequently agreed in writing by the parties, without prejudice to any other right or remedy the *Owner* may have, the *Owner* may by giving *Notice in Writing*:
- .1 correct such default and deduct the cost thereof from any payment then or thereafter due the *Contractor* for the *Work* provided the *Consultant* has certified such cost to the *Owner* and the *Contractor*, or
 - .2 terminate the *Contractor*'s right to continue with the *Work* in whole or in part or terminate the *Contract*.
- 7.1.5 If the *Owner* terminates the *Contractor*'s right to continue with the *Work* as provided in paragraphs 7.1.1 and 7.1.4, the *Owner* shall be entitled to:
- .1 take possession of the *Work* and *Products* at the *Place of the Work*; subject to the rights of third parties, utilize the *Construction Equipment* at the *Place of the Work*; finish the *Work* by whatever method the *Owner* may consider expedient, but without undue delay or expense,
 - .2 withhold further payment to the *Contractor* until a final certificate for payment is issued,
 - .3 charge the *Contractor* the amount by which the full cost of finishing the *Work* as certified by the *Consultant*, including compensation to the *Consultant* for the *Consultant*'s additional services and a reasonable allowance as determined by the *Consultant* to cover the cost of corrections to work performed by the *Contractor* that may be required under GC 12.3 – WARRANTY, exceeds the unpaid balance of the *Contract Price*; however, if such cost of finishing the *Work* is less than the unpaid balance of the *Contract Price*, the *Owner* shall pay the *Contractor* the difference, and
 - .4 on expiry of the warranty period, charge the *Contractor* the amount by which the cost of corrections to the *Contractor*'s work under GC 12.3 – WARRANTY exceeds the allowance provided for such corrections, or if the cost of such corrections is less than the allowance, pay the *Contractor* the difference.
- 7.1.6 The *Contractor*'s obligation under the *Contract* as to quality, correction and warranty of the work performed by the *Contractor* up to the time of termination shall continue in force after such termination of the *Contract*.

GC 7.2 CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT

- 7.2.1 If the *Owner* is adjudged bankrupt, or makes a general assignment for the benefit of creditors because of the *Owner*'s insolvency, or if a receiver is appointed because of the *Owner*'s insolvency, the *Contractor* may, without prejudice to any other right or remedy the *Contractor* may have, terminate the *Contract* by giving the *Owner* or receiver or trustee in bankruptcy *Notice in Writing* to that effect.
- 7.2.2 If the *Work* is suspended or otherwise delayed for a period of 20 *Working Days* or more under an order of a court or other public authority and providing that such order was not issued as the result of an act or fault of the *Contractor* or of anyone directly or indirectly employed or engaged by the *Contractor*, the *Contractor* may, without prejudice to any other right or remedy the *Contractor* may have, terminate the *Contract* by giving the *Owner* *Notice in Writing* to that effect.
- 7.2.3 The *Contractor* may give *Notice in Writing* to the *Owner*, with a copy to the *Consultant*, that the *Owner* is in default of the *Owner*'s contractual obligations if:
- .1 the *Owner* fails to furnish, when so requested by the *Contractor*, reasonable evidence that financial arrangements have been made to fulfill the *Owner*'s obligations under the *Contract*,
 - .2 the *Consultant* fails to issue a certificate as provided in Part 5 of the General Conditions – PAYMENT,
 - .3 the *Owner* fails to pay the *Contractor* when due the amounts certified by the *Consultant* or awarded by adjudication, arbitration or court, or
 - .4 the *Owner* fails to comply with the requirements of the *Contract* to a substantial degree and the *Consultant*, except for GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER, gives a written statement to the *Owner* and the *Contractor* that provides detail of such failure to comply with the requirements of the *Contract* to a substantial degree.
- 7.2.4 The *Contractor*'s *Notice in Writing* to the *Owner* provided under paragraph 7.2.3 shall advise that if the default is not corrected within 5 *Working Days* following the receipt of the *Notice in Writing*, the *Contractor* may, without prejudice to any other right or remedy the *Contractor* may have, suspend the *Work* or terminate the *Contract*.
- 7.2.5 If the *Contractor* terminates the *Contract* by giving a *Notice in Writing* to the *Owner* under the conditions set out above, the *Contractor* shall be entitled to be paid for all work performed including reasonable profit, for loss sustained upon *Products* and *Construction Equipment*, and such other damages as the *Contractor* may have sustained as a result of the termination of the *Contract*.

PART 8 DISPUTE RESOLUTION

GC 8.1 AUTHORITY OF THE CONSULTANT

- 8.1.1 Differences between the parties to the *Contract* as to the interpretation, application or administration of the *Contract* or any failure to agree where agreement between the parties is called for, herein collectively called disputes, which are not resolved

in the first instance by findings of the *Consultant* as provided in GC 2.2 – ROLE OF THE CONSULTANT, shall be settled in accordance with the requirements of Part 8 of the General Conditions – DISPUTE RESOLUTION.

- 8.1.2 If a dispute arises under the *Contract* in respect of a matter in which the *Consultant* has no authority under the *Contract* to make a finding, the procedures set out in paragraph 8.1.3 and paragraphs 8.3.3 to 8.3.8 of GC 8.3 – NEGOTIATION, MEDIATION AND ARBITRATION, and in GC 8.4 – RETENTION OF RIGHTS apply to that dispute with the necessary changes to detail as may be required.
- 8.1.3 If a dispute is not resolved promptly, the *Consultant* will give such instructions as in the *Consultant's* opinion are necessary for the proper performance of the *Work* and to prevent delays pending settlement of the dispute. The parties shall act immediately according to such instructions, it being understood that by so doing neither party will jeopardize any claim the party may have. If it is subsequently determined that such instructions were in error or at variance with the *Contract Documents*, the *Owner* shall pay the *Contractor* costs incurred by the *Contractor* in carrying out such instructions which the *Contractor* was required to do beyond what the *Contract Documents* correctly understood and interpreted would have required, including costs resulting from interruption of the *Work*.

GC 8.2 ADJUDICATION

- 8.2.1 Nothing in this *Contract* shall be deemed to affect the rights of the parties to resolve any dispute by adjudication as may be prescribed by applicable legislation.

GC 8.3 NEGOTIATION, MEDIATION AND ARBITRATION

- 8.3.1 In accordance with the rules for mediation as provided in CCDC 40 ‘Rules for Mediation and Arbitration of Construction Industry Disputes’ in effect at the time of bid closing, the parties shall appoint a Project Mediator
- .1 within 20 *Working Days* after the *Contract* was awarded, or
 - .2 if the parties neglected to make an appointment within the 20 *Working Days*, within 10 *Working Days* after either party by *Notice in Writing* requests that the Project Mediator be appointed.
- 8.3.2 A party shall be conclusively deemed to have accepted a finding of the *Consultant* under GC 2.2 – ROLE OF THE CONSULTANT and to have expressly waived and released the other party from any claims in respect of the particular matter dealt with in that finding unless, within 15 *Working Days* after receipt of that finding, the party sends a *Notice in Writing* of dispute to the other party and to the *Consultant*, which contains the particulars of the matter in dispute and the relevant provisions of the *Contract Documents*. The responding party shall send a *Notice in Writing* of reply to the dispute within 10 *Working Days* after receipt of such *Notice in Writing* setting out particulars of this response and any relevant provisions of the *Contract Documents*.
- 8.3.3 The parties shall make all reasonable efforts to resolve their dispute by amicable negotiations and agree to provide, without prejudice, frank, candid, and timely disclosure of relevant facts, information and documents to facilitate these negotiations.
- 8.3.4 After a period of 10 *Working Days* following receipt of a responding party’s *Notice in Writing* of reply under paragraph 8.3.2, the parties shall request the Project Mediator to assist the parties to reach agreement on any unresolved dispute. The mediated negotiations shall be conducted in accordance with the rules for mediation as provided in CCDC 40 in effect at the time of bid closing.
- 8.3.5 If the dispute has not been resolved at the mediation or within such further period as is agreed by the parties, the Project Mediator will terminate the mediated negotiations by giving *Notice in Writing* to the *Owner*, the *Contractor* and the *Consultant*.
- 8.3.6 By giving a *Notice in Writing* to the other party and the *Consultant*, not later than 10 *Working Days* after the date of termination of the mediated negotiations under paragraph 8.3.5, either party may refer the dispute to be finally resolved by arbitration under the rules of arbitration as provided in CCDC 40 in effect at the time of bid closing. The arbitration shall be conducted in the jurisdiction of the *Place of the Work*.
- 8.3.7 On expiration of the 10 *Working Days*, the arbitration agreement under paragraph 8.3.6 is not binding on the parties and, if a *Notice in Writing* is not given under paragraph 8.3.6 within the required time, the parties may refer the unresolved dispute to the courts or to any other form of dispute resolution, including arbitration, which they have agreed to use.
- 8.3.8 If neither party, by *Notice in Writing*, given within 10 *Working Days* of the date of *Notice in Writing* requesting arbitration in paragraph 8.3.6, requires that a dispute be arbitrated immediately, all disputes referred to arbitration as provided in paragraph 8.3.6 shall be:
- .1 held in abeyance until:
 - (1) *Ready-for-Takeover*,
 - (2) the *Contract* has been terminated, or
 - (3) the *Contractor* has abandoned the *Work*,whichever is earlier; and

- .2 consolidated into a single arbitration under the rules governing the arbitration under paragraph 8.3.6.

GC 8.4 RETENTION OF RIGHTS

- 8.4.1 It is agreed that no act by either party shall be construed as a renunciation or waiver of any rights or recourses, provided the party has given the *Notice in Writing* required under Part 8 of the General Conditions – DISPUTE RESOLUTION and has carried out the instructions as provided in paragraph 8.1.3 of GC 8.1 – AUTHORITY OF THE CONSULTANT.
- 8.4.2 Nothing in Part 8 of the General Conditions – DISPUTE RESOLUTION shall be construed in any way to limit a party from asserting any statutory right to a lien under applicable lien legislation of the jurisdiction of the *Place of the Work* and the assertion of such right by initiating judicial proceedings is not to be construed as a waiver of any right that party may have under paragraph 8.3.6 of GC 8.3 – NEGOTIATION, MEDIATION AND ARBITRATION to proceed by way of arbitration to adjudicate the merits of the claim upon which such a lien is based.

PART 9 PROTECTION OF PERSONS AND PROPERTY

GC 9.1 PROTECTION OF WORK AND PROPERTY

- 9.1.1 The *Contractor* shall protect the *Work*, the *Owner's* property and property adjacent to the *Place of the Work* from damage which may arise as the result of the *Contractor's* operations under the *Contract*, and shall be responsible for such damage, except damage which occurs as the result of:
- .1 errors or omissions in the *Contract Documents*; or
 - .2 acts or omissions by the *Owner*, the *Consultant*, *Other Contractors*, or their agents and employees.
- 9.1.2 Before commencing any work, the *Contractor* shall determine the location of all underground utilities and structures indicated in the *Contract Documents* or that are reasonably apparent in an inspection of the *Place of the Work*.
- 9.1.3 Should the *Contractor* in the performance of the *Contract* damage the *Work*, the *Owner's* property or property adjacent to the *Place of the Work*, the *Contractor* shall be responsible for making good such damage at the *Contractor's* expense.
- 9.1.4 Should damage occur to the *Work* or the *Owner's* property for which the *Contractor* is not responsible, as provided in paragraph 9.1.1, the *Contractor* shall make good such damage to the *Work* and, if the *Owner* so directs, to the *Owner's* property. The *Contract Price* and *Contract Time* shall be adjusted as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 – CHANGE ORDER and GC 6.3 – CHANGE DIRECTIVE.

GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

- 9.2.1 For the purposes of applicable legislation related to toxic and hazardous substances, the *Owner* shall be deemed to have control and management of the *Place of the Work* with respect to existing conditions.
- 9.2.2 Prior to the *Contractor* commencing the *Work*, the *Owner* shall,
- .1 take all reasonable steps to determine whether any toxic or hazardous substances are present at the *Place of the Work*, and
 - .2 provide the *Consultant* and the *Contractor* with a written list of any such substances that are known to exist and their locations.
- 9.2.3 The *Owner* shall take all reasonable steps to ensure that no person's exposure to any toxic or hazardous substance exceeds the time weighted levels prescribed by applicable legislation at the *Place of the Work* and that no property is damaged or destroyed as a result of exposure to, or the presence of, toxic or hazardous substances which were at the *Place of the Work* prior to the *Contractor* commencing the *Work*.
- 9.2.4 Unless the *Contract* expressly provides otherwise, the *Owner* shall be responsible for taking all necessary steps, in accordance with applicable legislation in force at the *Place of the Work*, to dispose of, store or otherwise render harmless any toxic or hazardous substance which was present at the *Place of the Work* prior to the *Contractor* commencing the *Work*.
- 9.2.5 If the *Contractor*
- .1 encounters toxic or hazardous substances at the *Place of the Work*, or
 - .2 has reasonable grounds to believe that toxic or hazardous substances are present at the *Place of the Work*, which were not brought to the *Place of the Work* by the *Contractor* or anyone for whom the *Contractor* is responsible and which were not disclosed by the *Owner* or which were disclosed but have not been dealt with as required under paragraph 9.2.4, the *Contractor* shall
 - .3 take all reasonable steps, including stopping the *Work*, to ensure that no person's exposure to any toxic or hazardous substance exceeds any applicable time weighted levels prescribed by applicable legislation at the *Place of the Work*, and
 - .4 immediately report the circumstances to the *Consultant* and the *Owner* in writing.

- 9.2.6 If the *Owner* and the *Contractor* do not agree on the existence, significance of, or whether the toxic or hazardous substances were brought onto the *Place of the Work* by the *Contractor* or anyone for whom the *Contractor* is responsible, the *Owner* shall retain and pay for an independent qualified expert to investigate and determine such matters. The expert's report shall be delivered to the *Owner* and the *Contractor*.
- 9.2.7 If the *Owner* and the *Contractor* agree or if the expert referred to in paragraph 9.2.6 determines that the toxic or hazardous substances were not brought onto the place of the *Work* by the *Contractor* or anyone for whom the *Contractor* is responsible, the *Owner* shall promptly at the *Owner's* own expense:
- .1 take all steps as required under paragraph 9.2.4;
 - .2 reimburse the *Contractor* for the costs of all steps taken pursuant to paragraph 9.2.5;
 - .3 extend the *Contract Time* for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor* and the expert referred to in 9.2.6 and reimburse the *Contractor* for reasonable costs incurred as a result of the delay; and
 - .4 indemnify the *Contractor* as required by GC 13.1 – INDEMNIFICATION.
- 9.2.8 If the *Owner* and the *Contractor* agree or if the expert referred to in paragraph 9.2.6 determines that the toxic or hazardous substances were brought onto the place of the *Work* by the *Contractor* or anyone for whom the *Contractor* is responsible, the *Contractor* shall promptly at the *Contractor's* own expense:
- .1 take all necessary steps, in accordance with applicable legislation in force at the *Place of the Work*, to safely remove and dispose the toxic or hazardous substances;
 - .2 make good any damage to the *Work*, the *Owner's* property or property adjacent to the place of the *Work* as provided in paragraph 9.1.3 of GC 9.1 – PROTECTION OF WORK AND PROPERTY;
 - .3 reimburse the *Owner* for reasonable costs incurred under paragraph 9.2.6; and
 - .4 indemnify the *Owner* as required by GC 13.1 – INDEMNIFICATION.
- 9.2.9 If either party does not accept the expert's findings under paragraph 9.2.6, the disagreement shall be settled in accordance with Part 8 of the General Conditions – DISPUTE RESOLUTION. If such disagreement is not resolved promptly, the parties shall act immediately in accordance with the expert's determination and take the steps required by paragraph 9.2.7 or 9.2.8 it being understood that by so doing, neither party will jeopardize any claim that party may have to be reimbursed as provided by GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES.

GC 9.3 ARTIFACTS AND FOSSILS

- 9.3.1 Fossils, coins, articles of value or antiquity, structures and other remains or things of scientific or historic interest discovered at the *Place or Work* shall, as between the *Owner* and the *Contractor*, be deemed to be the absolute property of the *Owner*.
- 9.3.2 The *Contractor* shall take all reasonable precautions to prevent removal or damage to discoveries as identified in paragraph 9.3.1, and shall advise the *Consultant* upon discovery of such items.
- 9.3.3 The *Consultant* will investigate the impact on the *Work* of the discoveries identified in paragraph 9.3.1. If conditions are found that would cause an increase or decrease in the *Contractor's* cost or time to perform the *Work*, the *Owner*, through the *Consultant*, shall issue appropriate instructions for a change in the *Work* as provided in GC 6.2 – CHANGE ORDER or GC 6.3 – CHANGE DIRECTIVE.

GC 9.4 CONSTRUCTION SAFETY

- 9.4.1 The *Contractor* shall be responsible for establishing, initiating, maintaining, and supervising all health and safety precautions and programs in connection with the performance of the *Work* in accordance with the applicable health and safety legislation.
- 9.4.2 The *Owner* and the *Contractor* shall comply with all health and safety precautions and programs established at the *Place of the Work*.
- 9.4.3 The *Owner* and the *Contractor* shall comply with the rules, regulations and practices required by the applicable health and safety legislation.
- 9.4.4 The *Owner* shall cause the *Consultant*, *Other Contractors* and the *Owner's* own forces to comply with all health and safety precautions and programs established by the *Contractor* at the *Place of the Work*.
- 9.4.5 Nothing in this *Contract* shall affect the determination of liability under the applicable health and safety legislation.

GC 9.5 MOULD

- 9.5.1 If the *Contractor* or the *Owner* observes or reasonably suspects the presence of mould at the *Place of the Work*, the remediation of which is not expressly part of the *Work*,
- .1 the observing party shall promptly report the circumstances to the other party in writing,
 - .2 the *Contractor* shall promptly take all reasonable steps, including stopping the *Work* if necessary, to ensure that no person suffers injury, sickness or death and that no property is damaged as a result of exposure to or the presence of the mould, and

- .3 if the *Owner* and the *Contractor* do not agree on the existence, significance or cause of the mould or as to what steps need be taken to deal with it, the *Owner* shall retain and pay for an independent qualified expert to investigate and determine such matters. The expert's report shall be delivered to the *Owner* and the *Contractor*.
- 9.5.2 If the *Owner* and the *Contractor* agree, or if the expert referred to in paragraph 9.5.1.3 determines that the presence of mould was caused by the *Contractor*'s operations under the *Contract*, the *Contractor* shall promptly, at the *Contractor*'s own expense:
- .1 take all reasonable and necessary steps to safely remediate or dispose of the mould,
 - .2 make good any damage to the *Work*, the *Owner*'s property or property adjacent to the *Place of the Work* as provided in paragraph 9.1.3 of GC 9.1 – PROTECTION OF WORK AND PROPERTY,
 - .3 reimburse the *Owner* for reasonable costs incurred under paragraph 9.5.1.3, and
 - .4 indemnify the *Owner* as required by GC 13.1 – INDEMNIFICATION.
- 9.5.3 If the *Owner* and the *Contractor* agree, or if the expert referred to in paragraph 9.5.1.3 determines that the presence of mould was not caused by the *Contractor*'s operations under the *Contract*, the *Owner* shall promptly, at the *Owner*'s own expense:
- .1 take all reasonable and necessary steps to safely remediate or dispose of the mould,
 - .2 reimburse the *Contractor* for the cost of taking the steps under paragraph 9.5.1.2 and making good any damage to the *Work* as provided in paragraph 9.1.4 of GC 9.1 – PROTECTION OF WORK AND PROPERTY,
 - .3 extend the *Contract Time* for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor* and the expert referred to in paragraph 9.5.1.3 and reimburse the *Contractor* for reasonable costs incurred as a result of the delay, and
 - .4 indemnify the *Contractor* as required by GC 13.1 – INDEMNIFICATION.
- 9.5.4 If either party does not accept the expert's finding under paragraph 9.5.1.3, the disagreement shall be settled in accordance with Part 8 of the General Conditions – DISPUTE RESOLUTION. If such disagreement is not resolved promptly, the parties shall act immediately in accordance with the expert's determination and take the steps required by paragraphs 9.5.2 or 9.5.3, it being understood that by so doing neither party will jeopardize any claim the party may have to be reimbursed as provided by GC 9.5 – MOULD.

PART 10 GOVERNING REGULATIONS

GC 10.1 TAXES AND DUTIES

- 10.1.1 The *Contract Price* shall include all taxes and customs duties in effect at the time of the bid closing except for *Value Added Taxes* payable by the *Owner* to the *Contractor* as stipulated in Article A-4 of the Agreement – CONTRACT PRICE.
- 10.1.2 Any increase or decrease in costs to the *Contractor* due to changes in taxes and duties after the time of the bid closing shall increase or decrease the *Contract Price* accordingly.

GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

- 10.2.1 The laws of the *Place of the Work* shall govern the *Work*.
- 10.2.2 The *Owner* shall obtain and pay for development approvals, building permit, permanent easements, rights of servitude, and all other necessary approvals and permits, except for the permits and fees referred to in paragraph 10.2.3 or for which the *Contract Documents* specify as the responsibility of the *Contractor*.
- 10.2.3 The *Contractor* shall be responsible for the procurement of permits, licences, inspections, and certificates, which are necessary for the performance of the *Work* and customarily obtained by contractors in the jurisdiction of the *Place of the Work* after the issuance of the building permit. The *Contract Price* includes the cost of these permits, licences, inspections, and certificates, and their procurement.
- 10.2.4 The *Contractor* shall give the required notices and comply with the laws, ordinances, rules, regulations, or codes which are or become in force during the performance of the *Work* and which relate to the *Work*, to the preservation of the public health, and to construction safety.
- 10.2.5 The *Contractor* shall not be responsible for verifying that the *Contract Documents* are in compliance with the applicable laws, ordinances, rules, regulations, or codes relating to the *Work*. If the *Contract Documents* are at variance therewith, or if, subsequent to the time of bid closing, changes are made to the applicable laws, ordinances, rules, regulations, or codes which require modification to the *Contract Documents*, the *Contractor* shall advise the *Consultant* in writing requesting direction immediately upon such variance or change becoming known. The *Consultant* will issue the changes required to the *Contract Documents* as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 – CHANGE ORDER and GC 6.3 – CHANGE DIRECTIVE.

- 10.2.6 If the *Contractor* fails to advise the *Consultant* in writing; fails to obtain direction as required in paragraph 10.2.5; and performs work knowing it to be contrary to any laws, ordinances, rules, regulations, or codes; the *Contractor* shall be responsible for and shall correct the violations thereof; and shall bear the costs, expenses and damages attributable to the failure to comply with the provisions of such laws, ordinances, rules, regulations, or codes.
- 10.2.7 If, subsequent to the time of bid closing, changes are made to applicable laws, ordinances, rules, regulations, or codes of authorities having jurisdiction which affect the cost of the *Work*, either party may submit a claim in accordance with the requirements of GC 6.6 – CLAIMS FOR A CHANGE IN CONTRACT PRICE.

GC 10.3 PATENT FEES

- 10.3.1 The *Contractor* shall pay the royalties and patent licence fees required for the performance of the *Contract*. The *Contractor* shall hold the *Owner* harmless from and against claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of the *Contractor*'s performance of the *Contract* which are attributable to an infringement or an alleged infringement of a patent of invention by the *Contractor* or anyone for whose acts the *Contractor* may be liable.
- 10.3.2 The *Owner* shall hold the *Contractor* harmless against claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of the *Contractor*'s performance of the *Contract* which are attributable to an infringement or an alleged infringement of a patent of invention in executing anything for the purpose of the *Contract*, the physical model, plan or design of which was supplied to the *Contractor* as part of the *Contract*.

GC 10.4 WORKERS' COMPENSATION

- 10.4.1 Prior to commencing the *Work*, and again with the *Contractor*'s applications for payment, the *Contractor* shall provide evidence of compliance with workers' compensation legislation at the *Place of the Work*.

PART 11 INSURANCE

GC 11.1 INSURANCE

- 11.1.1 Without restricting the generality of GC 13.1 – INDEMNIFICATION, the *Contractor* shall provide, maintain and pay for the following insurance coverages, the requirements of which are specified in CCDC 41 'CCDC Insurance Requirements' in effect at the time of bid closing except as hereinafter provided:
- .1 General liability insurance in the name of the *Contractor* and include, or in the case of a single, blanket policy, be endorsed to name, the *Owner* and the *Consultant* as insureds but only with respect to liability, other than legal liability arising out of their sole negligence, arising out of the operations of the *Contractor* with regard to the *Work*. General liability insurance shall be maintained from the date of commencement of the *Work* until one year from the date of *Ready-for-Takeover*. Liability coverage shall be provided for completed operations hazards from the date of *Ready-for-Takeover* on an ongoing basis for a period of 6 years following *Ready-for-Takeover*.
 - .2 Automobile Liability Insurance from the date of commencement of the *Work* until one year after the date of *Ready-for-Takeover*.
 - .3 Unmanned aerial vehicle aircraft, manned aircraft or watercraft Liability Insurance when owned or non-owned manned or unmanned aircraft or watercraft are used directly or indirectly in the performance of the *Work*.
 - .4 "Broad form" property insurance in the joint names of the *Contractor*, the *Owner* and the *Consultant*. The policy shall include as insureds all *Subcontractors*. The "Broad form" property insurance shall be provided from the date of commencement of the *Work* until the earliest of:
 - (1) 10 calendar days after the date of *Ready-for-Takeover*;
 - (2) on the commencement of use or occupancy of any part or section of the *Work* unless such use or occupancy is for construction purposes, habitational, office, banking, convenience store under 465 square metres in area, or parking purposes, or for the installation, testing and commissioning of equipment forming part of the *Work*; and
 - (3) when left unattended for more than 30 consecutive calendar days or when construction activity has ceased for more than 30 consecutive calendar days.
 - .5 Boiler and machinery insurance in the joint names of the *Contractor*, the *Owner* and the *Consultant*. The policy shall include as insureds all *Subcontractors*. The coverage shall be maintained continuously from commencement of use or operation of the boiler and machinery objects insured by the policy and until 10 calendar days after the date of *Ready-for-Takeover*.
 - .6 The "Broad form" property and boiler and machinery policies shall provide that, in the case of a loss or damage, payment shall be made to the *Owner* and the *Contractor* as their respective interests may appear. In the event of loss or damage:
 - (1) the *Contractor* shall act on behalf of the *Owner* for the purpose of adjusting the amount of such loss or damage payment with the insurers. When the extent of the loss or damage is determined, the *Contractor* shall proceed to restore the *Work*. Loss or damage shall not affect the rights and obligations of either party under the *Contract* except

that the *Contractor* shall be entitled to such reasonable extension of *Contract Time* relative to the extent of the loss or damage as the *Consultant* may recommend in consultation with the *Contractor*;

- (2) the *Contractor* shall be entitled to receive from the *Owner*, in addition to the amount due under the *Contract*, the amount which the *Owner's* interest in restoration of the *Work* has been appraised, such amount to be paid as the restoration of the *Work* proceeds in accordance with the progress payment provisions. In addition the *Contractor* shall be entitled to receive from the payments made by the insurer the amount of the *Contractor's* interest in the restoration of the *Work*; and
- (3) to the *Work* arising from the work of the *Owner*, the *Owner's* own forces or *Other Contractors*, the *Owner* shall, in accordance with the *Owner's* obligations under the provisions relating to construction by the *Owner* or *Other Contractors*, pay the *Contractor* the cost of restoring the *Work* as the restoration of the *Work* proceeds and as in accordance with the progress payment provisions.

- .7 *Contractors' Equipment Insurance* from the date of commencement of the *Work* until one year after the date of *Ready-for-Takeover*.
- .8 *Contractors' Pollution Liability Insurance* from the date of commencement of the *Work* until one year after the date of *Ready-for-Takeover*.

- 11.1.2 Prior to commencement of the *Work* and upon the placement, renewal, amendment, or extension of all or any part of the insurance, the *Contractor* shall promptly provide the *Owner* with confirmation of coverage and, if required, a certified true copy of the policies certified by an authorized representative of the insurer together with copies of any amending endorsements applicable to the *Work*.
- 11.1.3 The parties shall pay their share of the deductible amounts in direct proportion to their responsibility in regards to any loss for which the above policies are required to pay, except where such amounts may be excluded by the terms of the *Contract*.
- 11.1.4 If the *Contractor* fails to provide or maintain insurance as required by the *Contract Documents*, then the *Owner* shall have the right to provide and maintain such insurance and give evidence to the *Contractor* and the *Consultant*. The *Contractor* shall pay the cost thereof to the *Owner* on demand or the *Owner* may deduct the cost from the amount which is due or may become due to the *Contractor*.
- 11.1.5 All required insurance policies shall be with insurers licensed to underwrite insurance in the jurisdiction of the *Place of the Work*.
- 11.1.6 If a revised version of CCDC 41 is published, which specifies reduced insurance requirements, the parties shall address such reduction, prior to the *Contractor's* insurance policy becoming due for renewal, and record any agreement in a *Change Order*.
- 11.1.7 If a revised version of CCDC 41 is published, which specifies increased insurance requirements, the *Owner* may request the increased coverage from the *Contractor* by way of a *Change Order*.
- 11.1.8 A *Change Directive* shall not be used to direct a change in the insurance requirements in response to the revision of CCDC 41.

PART 12 OWNER TAKEOVER

GC 12.1 READY-FOR-TAKEOVER

- 12.1.1 The prerequisites to attaining *Ready-for-Takeover* of the *Work* are limited to the following:
 - .1 The *Consultant* has certified or verified the *Substantial Performance of the Work*.
 - .2 Evidence of compliance with the requirements for occupancy or occupancy permit as prescribed by the authorities having jurisdiction.
 - .3 Final cleaning and waste removal at the time of applying for *Ready-for-Takeover*, as required by the *Contract Documents*.
 - .4 The delivery to the *Owner* of such operations and maintenance documents reasonably necessary for immediate operation and maintenance, as required by the *Contract Documents*.
 - .5 Make available a copy of the as-built drawings completed to date on site.
 - .6 Startup, testing required for immediate occupancy, as required by the *Contract Documents*.
 - .7 Ability to secure access to the *Work* has been provided to the *Owner*, if required by the *Contract Documents*.
 - .8 Demonstration and training, as required by the *Contract Documents*, is scheduled by the *Contractor* acting reasonably.
- 12.1.2 If any prerequisites set forth in paragraphs 12.1.1.3 to 12.1.1.6 must be deferred because of conditions reasonably beyond the control of the *Contractor*, or by agreement between the *Owner* and the *Contractor* to do so, *Ready-for-Takeover* shall not be delayed.
- 12.1.3 When the *Contractor* considers that the *Work* is *Ready-for-Takeover*, the *Contractor* shall deliver to the *Consultant* and to the *Owner* a comprehensive list of items to be completed or corrected, together with a written application for *Ready-for-Takeover* for review. Failure to include an item on the list does not alter the responsibility of the *Contractor* to complete the *Contract*.
- 12.1.4 The *Consultant* will review the *Work* to verify the validity of the application and will promptly, and in any event, no later than 10 calendar days after receipt of the *Contractor's* list and application:

- .1 advise the *Contractor* in writing that the *Work* is not *Ready-for-Takeover* and give reasons why, or
- .2 confirm the date of *Ready-for-Takeover* in writing to each of the *Owner* and the *Contractor*.

12.1.5 Immediately following the confirmation of the date of *Ready-for-Takeover*, the *Contractor*, in consultation with the *Consultant*, shall establish a reasonable date for finishing the *Work*.

12.1.6 The provision of GC 12.1 – READY-FOR-TAKEOVER shall be subject to GC 12.2 – EARLY OCCUPANCY BY THE OWNER.

GC 12.2 EARLY OCCUPANCY BY THE OWNER

12.2.1 The *Owner* may take occupancy of a part or the entirety of the *Work* before *Ready-for-Takeover* has been attained only as agreed by the *Contractor* which agreement shall not be unreasonably withheld.

12.2.2 The *Owner* shall not occupy a part or the entirety of the *Work* without prior approval by authorities having jurisdiction.

12.2.3 If the *Owner* takes occupancy of a part of the *Work* before *Ready-for-Takeover* has been attained:

- .1 The part of the *Work* which is occupied shall be deemed to have been taken over by the *Owner* as from the date on which it is occupied.
- .2 The *Contractor* shall cease to be liable for the care of such part as from this date, when responsibility shall pass to the *Owner*.
- .3 The warranty period specified in paragraph 12.3.1 of GC 12.3 – WARRANTY for that part of the *Work* shall start from the date on which it is occupied.

12.2.4 If the *Owner* takes occupancy of the entirety of the *Work* before all the prerequisites are met as described in paragraph 12.1.1 of GC 12.1 – READY-FOR-TAKEOVER, the *Work* shall, subject to the requirements of the applicable lien legislation, be deemed to achieve *Ready-for-Takeover*. This shall not relieve the *Contractor*'s responsibility to complete the *Work* in a timely manner.

GC 12.3 WARRANTY

12.3.1 Except for extended warranties as described in paragraph 12.3.6, the warranty period under the *Contract* is one year from the date when *Ready-for-Takeover* has been attained.

12.3.2 The *Contractor* shall be responsible for the proper performance of the *Work* to the extent that the design and *Contract Documents* permit such performance.

12.3.3 The *Owner*, through the *Consultant*, shall promptly give the *Contractor Notice in Writing* of observed defects and deficiencies which occur during the one year warranty period.

12.3.4 Subject to paragraph 12.3.2, the *Contractor* shall correct promptly, at the *Contractor*'s expense, defects or deficiencies in the *Work* which appear prior to and during the one year warranty period.

12.3.5 The *Contractor* shall correct or pay for damage resulting from corrections made under the requirements of paragraph 12.3.4.

12.3.6 Any extended warranties required beyond the one year warranty period as described in paragraph 12.3.1, shall be as specified in the *Contract Documents*. Extended warranties shall be issued by the warrantor to the benefit of the *Owner*. The *Contractor*'s responsibility with respect to extended warranties shall be limited to obtaining any such extended warranties from the warrantor. The obligations under such extended warranties are solely the responsibilities of the warrantor.

PART 13 INDEMNIFICATION AND WAIVER

GC 13.1 INDEMNIFICATION

13.1.1 Without restricting the parties' obligation to indemnify respecting toxic and hazardous substances, patent fees and defect in title claims all as described in paragraphs 13.1.4 and 13.1.5, the *Owner* and the *Contractor* shall each indemnify and hold harmless the other from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings whether in respect to losses suffered by them or in respect to claims by third parties that arise out of, or are attributable in any respect to their involvement as parties to this *Contract*, provided such claims are:

- .1 caused by:
 - (1) the negligent acts or omissions of the party from whom indemnification is sought or anyone for whose negligent acts or omissions that party is liable, or
 - (2) a failure of the party to the *Contract* from whom indemnification is sought to fulfill its terms or conditions; and
- .2 made by *Notice in Writing* within a period of 6 years from the *Ready-for-Takeover* date or within such shorter period as may be prescribed by any limitation statute of the Province or Territory of the *Place of the Work*.

The parties expressly waive the right to indemnity for claims other than those provided for in this *Contract*.

- 13.1.2 The obligation of either party to indemnify as set forth in paragraph 13.1.1 shall be limited as follows:
- .1 In respect to losses suffered by the *Owner* and the *Contractor* for which insurance is to be provided by either party pursuant to GC 11.1 – INSURANCE, the minimum liability insurance limit for one occurrence, of the applicable insurance policy, as referred to in CCDC 41 in effect at the time of bid closing.
 - .2 In respect to losses suffered by the *Owner* and the *Contractor* for which insurance is not required to be provided by either party in accordance with GC 11.1 – INSURANCE, the greater of the *Contract Price* as recorded in Article A-4 – CONTRACT PRICE or \$2,000,000, but in no event shall the sum be greater than \$20,000,000.
 - .3 In respect to indemnification by a party against the other with respect to losses suffered by them, such obligation shall be restricted to direct loss and damage, and neither party shall have any liability to the other for indirect, consequential, punitive or exemplary damages.
 - .4 In respect to indemnification respecting claims by third parties, the obligation to indemnify is without limit.
- 13.1.3 The obligation of either party to indemnify the other as set forth in paragraphs 13.1.1 and 13.1.2 shall be inclusive of interest and all legal costs.
- 13.1.4 The *Owner* and the *Contractor* shall indemnify and hold harmless the other from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of their obligations described in GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES.
- 13.1.5 The *Owner* shall indemnify and hold harmless the *Contractor* from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings:
- .1 as described in paragraph 10.3.2 of GC 10.3 – PATENT FEES, and
 - .2 arising out of the *Contractor*'s performance of the *Contract* which are attributable to a lack of or defect in title or an alleged lack of or defect in title to the *Place of the Work*.
- 13.1.6 In respect to any claim for indemnity or to be held harmless by the *Owner* or the *Contractor*:
- .1 *Notice in Writing* of such claim shall be given within a reasonable time after the facts upon which such claim is based become known; and
 - .2 should any party be required as a result of its obligation to indemnify another to pay or satisfy a final order, judgment or award made against the party entitled by this contract to be indemnified, then the indemnifying party upon assuming all liability for any costs that might result shall have the right to appeal in the name of the party against whom such final order or judgment has been made until such rights of appeal have been exhausted.

GC 13.2 WAIVER OF CLAIMS

- 13.2.1 Subject to any lien legislation applicable to the *Place of the Work*, the *Contractor* waives and releases the *Owner* from all claims which the *Contractor* has or reasonably ought to have knowledge of that could be advanced by the *Contractor* against the *Owner* under the *Contract*, including, without limitation, those arising from negligence or breach of contract in respect to which the cause of action is based upon acts or omissions which occurred prior to or on the *Ready-for-Takeover* date, except as follows:
- .1 claims arising prior to or on the *Ready-for-Takeover* date for which *Notice in Writing* of claim has been received by the *Owner* from the *Contractor* no later than 5 calendar days before the expiry of the lien period provided by the lien legislation applicable at the *Place of the Work* or 20 calendar days following the *Ready-for-Takeover* date, whichever is later;
 - .2 indemnification for claims advanced against the *Contractor* by third parties for which a right of indemnification may be asserted by the *Contractor* against the *Owner* pursuant to the provisions of this *Contract*;
 - .3 claims respecting toxic and hazardous substances, patent fees and defect in title matters for which a right of indemnity could be asserted by the *Contractor* pursuant to the provisions of paragraphs 13.1.4 or 13.1.5 of GC 13.1 – INDEMNIFICATION; and
 - .4 claims resulting from acts or omissions which occur after the *Ready-for-Takeover* date.
- 13.2.2 The *Contractor* waives and releases the *Owner* from all claims resulting from acts or omissions which occurred after the *Ready-for-Takeover* date except for:
- .1 indemnification respecting third party claims, and claims respecting toxic and hazardous substances, patent fees and defect in title matters, all as referred in paragraphs 13.2.1.2 and 13.2.1.3; and
 - .2 claims for which *Notice in Writing* of claim has been received by the *Owner* from the *Contractor* within 395 calendar days following the *Ready-for-Takeover* date.
- 13.2.3 Subject to any lien legislation applicable to the *Place of the Work*, the *Owner* waives and releases the *Contractor* from all claims which the *Owner* has or reasonably ought to have knowledge of that could be advanced by the *Owner* against the *Contractor* under the *Contract*, including, without limitation, those arising from negligence or breach of contract in respect to which the cause of action is based upon acts or omissions which occurred prior to or on the *Ready-for-Takeover* date, except as follows:
- .1 claims arising prior to or on the *Ready-for-Takeover* date for which *Notice in Writing* of claim has been received by the *Contractor* from the *Owner* no later than 20 calendar days following the *Ready-for-Takeover* date;

- .2 indemnification for claims advanced against the *Owner* by third parties for which a right of indemnification may be asserted by the *Owner* against the *Contractor* pursuant to the provisions of this *Contract*;
 - .3 claims respecting toxic and hazardous substances for which a right of indemnity could be asserted by the *Owner* against the *Contractor* pursuant to the provisions of paragraph 13.1.4 of GC 13.1 – INDEMNIFICATION;
 - .4 damages arising from the *Contractor*'s actions which result in substantial defects or deficiencies in the *Work*. "Substantial defects or deficiencies" mean those defects or deficiencies in the *Work* which affect the *Work* to such an extent or in such a manner that a significant part or the whole of the *Work* is unfit for the purpose intended by the *Contract Documents*;
 - .5 claims arising pursuant to GC 12.3 – WARRANTY; and
 - .6 claims arising from acts or omissions which occur after the *Ready-for-Takeover* date.
- 13.2.4 Respecting claims arising upon substantial defects and deficiencies in the *Work*, as referenced in paragraph 13.2.3.4, and notwithstanding paragraph 13.2.3.5, the *Owner* waives and releases the *Contractor* from all claims except claims for which *Notice in Writing* of claim has been received by the *Contractor* from the *Owner* within a period of six years from the *Ready-for-Takeover* date, provided that any limitation statute of the Province or Territory of the *Place of the Work* permit such agreement. If the applicable limitation statute does not permit such agreement, the time within which any such claim may be brought shall be such shorter period as may be prescribed by any limitation statute of the Province or Territory of the *Place of the Work*.
- 13.2.5 The *Owner* waives and releases the *Contractor* from all claims arising from acts or omissions which occur after the *Ready-for-Takeover* date, except for:
- .1 indemnification for claims advanced against the *Owner* by third parties, as referenced in paragraph 13.2.3.2;
 - .2 claims respecting toxic and hazardous substances for which a right of indemnity could be asserted by the *Owner* against the *Contractor*, as referenced in paragraph 13.2.3.3;
 - .3 claims arising under GC 12.3 – WARRANTY; and
 - .4 claims for which *Notice in Writing* has been received by the *Contractor* from the *Owner* within 395 calendar days following the *Ready-for-Takeover* date.
- 13.2.6 "Notice in Writing of claim" as provided for in GC 13.2 – WAIVER OF CLAIMS to preserve a claim or right of action which would otherwise, by the provisions of GC 13.2 – WAIVER OF CLAIMS, be deemed to be waived, must include the following:
- .1 a clear and unequivocal statement of an intention to claim;
 - .2 a statement as to the nature of the claim and the grounds upon which the claim is based; and
 - .3 a statement of the estimated quantum of the claim.
- 13.2.7 A claim for lien asserted under the lien legislation prevailing at the *Place of the Work* shall qualify as notice of claim for the purposes of this *Contract*.
- 13.2.8 The party giving the *Notice in Writing* of claim as provided for in GC 13.2 – WAIVER OF CLAIMS shall submit within a reasonable time a detailed account of the amount claimed.
- 13.2.9 Where the event or series of events giving rise to a claim made under paragraphs 13.2.1 or 13.2.3 has a continuing effect, the detailed account submitted under paragraph 13.2.8 shall be considered to be an interim account and the party making the claim shall submit further interim accounts, at reasonable intervals, giving the accumulated amount of the claim and any further grounds upon which such claim is based. The party making the claim shall submit a final account after the end of the effects resulting from the event or series of events.
- 13.2.10 Nothing in GC 13.2 – WAIVER OF CLAIMS shall be deemed to affect the rights of the parties under any lien legislation or limitations legislation prevailing at the *Place of the Work*.

1. INTENT

- .1 These Supplementary Specifications modify the specification sections to which they refer.
- .2 The Supplementary Specifications take precedence over the specification to which they refer.

2. CCDC 2 - GENERAL CONDITIONS OF STIPULATED PRICE CONTRACT

GC 2.2 - ROLE OF THE CONSULTANT

- .1 Delete Subsection 2.2.2 and replace with the following:
 - "12 If the Owner and Consultant agree, the Consultant will provide at the site one or more Project Representatives to assist the Consultant in carrying out his duties. Project Representatives are required to see that the provisions of the Contract are faithfully adhered to, especially as regards quality of workmanship and materials. Project Representatives will have the authority to reject work which in their opinion does not conform to the Contract Documents."

GC 5 – PAYMENT

- .1 Add Clause 5.3.2:

"5.3.2 When extra work is to be performed on a cost plus percentage basis, the amount to be paid shall be determined as follows:

 - .1 Labour Rates: shall be those included in a list to be provided by the Contractor as part of this tender. No percentage shall be added to these rates in determining the cost of extra work. Rates are subject to review and will not be accepted unless they are consistent with industry standards for fees for similar labour.
 - .2 Equipment Rates: shall be provided by the Contractor as part of his tender, and no percentage shall be added to them in determining the cost of extra work. Rates are subject to review and will not be accepted unless they are consistent with industry standards for rental of similar equipment.
 - .3 Materials: will be paid for at cost as substantiated by invoices from the suppliers, plus ten (10%) percent to cover handling charges, overhead and profit.
 - .4 Specialist Sub-Contractors' Rates: will be paid for at cost as substantiated by invoices from sub-contractors, plus ten percent (10%) to cover other charges, overhead and profit.
 - .5 Daily Work Orders: shall be completed by the Contractor and signed by his representative and the Project Representative each day for the work completed that day. No claims for extra work will be allowed other than those covered by daily work orders.

- .1 Add the following clause:
- "5.3.3 Contractor to submit a Statutory Declaration with each application for progress payment verifying that there are no outstanding liens, garnishees, attachments or claims relating to the work except for amounts properly retained as a holdback or as an identified amount in dispute."

GC 5.3 - PAYMENT

- .1 Change Subsection 5.3.1 by replacing "10 *calendar days*" with "30 *Days*".

GC 5.4 - SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK

- .1 Replace Subsection 5.4.1 with the following:
- "Holdback monies shall not be released until the Contractor has submitted the following documents, each in a form satisfactory to the Consultant dated after the expiration of sixty days from the date of Substantial Performance of the Work as specified in the Certificate of Substantial Performance issued by the Consultant.
- .1 Statutory Declarations verifying that all liabilities incurred by the Contractor and his Sub-Contractors in carrying out the Work have been paid and there are no outstanding liens, garnishees, attachments or claims relating to the work except for amounts properly retained as a holdback or as an identified amount in dispute.
- .2 A certificate of clearance from the Workers' Compensation Board of the Province in which the Work is being performed certifying the Contractor's compliance with the requirements, if any, of the Workers Compensation Act of the Province in which the Work is being performed, including any payment due thereunder.
- .3 All warranties required under the provision of this contract, whether originating from the Contractor or Sub-Contractors or Suppliers.
- .4 A copy of the Tenderer's current and valid Letter of Good Standing issued jointly by the Nova Scotia Construction Safety Association and the Province of Nova Scotia Department of Labour.
- .5 A Certificate to the Owner by a solicitor qualified to practice law in the Province in which the Work is being performed to the effect that no lien associated with the Work exists against the Owner's property and the Work under the applicable lien legislation of the Province or Provinces in which the Work is being performed.
- .6 A letter of release from the Surety Company.
- .7 Submission of Final Record Drawings."

- .2 Replace Subsection 5.4.3 with the following:

“Subject to the requirements of any Payment Legislation, all holdback amount prescribed by the applicable lien legislation for the Work shall become due and payable to the Contractor no later than 30 Working Days following the expiration of the holdback period stipulated in the lien legislation applicable to the Place of the Work.”

GC 6.4 - CONCEALED OR UNKNOWN CONDITIONS

- .1 Add the following Subsections to Clause 6.4:

- "6.4.5 Utilities of various types as well as structures immediately adjacent to the line of the work have been shown on the Drawings. The locations of these utilities, buildings, and structures are shown using the best information available but no guarantee is given that the locations are absolutely accurate or that utilities or structures other than those shown are not present.
- 6.4.6 The Contractor shall carefully examine the location of the work and make special enquiry of the companies or individuals owning, controlling or operating any services and structures, and determine to his own satisfaction the location of such services and structures. The Contractor shall not make any claims against the Owner for damages or additions to the Work caused or occasioned by his relying upon such information.
- 6.4.7 The Contractor shall, at his own cost and expense, sustain in their places and protect from injury any and all services, structures or property in the vicinity of his work, whether over or underground, or which appear within the excavation, and he shall assume all costs and expenses for damages which may be occasioned by injury to any of them. He shall at all times have sufficient quantity of timber and plank, chains, etc., on the site and shall use the same as required for sheathing or sheet-piling and bracing the sides, roofs and ends of excavations, and for sustaining or supporting any and all the structures that are endangered.

- 6.4.8 If damage of any structure, utility or improvement occurs, even though special precautions have been employed, the Contractor shall be entirely responsible for such damage and all such damage shall be satisfactorily rectified at the Contractor's expense.
- 6.4.9 Should the location or position of any service, utility or other underground structure be such as, in the opinion of the Consultant, to require its removal, realignment or change, or if the locations be such that they intersect a pipe line structure, the work of removal, realignment or change only shall be without cost to the Contractor, but such structure shall be stripped or uncovered, and supported or sustained, by the Contractor, at his own cost and expense, before such removal or before and after such realignment or change, as constituting part of the Contract. The Contractor shall not become entitled to claim any damage or extra compensation from or on account of the presence of such structure or on account of any delay due to removal or rearrangement of the same, but the Contractor shall be entitled to such an extension of the time for completion of the Contract as the Consultant shall decide is equivalent to the time that the work has been delayed by any delay in the removal, realignment or change of any such obstructions."

GC 6.5 - DELAYS

- .1 Add the following Subsection:

- "6.5.6 If, in the opinion of the Consultant, the critical path of the project schedule will be adversely affected by delays in completing the work, the Consultant may order the contractor to employ additional labour and equipment or work overtime at no cost to the owner (except when making up time due to delays of the kinds referred to in clause 6.5.1, 6.5.2 and 6.5.3 hereof) to bring the work back on the contract work schedule. Should the Contractor fail to comply with such orders, the owner shall have the right to employ the required labour and equipment and (except when making up time lost due to delays of the kinds referred to in clauses 6.5.1, 6.5.2 and 6.5.3 hereof) deduct the cost of same from any payment then or thereafter due to the contractor."

GC 9.4 - CONSTRUCTION SAFETY

- .1 Add the following Subsection:

- "9.4.6 The Contractor shall develop and be responsible for the implementation of a comprehensive safety program covering all aspects of the Work. A copy of this program shall be delivered to the Consultant prior to any work being conducted on the project."

Add the following Section

"GC11.2 - CONTRACT SECURITY

- .1 The Contractor shall provide to the Owner Performance, and Labour and Material Payment Bonds, each for fifty percent (50%) of the Total Estimated Contract Price as defined in section

00 41 43.”

3. SECTION 01 10 00 - GENERAL REQUIREMENTS

SUBSECTION 2 - SUMMARY OF WORK

Add the following:

- .2 The work to be completed under this contract is the installation of Owner supplied equipment to expand the capacity of the East Hants WTP. It includes but is not limited to the following:
 - .1 Shipping coordination, delivery acceptance, storage (as needed), inspection and installation of owner supplied pre-engineered packaged water treatment units and appurtenances;
 - .2 Fabrication and installation of miscellaneous steel packages related to the WTP;
 - .3 Supply and installation of all spool pieces, miscellaneous fittings and other appurtenances necessary to integrate the new treatment train;
 - .4 All required interruptions or shut downs to normal plant operation. This shall be coordinated and approved in advance by the Owner.
 - .5 Testing, flushing, cleaning, disinfection and commissioning of new equipment in consultation with the Manufacturer.
 - .6 The provision of integration and programming services to incorporate the new systems into the existing SCADA system owned by the Municipality.
 - .7 All connections of equipment to the existing facility;
 - .8 All related work and incidentals associated with the above work.

SUBSECTION 5 - EXISTING SITE CONDITIONS

- .1 Add the following new Subsection:
 - ".4 Locations of existing buried utilities as indicated on the drawings are approximate only. Contractor is responsible to confirm actual locations of utilities prior to construction. Contractor is to arrange for a representative from Aliant and NSPI to determine whether underground cable exists in the area."

SUBSECTION 8 - RECORD DRAWINGS

- .1 Delete entire Clause and replace with the following:

- "8. **RECORD DRAWINGS** .1 The Consultant can provide two (2) sets of full-size whiteprints for Record Drawings purposes upon request.
 - .2 Maintain Project Record Drawings and record accurately significant deviations from Contract Drawings caused by site conditions and changes ordered by the Consultant.

- .3 Mark changes in red on one set of whiteprints.
- .4 Record following significant deviations:
 - .1 depths of various elements of works in relation to geodetic elevation;
 - .2 horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface features such as foundation corners, etc. to the satisfaction of the Consultant;
 - .3 location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure;
 - .4 field changes of dimensions;
 - .5 other significant deviations which are concealed in construction and cannot be identified by visual inspection.
- .5 Provide a table indicating co-ordinates (northings and eastings) for all valves, pipe fittings, catch basins, manholes, curb stops, pipe stubs and hydrants. Also provide a table containing the inverts of all catch basins and manholes.
- .6 At completion of project and prior to final inspection, neatly transfer records to second set of whiteprints using fine, red marker. Neatly print lettering and number in size to match original. Lines may be drawn free-hand, but shall be neat and accurate.

Add at each Drawing Title Block Note: "AS-RECORDED".
- .7 Submit this set of Record Drawings to the Consultant."

SUBSECTION 11 - DELIVERY OF MATERIALS AND USE OF THE SITE

- .1 Revise Subsection 11.1 to read:
 - ".1 Confine equipment, products, and operations to within the boundaries of roads, specified right-of-way of the Owner, or site limits shown."

SUBSECTION 12 – TRAFFIC CONTROL

.1 Add the following new subsections:

"6 Contractor is to maintain at least single lane access on roads at all times. The Contractor shall comply with the temporary traffic control manual and all other specific requirements stipulated by Nova Scotia Department of Public Works.

.7 The Contractor is responsible for notifying the public and local businesses of traffic interruptions and/or detours. Notices shall include newspaper and radio advisories as well as traffic control signage for the public and direct contact with affected business owners. "

END OF SECTION

PART 1 GENERAL

1.1 Work Covered By the Contract Documents

- .1 Work of this Contract includes, but is not limited to, the mechanical, electrical, process and structural construction and commissioning services for the expansion of the East Hants Water Treatment Plant. This includes adding an additional train to the existing treatment system, with major equipment supplied by the owner. Refer to the project design specifications and drawings for complete scope of work requirements.
- .2 The Contractor is responsible for coordinating delivery, acceptance, unloading, inspection and storage. Report any damage immediately to the Owner in writing, with photos.
- .3 The Contractor will be responsible for purchase, installation, start-up, testing, commissioning and functional performance testing of all systems specified plus the installation, start-up, testing, commissioning and functional performance testing of owner supplied equipment.
- .4 The contractor is responsible for supplying and installing miscellaneous steel packages associated with the new treatment equipment. This includes modification of parts of the process area floor pipe gallery grating, design, supply and installation of a new work platform adjacent to existing DAF #1 and acceptance and installation of the owner supplied steel packages which include a new catwalk section between new DAF #3 and new Filter #4 as well as a work platform mounted to new DAF#3. The contractor is also responsible for the modification of existing catwalk components to allow the installation of the new DAF and Filter units as indicated on the drawings.
- .5 The Contractor is responsible for modifying the existing electrical panel(s) as indicated to power the new treatment equipment and providing cabling and conduit runs and terminations as indicated on the drawings.
- .6 The existing water treatment plant must remain fully operational throughout the construction. The Contractor will be responsible for providing a sufficient workforce to provide services to complete the project.
- .7 The Contractor is responsible for coordinating shutdowns/interruptions with the Owner's approval, and connecting to existing piping, controls or electrical features. The Contractor shall be responsible for reviewing and following any safe-work procedures provided by the Owner or Equipment Manufacturer relating to their scope of supply.
- .8 The Contractor shall provide a detailed, site-specific safety plan regarding the work required and shall provide all required testing and cleaning required to mitigate risks identified within the Contractor's safety plan.
- .9 The Work generally includes Mechanical, Electrical and Structural whom will be engaged by this Contractor. The Work also includes connecting to existing equipment/piping, which shall be completed under this Contract.

- .10 The Contractor is responsible for providing security within their area of work.
- .11 The Contractor shall prepare for review a comprehensive overall commissioning plan and schedule in direct consultation with the Manufacturer and Operator.

1.2 CONTRACT METHOD

- .1 Refer to Division 00.

1.3 Work By Others

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from the Engineer.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends on its proper execution or result upon work of another Contractor, report promptly to Engineer, in writing, any defects which may interfere with proper execution of Work.

1.4 Work Sequence

- .1 Construct Work in a single phase. Co-ordinate with the Owner in terms of shut-down(s), parking and other policies in force on the job site during construction.
- .2 Minimize disruption and disturbance.
- .3 All Contractor work to be done during regular Construction working hours (i.e.: Monday to Friday from 0700 to 1700 hours), except where specifically identified within the scope of work summary or in the contract documents, such as during plant shut downs.
- .4 Coordinate work with the Owner for off-hours Work during the evenings, early morning hours, on the weekends (i.e.; Saturday and/or Sunday) and/or during Holidays.
- .5 Co-ordinate Progress Schedule and co-ordinate with the Owner during construction.
- .6 Maintain fire access/control.
- .7 Clean job-site daily. Be responsible for all construction related debris. Secure all work and maintain a safe job-site.

1.5 Contractor Use of Premises

- .1 Limit use of premises for Work, for storage and for access, to allow:
 - .1 Owner occupancy.
 - .2 Work by other Contractors.
- .2 Co-ordinate use of premises under direction of Owner.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations or adjoining work, as directed by Owner.
- .6 At completion of operations condition of existing work shall be the same which existed before new work started.

1.6 Co-Operation with the Ongoing Plant Operation

- .1 Co-operate with the Owner with respect to Work scheduling and operations to minimize conflict and to facilitate the Owner's usage of the existing treatment facility.

1.7 Alterations, Additions and/or Repairs

- .1 Execute work with least possible interference or disturbance to the existing treatment facility operations. Co-ordinate the Work with the Owner to facilitate execution of the Work.
- .2 Accept liability for damage, safety of equipment and over-loading of existing equipment.

1.8 Existing Services

- .1 Notify the Owner of intended interruption of services and obtain required permission prior to interruption.
- .2 Where Work involves breaking into or connecting to existing services, give Owner 48 business hours advanced notice for necessary interruption of mechanical and/or electrical service throughout the course of the Work. Minimize duration of interruptions. Carry out Work at times as directed by the Owner with minimum disturbance to operations.
- .3 Maintain accessibility to the existing treatment facility at all times.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify the Owner of findings.
- .5 Submit schedule to and obtain approval from the Owner for any shut-down or closure of active service or facility including water, power, and/or steam. Adhere to approved schedule and provide notice to affected parties.
- .6 Where unknown services are encountered, immediately advise the Engineer. Confirm findings in writing.
- .7 Protect, relocate or maintain the remaining existing active services. When inactive services are encountered, cap off in manner approved by the Engineer.
- .8 Record locations of maintained, re-routed and abandoned service lines.

1.9 Documents Required

- .1 Maintain at job site, one (1) copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other Modifications to Contract.
 - .8 Field Test Reports.
 - .9 Copy of Approved Work Schedule.
 - .10 Health and Safety Plan and Other Safety Related Documents.
 - .11 Other documents as specified.

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 Access and Egress

- .1 Maintain "access to" and "egress from" work areas, including relevant equipment rooms, as directed by the Owner and in accordance with relevant Municipal, Provincial, Federal and/or other regulations.

1.2 Use of Site and Facilities

- .1 The site is an active municipal water treatment facility. Work under this Contract shall not interfere with existing operations unless required and approved by the Owner in advance. Some aspects of the work, e.g. connections to existing, may need to take place during off-hours based on community water demand and plant operation.
- .2 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Owner to facilitate work as stated.
- .3 Maintain existing access to and from for authorized personnel and vehicle access.
- .4 The Owner will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Accept liability for damage, safety of equipment and overloading of existing equipment.
- .6 Closures: protect work temporarily until permanent enclosures are completed.
- .7 Parking spaces are limited on-site. Coordinate the number of vehicles permitted with the Owner.

1.3 Alterations, Additions or Repairs to Existing Building

- .1 Execute work with least possible interference or disturbance to water treatment plant operations, occupants, public and normal use of premises. Coordinate the Work with the Owner to facilitate execution of the Work.

1.4 Existing Services

- .1 Notify the Owner of intended interruption of services and obtain required permission prior to the interruption.
- .2 Where Work involves breaking into or connecting to existing services, give the Owner 5 business days' of notice for necessary interruption throughout course of work. Keep duration of interruptions to a minimum.
- .3 Construct barriers in accordance with Section 01 56 00 Temporary Barriers and Enclosures.

1.5 Special Requirements

- .1 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .2 Keep within limits of work and avenues of ingress and egress.

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 Related Sections

- .1 Section 01 78 24 – Record Drawings.

1.2 Administrative

- .1 Submit to Engineer one electronic (PDF) copy of submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable. Review submittals prior to submission to Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .5 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Verify field measurements and affected adjacent Work are co-ordinated.
- .7 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer review.
- .9 Keep one reviewed copy of each submission on-site.

1.3 Shop Drawings and Product Data

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Nova Scotia where required.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment,

indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

- .4 Allow 10 days for Engineer's review of each submission.
- .5 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .6 Make changes in shop drawings as Engineer may require. When resubmitting, notify Engineer in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .4 Subcontractor:
 - .1 Supplier.
 - .2 Manufacturer.
 - .5 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .6 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Engineer's review, distribute copies.

- .10 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Engineer may reasonably request.
- .11 Submit one (1) electronic of test reports for requirements requested in specification Sections and as requested by Engineer:
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within three (3) years of date of contract award for project.
- .12 Submit one (1) electronic copy of certificates for requirements requested in specification Sections and as requested by Engineer:
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .13 Submit one (1) electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Engineer:
 - .1 Information describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .14 Submit one (1) electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Engineer:
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .15 One electronic of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Engineer.
- .16 Delete information not applicable to project.
- .17 Supplement standard information to provide details applicable to project.
- .18 If upon review by Engineer, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.4 **Samples**

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

- .2 Deliver samples prepaid to Engineer's office.
- .3 Notify Engineer in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .6 Make changes in samples which Engineer may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.5 **Certificates and Transcripts**

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

END OF SECTION

PART 1 GENERAL

1.1 Construction Safety Measures

- .1 Safety is the Contractor's responsibility. The Contractor will be the "Constructor" as defined in the Occupational Health and Safety Act.
- .2 Observe and enforce construction safety measures of National Building Code, latest edition, Part 8, Provincial Government, Workplace Safety & Insurance Board, municipal statutes, WHMIS and local authorities.
- .3 Before any work at the site is started, the Contractor shall have prepared a Health and Safety Plan and Manual for project specific health and safety precautions and programs, safety of property on site, and for protection of persons adjacent to site and environment to the extent that they may be affected by conduct of Work (in accordance with Article 6 of the Project Agreement and Schedule V). The plan shall be complete with respect to procedures and actions that the Contractor needs to follow in order for the Contractor and all others to comply with all applicable laws and regulations.
- .4 Contractor to comply with and enforce compliance by employees of Contract Documents, applicable federal, provincial, territorial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan and Manual and all other specific Owner's requirements.
- .5 The Contractor shall designate a qualified and experienced safety representative at the site.

1.2 Submittals

- .1 Make submittals in accordance with **Section 01 33 00 - Submittal Procedures**.
- .2 Submit site-specific Health and Safety Plan and Manual to Owner: Not later than 30 days following the Commercial Close Date, within seven days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan and Manual must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
 - .3 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to Owner and authority having jurisdiction, weekly.
 - .4 Submit copies of reports or directions issued by Provincial health and safety inspectors.
 - .5 Submit copies of incident and accident reports.
 - .6 Contractor to maintain up-to-date WHMIS MSDS - Material Safety Data Sheets on site in an area accessible to working staff, the Engineer, and the Owner.

- .7 Owner's Engineer will review Contractor's site-specific Health and Safety Plan and Manual and provide comments to Contractor within ten business days of receipt. Revise plan as appropriate and resubmit plan to Owner's Engineer for acceptance.
- .8 Owner's Engineer review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Engineer.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 Filing of Notice

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

1.4 Safety Assessment and Meetings

- .1 Perform site specific safety hazard assessment related to project.
- .2 Schedule and administer Health and Safety meeting with staff and Engineer prior to commencement of Work.
- .3 Do Work in accordance with Regulatory Requirements.

1.5 Unforeseen Hazards

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur 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 and advise Engineer verbally and in writing.

1.6 Correction of Non-Compliance

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

1.7 Fire Safety Requirements

- .1 Implement and follow fire safety measures during work. Comply with the following:
 - .1 National Fire Code, 2020.
 - .2 Fire Protection Standards PCC 301, Standard for Construction Operations and FCC 302, Standard for Welding and Cutting as issued by the Fire Protection Services of Human Resources Development Canada.
 - .3 Federal and Provincial Occupational Health and Safety Acts and Regulations.
- .2 In event of conflict between any provisions of above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Engineer will advise on the course of action to be followed.

1.8 Overloading

- .1 Ensure no part of Work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.9 Falsework

- .1 Design and construct falsework in accordance with CSA S269.1 1975, latest edition and Division 3 of these Specifications.
- .2 All falsework design shall be certified by a Professional Engineer licensed to practice in the Northwest Territories.

1.10 Scaffolding

- .1 Design and construct scaffolding in accordance with CSA S269.2 M87 (R2003), latest edition.
- .2 The Shop Drawings shall be submitted to the Engineer and shall include Detail Drawings and Design Calculations for scaffolding. The Engineer will not be responsible for review of scaffolding.
- .3 The Detail Drawings and Design Calculations for scaffolding shall bear the signature and stamp of a Professional Engineer registered in the Northwest Territories, and experienced in scaffolding design.
- .4 The Professional Engineer, whose signature and seal appear on the Detail Design Drawings and Design Calculations, shall inspect and check the completed scaffolding and certify in writing that the scaffolding is in accordance with Calculations and Drawings submitted to the Engineer.
- .5 The scaffolding shall be re-inspected after any change in detail or placement to ensure that it is properly placed, rigid, and secure before commencing work. Each re-inspection

will be certified by the Professional Engineer whose signature and seal appear on the Calculations and Drawings.

- .6 Submit such certifications to the Engineer before commencing work.

1.11 Materials on Site

- .1 Comply with WHMIS requirements regarding all materials stored on site. Submit safety data sheets to Contractor prior to shipping materials.

1.12 Confined Space Entry

- .1 In a confined space in which there is likely to exist a hazardous gas, vapor, dust, fumes or oxygen deficiency, the worker must first test and record atmosphere conditions in the confined space, wear breathing apparatus and safety harness when entering and monitor atmosphere at all times while working in the confined space.
- .2 At no time will an employee enter a confined space where a hazardous condition exists, without first notifying the supervisor and following the adopted procedure.
- .3 The following procedures will apply to all confined spaces and/or areas where a potential hazard could exist:
 - .1 Do not enter confined space areas where the safety equipment supplied is not suitable or available.
 - .2 Comply with Regional Safety Specifications.

END OF SECTION

PART 1 GENERAL

1.1 Fires

- .1 Fires and burning of rubbish on site is not permitted.

1.2 Disposal of Wastes

- .1 Do not bury rubbish and waste materials on site unless approved by Engineer.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.3 Drainage

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances with use of siltation fences, sedimentation ponds, diversion ditches, silt curtains, sedimentation blankets, slope stabilization and the like, all in accordance with required environmental regulations and permits.

1.4 Site Clearing and Plant Protection

- .1 Protect trees and plants on site and on adjacent properties.
- .2 Minimize stripping of topsoil and vegetation.
- .3 Minimize disruption to active layer.
- .4 Restrict tree removal to areas indicated or designated by Engineer.

1.5 Work Adjacent To Waterways

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in to waterways.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.

1.6 Pollution Control

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

END OF SECTION

PART 1 GENERAL

1.1 Submittals

- .1 Submittals: in accordance with **Section 01 33 00 – Shop Drawings and Submittals.**

1.2 Inspection

- .1 Allow Engineer access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Engineer's instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Engineer will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner shall pay cost of examination and replacement.

1.3 Independent Inspection Agencies

- .1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Contractor.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Engineer. Pay costs for retesting and re-inspection.

1.4 Access to Work

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.5 Procedures

- .1 Notify appropriate agency and Engineer in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 Rejected Work

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Engineer as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.

1.7 Reports

- .1 Submit copies of inspection and test reports to Engineer.
- .2 Provide copies to subcontractor, manufacturer, or fabricator of work being inspected or tested.

1.8 Tests and Mix Designs

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Engineer and may be authorized as recoverable.

1.9 Mock-Ups

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Engineer.
- .3 Prepare mock-ups for Engineer's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Engineer will assist in preparing schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Engineer.
- .7 Mock-ups may remain as part of Work.
- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.10 Mill Tests

- .1 Submit mill test certificates as required of specification Sections or as requested by Engineer.

1.11 Equipment and Systems

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to relevant Sections for definitive requirements.

PART 2 PRODUCTS

2.1 This Section Is Not Applicable

PART 3 EXECUTION

3.1 This Section Is Not Applicable

END OF SECTION

PART 1 GENERAL

1.1 References

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Engineer reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be borne by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 Quality

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .4 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 Availability

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Engineer of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Engineer at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Engineer reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 Storage, Handling and Protection

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of the Engineer.
- .9 Touch-up damaged factory finished surfaces to Engineer's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 Transportation

- .1 Pay costs of transportation of products required in performance of Work.

1.6 Manufacturer's Instructions

- .1 Unless otherwise indicated in the specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Engineer in writing, of conflicts between specifications and manufacturer's instructions, so that Engineer will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Engineer to require removal and re-installation at no increase in Contract Price or Contract Time.
- .4 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Engineer if required Work is such as to make it impractical to produce required results.

- .5 Do not employ anyone unskilled in their required duties. Engineer reserves right to require dismissal from site, workers deemed incompetent or careless.
- .6 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Engineer, whose decision is final.

1.7 Co-ordination

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.8 Concealment

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Engineer if there is interference.

1.9 Remedial Work

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.10 Location of Fixtures

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Engineer of conflicting installation. Install as directed.

1.11 Fastenings

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Use No. 304 stainless steel fasteners for interior work.
- .5 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

- .6 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .7 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.12 Fastenings - 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 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.13 Protection of Work In Progress

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Engineer.

1.14 Existing Utilities

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

PART 2 PRODUCTS

2.1 Not Used

PART 3 EXECUTION

3.1 Not Used

END OF SECTION

PART 1 GENERAL

1.1 Waste Processing Sites

- .1 Comply with applicable regulatory requirements when disposing of waste materials. Refer to clause 18.3 of the Owner's Bylaw IO-400. This clause states that all waste material generated within the Municipality has to be disposed of within the boundaries of the Municipality.

1.2 Storage, Handling and Protection

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Engineer.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Engineer.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities:
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Provide waybills for separated materials.

1.3 Disposal of Wastes

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner, or excavation material into waterways, storm, or sanitary sewers.
- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .4 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.
- .5 Dispose of waste in accordance with Municipal and Provincial regulations.

1.4 Use of Site and Facilities

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility and provide temporary security measures approved by Engineer as required.

1.5 Scheduling

- .1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

PART 2 **PRODUCTS**

2.1 This Section is not applicable

PART 3 **EXECUTION**

3.1 Unit/Component/Subsection

3.2 Application

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.3 Cleaning

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

PART 1 GENERAL

1.1 Work Included

- .1 This section specifies requirements for cleaning and disposal of waste at the site.

1.2 General

- .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .3 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

1.3 Materials

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

1.4 Cleaning During Construction

- .1 Provide on-site containers for collection of waste materials, and debris.
- .2 Dispose of waste materials off-site.
- .3 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.5 Final Cleaning

- .1 Remove grease, dust dirt, stains, labels, fingerprints, and other foreign materials, from interior and exterior finished surfaces including glass, piping, equipment and other polished surfaces.
- .2 Clean lighting reflectors, lenses, and other lighting surfaces.
- .3 Broom clean paved surfaces; rake clean other surfaces of grounds.
- .4 Remove debris and surplus materials from crawl areas and accessible concealed spaces.
- .5 Remove snow and ice from access to building.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

- .1 Section 01 78 00 Closeout Submittals.

1.2 Inspection and Declaration

- .1 Contractor's Inspection: Contractor and Sub-contractors: conduct inspection of work, identify deficiencies and defects, and repair as required to conform to Contract Documents:
 - .1 Notify the Engineer in writing of satisfactory completion of Contractor's Inspection and that corrections have been made and deficiencies rectified.
 - .2 Request the Engineer's Inspection.
- .2 Engineer's Inspection: the Engineer and the Contractor will perform inspection of work to identify obvious defects or deficiencies. Contractor to correct work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by the various Authorities Having Jurisdiction (AHJ) have been submitted.
 - .5 Operation of systems have been demonstrated to the Engineer.
 - .6 Work is complete and ready for final inspection.
- .4 Final Inspection: When items noted above are completed, request final inspection of work by the Engineer. If Work is deemed incomplete by the Engineer, complete outstanding items and request re-inspection.
- .5 Notwithstanding the General Conditions, the Contractor's attention is drawn to the fact that the Engineer will not issue an Interim Certificate of completion until such time that Contractor performs following work and/or turns over to Engineer specified documents.
 - .1 Project record "As-Built" documents.
 - .2 Final operations and maintenance manuals.
 - .3 Maintenance materials, parts and tools.
 - .4 Certificates of test and test results.
 - .5 Training complete with related manuals.
 - .6 Manufacturer's Guarantee Certificates.
 - .7 Commissioning and support documents.

1.3 Cleaning

- .1 In accordance with Section 01 74 23 Final Cleaning.
- .2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 35 50 Waste Management and Disposal.

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 Record Drawings

- .1 Engineer will provide two sets of whiteprints for Record Drawing purposes.
- .2 Maintain project “As-Built” Record Drawings and record accurately deviations from Contract Documents caused by site conditions and changes ordered by the Engineer.
- .3 Mark “As-Built” changes in red-coloured ink on one set of whiteprints.
- .4 Record following significant deviations:
 - .1 Depths of various elements of foundation in relation to floor level.
 - .2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
 - .3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by Change Order or Field Order.
 - .6 Other significant deviations which are concealed in construction and cannot be identified by visual inspection.
 - .7 Electrical Contractor to indicate on “As-Built” Drawings all conduit runs as installed, including conduit sizes, number of wires, and percentage of fill.
- .5 At completion of project and prior to final inspection, neatly transfer “As-Built” notations to second set of whiteprints using fine red marker. Neatly print lettering and number in size to match original. Lines may be drawn free-hand, but shall be neat and accurate. Add at each Drawing Title Block Note: “AS-BUILT RECORD”. Also circle on List of Drawings each title and number of Drawing marked with “As-Built” records.
- .6 Submit this set of “As-Built” Record Drawings to the Engineer.

1.2 Photographs

- .1 Take sets of photographs during the Contract. The first set of photographs shall be taken prior to commencement of construction and the final set following completion of the project. Intermediate sets shall be taken at least once every month and at major milestones in construction. A minimum of three intermediate photo sets shall be taken.
- .2 Provide photographs to the Engineer. Digital photographs will be accepted provided they are taken at a resolution of 4 megapixel or greater. Digital photographs or prints shall be identified with the date of taking and the name of the job and the name of the Contractor.
- .3 Submit progress photographs to the Engineer with each monthly status report that includes application for payment.

PART 2 **PRODUCTS**

2.1 **This section does not apply**

PART 3 **EXECUTION**

3.1 **This section does not apply**

END OF SECTION

PART 1 GENERAL

1.1 Description

- .1 This Section specifies requirements for testing, start up, commissioning and trial operations of the works. The Contractor shall coordinate these works with the Engineer and the equipment manufacturers.

1.2 Definitions

- .1 Testing: Testing shall consist of hydrostatic, pressure, pumping, or other tests as described in the Specifications. Testing shall also include all instrumentation and controls for the operation of the facility. Coordinate such works with the equipment manufacturer. Test results shall be documented.
- .2 Start up: Start up for each individual piece of equipment shall consist of the manufacturer's representative inspecting the installation, starting and running the equipment and making any adjustments. Start up for each piece of equipment shall be considered complete when the Engineer is notified, in writing, by the manufacturer's representative that the equipment is installed, checked and in working order and ready to be put in continuous operation.
- .3 Commissioning: Commissioning shall consist of placing individual pieces of equipment and/or process subsystems into continuous operation. During commissioning equipment shall be verified for mechanical, electrical, and control conformance with the Specifications. Commissioning shall be deemed complete when the Engineer receives notification that the system is ready for trial operation.
- .4 Trial operation: Trial operation shall consist of placing all of the various systems of the works into continuous operation. Once all systems are on line and working as a complete unit, the system will be operated continuously for seven (7) days. Trial operation shall be deemed complete after the works have been operating continuously for seven (7) days, and all process, mechanical, electrical, and instrumentation and controls equipment is free of vibration, overloading and overheating, and is functioning in accordance with specified rates, methods and performance.
- .5 Special equipment performance test requirements may exceed commissioning and trial operations as outlined above.

1.3 Submittals

- .1 The contractor shall submit to the engineer in writing a start-up report indicating, at a minimum, the following:
 - .1 Manufactures requirements.
 - .2 Approval of successful start-up by the manufacturer and the supplier.

- .3 Dates of all tests and results indicating flows, loads, pressures, currents, temperatures, etc.
- .2 The Contractor shall provide a detailed written description of the procedures he plans to follow for the start up on each system, including methods of calibration, flow routes, tests, and personnel involved. This procedure shall be submitted to the Engineer at least four weeks prior to startup of the systems.
- .3 The Contractor and Engineer shall together prepare a written procedure for commissioning and trial operations of the works. The Contractor shall accept the direction and coordination assistance of the Engineer for both commissioning and trial operation.
- .4 Start up, commissioning and trial operations shall not commence until the procedure has been approved by the Engineer.
- .5 Provide advance notice (3 business days) to the Engineer before the testing and startup of each system.

1.4 Responsibility

- .1 The Contractor shall be responsible for testing, start up, commissioning and trial operation. The Engineer will witness testing and start up.
- .2 The operating authority shall be responsible for system operation and monitoring during Trial Operations. The Contractor shall be expected to respond to calls from the Owner when system faults, alarms, or problems are identified during the trial operation. The Trial operation period will be restarted once all identified issues have been addressed.

PART 2 PRODUCTS

2.1 Not required

PART 3 EXECUTION

3.1 Testing and Start-up

- .1 When equipment installation has been completed by the Contractor to standards indicated by the Specifications and instructions by the Equipment Manufacturers, the Contractor shall arrange for the services of the Equipment Manufacturer's Technical Representative.
- .2 The Equipment Manufacturer's Technical Representative shall inspect the installation to ensure that the equipment has been installed in accordance with the manufacturer's requirements. If the installation is not in order, the Contractor shall make adjustments in accordance with instructions of the Equipment Manufacturer's Technical Representative. The equipment shall be started and run, and adjustments made at this time.

- .3 Calibrate, test and operate the works for trial operation. Following satisfactory start up, the Manufacturer's Technical Representative shall advise the Engineer, in writing, that the installation has been installed, checked and is in working order.

3.2 Commissioning and Trial Operations

- .1 The Engineer will request that the equipment be operated to demonstrate that it performs as specified. If the Engineer notes deficiencies, the deficiency shall be corrected immediately by the Contractor. The Contractor shall advise the Engineer, in writing, when the deficiencies have been corrected.
- .2 Deficiencies of a serious nature, as determined by the Engineer, shall be corrected by the Manufacturer's Representative.
- .3 The Contractor and Engineer shall jointly commission the works in accordance with the written procedure for commissioning. The Contractor shall provide sufficient manpower for the duration of the commissioning period. The Contractor shall make necessary adjustments during commissioning to put the works into continuous operation.
- .4 Commissioning will not commence until all Construction Completion Certificates (CCC) are issued for all systems.
- .5 During the trial operation period, the Contractor shall provide the manpower necessary to respond to calls from the Owner to maintain the works in operation outside normal working hours to ensure continuous operation of the works.
- .6 The Contractor shall demonstrate and simulate failures and ensure all alarms and safety features perform to the expectations.
- .7 The works will be considered substantially complete and ready for use at the end of the Trial Operation Period provided the 7-day running test has been satisfactorily completed and all other requirements of the Construction Lien Act have been met.

3.3 Construction Completion Certificate

- .1 The Contractor shall be required to prepare and use a Construction Completion Certificate (CCC) for each system of the works.
- .2 The CCC shall include the following:
 - .1 Description of system.
 - .2 Test results including areas for the Engineer's and Contractor's Signature.
 - .3 Test deficiencies.
 - .4 Start-up results including areas for the Engineer's and Contractor's signature.
 - .5 Start-up deficiencies.
 - .6 Instrument Calibration Sheets (as commissioned).

- .7 The CCC shall include, as attachments, records such as Suppliers' Representatives' Reports, Alignment Reports, instrumentation loop checks, as well as any other relevant information.

END OF SECTION

PART 1 GENERAL

1.1 Reference Standard

- .1 Welding work in accordance with CSA W59-1989 (R1998) by companies certified by Canadian Welding Bureau (CWB) with CSA W47.1-92 (R1998) for Division 1 or Division 2.

1.2 Samples

- .1 Submit samples of materials specified herein for approval to the Engineer upon request.

1.3 Shop Drawings

- .1 Submit Shop Drawings in accordance with **Section 01 33 00**.
- .2 Show general arrangement, details of construction, fabrication and installation of all components of the work.
- .3 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number and type of anchors, supports, reinforcement, details, and accessories.

1.4 Design Requirements

- .1 For design and details of stairs, railings, guards and significant metal fabrications, submit Shop Drawings stamped and signed by a qualified Professional Engineer, licensed in the Province of Nova Scotia, and experienced in structural design.

PART 2 PRODUCTS

2.1 Materials

- .1 Comply with the relevant CSA Specifications, and ensure materials are free from scale, buckles, pits and other defects.
- .2 Use only new materials of the best commercial quality for the purpose intended and with the necessary structural properties to safely withstand or sustain stresses to which they will be normally subjected.
- .3 The kind or type of finish of materials shall be in strict accordance to that hereinafter specified and equal in all respects to samples provided for approval.
- .4 Welding materials: to CSA W59-1989 (R1998) for steel, and CSA CAN3-S157 M83.

- .5 Structural steel shapes: to CSA G40.21-98 Grade 350W, HSS members shall be Grade 350, Class C.
- .6 Structural steel plates: to CSA G40.21-98 Grade 300W.
- .7 Structural aluminum: to 6063-T6 or 6351-T6 alloy, mill finish, unless otherwise specified.
- .8 Weld aluminum that is to be anodized later with aluminum alloy 5356 welding rod.
- .9 Stainless steel for all miscellaneous steel fabrications: Type 316L, unless otherwise noted.
- .10 Weld stainless steel to standard mild steel using stainless steel electrodes.
- .11 Grout: non-shrink, non-metallic, flowable, 24 hour, MPa 15, pull-out strength 7.9 MPa.
- .12 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181-99.

2.2 Galvanizing

- .1 Hot-dipped galvanizing with a minimum coating of 610 g/mof zinc in accordance with CSA G164-M92 (R1998).
- .2 All aluminum required to be hot-dipped galvanized and later painted shall have an unpassivated surface treatment or wipe coat treatment, depending on location and use of the steel.
- .3 Aluminum required to be hot-dipped galvanized, but not to be painted, may be supplied with the standard passivated treatment.

2.3 Protection From Corrosion

- .1 Paint all aluminum work embedded in or in contact with concrete with two coats of an approved bituminous paint.
- .2 Prevent contact of aluminum and steel by:
 - .1 Coating contact areas with aluminum impregnated caulking compound immediately prior to assembly, or
 - .2 Installing a synthetic rubber gasket or nylon washer between aluminum and steel.

2.4 Concrete Anchors

- .1 For securing metal fabrications to concrete and masonry surfaces, use Hilti "Kwik-Bolt" or Molly "Parabolt" type stainless steel anchors of size and spacing suitable to maintain the design loading requirements for the item.

2.5 Anchor Bolts

- .1 Anchor bolts and nuts shall be supplied for all equipment and appurtenances and shall be of adequate number and design for the service intended.
- .2 Anchor bolts and nuts shall be of low carbon steel to ASTM A 307-00 and shall be cadmium-plated. Threads shall be American Standard. Bending and configurations shall be as shown on the Drawings or as recommended by the Equipment Supplier. The Engineer may approve the use of expansion shields in certain applications.
- .3 Expansion shields shall be long standard, zinc alloy type with stainless steel bolts, "Star Loxin" as manufactured by Star Expansion Industries Corporation, or Engineer-approved equal.
- .4 Colours for wall guards and end caps as selected by the Engineer from the manufacturer's standards.

2.6 Aluminum Platform Framing

- .1 Supply and install aluminum framed platform, with provisions for fixed and hinged aluminum grating sections as indicated on the Drawings.
- .2 Fabricate platform framing of mill finished structural aluminum sections and to landing sizes indicated. Grind welds smooth.
- .3 Include aluminum pipe safety posts and chains as indicated on the Drawings.
- .4 Fabricate posts of standard weight ANSI Schedule 40 aluminum pipe, 48.3 mm od, mill finish, to height indicated.
- .5 Cap top and bottom of posts with welded aluminum plate of same od as posts, and securely weld posts to face of platform framing.
- .6 Fabricate aluminum safety chains of properly sized links with aluminum or stainless steel snap hooks at one end, and fixed eyes on posts at opposite ends.
- .7 Anchor chains at top of posts and at mid-height above grating level with minimum sag.
- .8 Remove all burrs and sharp edges, grind welds and buff smooth.
- .9 Secure platform rigidly in place using stainless steel anchors in concrete as required to safely accommodate design loadings.

2.7 Aluminum Angle Framing

- .1 Provide aluminum angle framing where cast in or bolted to concrete, to support aluminum grating or checker plate in locations shown on the Drawings.

- .2 Angle framing: to size and profile indicated, continuously along perimeter of gratings and checker plate. Assemblies to include:
 - .1 Welded anchors as shown on the Drawings.
 - .2 Mitred and welded corners to form square, level and rigid units with exposed welds ground flush and smooth.
 - .3 Running lengths straight and true without twists or warps. Butt ends square smooth and free of burrs.
 - .4 Aluminum bar welded to horizontal leg of framing angle to provide stop for grating or checker plate.
 - .5 Bituminous coating on sides of frames in contact with concrete.

2.8 Aluminum Grating

- .1 Supply and install aluminum grating where indicated on the Drawings.
- .2 Grating: Borden Metal Type B, Fisher and Ludlow Series GAL, or Engineer-approved equal, of pressure locked aluminum construction with [plain] [serrated] bearing bars, mill finish.
- .3 Fabricate grating sections to required configurations. Weld continuous aluminum banding to ends of bearing bars, and buff all welds smooth.
- .4 Secure grating sections on supporting frames with aluminum or stainless steel saddle clips and bolts.
- .5 Fabricate hinged sections of gratings to sizes and details indicated. Provide suitable latches to hold hinged grating sections in full open position.
- .6 Provide 3 mm diameter stainless steel lifting cables suitably tied to grating covers on sumps where indicated, and anchor other end of cable to stainless steel eye-bolt mounted at required height.

PART 3 EXECUTION

3.1 Workmanship

- .1 All work shall be, as far as possible, fitted and shop assembled ready for erection, executed in strict accordance with reviewed Shop Drawings.
- .2 Fabricate and erect all items true to dimensions, square, straight, plumb and level.
- .3 Joints and intersections shall be substantially constructed, closely fitted and securely anchored.
- .4 Anchorage systems shall be to the best standard methods and as approved.

- .5 For close fit, actual field measurements shall be taken prior to fabrication.
- .6 All anchors, braces, hangers and fixings required to complete this work or joined to others, shall be installed, carefully fitted and secured.
- .7 All exposed surfaces shall be finished smooth with even close joints and neat, moisture-excluding connections.

3.2 Shop Painting

- .1 Material to be thoroughly cleaned, and given a minimum of one coat of primer before leaving the shop.
- .2 Parts inaccessible shall receive a second coat before erection.
- .3 After installation, all metalwork shall be cleaned and all damaged paint areas shall be touched up ready for finishing.

3.3 Isolation Joints

- .1 All contact surfaces, e.g., bolted connections between dissimilar materials, shall be isolated using approved neoprene or nylon gaskets, washers or sleeves.

3.4 Erection

- .1 Notify and direct other trades of any preparations necessary, and supply materials to be built in by others for attachment of this work. Provide templates where required for proper setting of built-in items.
- .2 Supply and install materials at such time that no delays occur.
- .3 Erect metalwork square, plumb, straight and true, accurately fitted, and with tight joints and intersections.
- .4 Provide suitable and acceptable means of anchorage, to suit design requirements and Engineer's approval.
- .5 Fasteners located in chambers, reservoirs, tanks, pumping stations, etc., shall be Type 316 stainless steel.
- .6 Touch up damaged galvanized surfaces with colour matched zinc rich primer.

END OF SECTION

PART 1 GENERAL

1.1 Summary

- .1 Section Includes:
 - .1 General requirements that are common to NMS sections found in **Section 26 – Electrical**.

1.2 References

- .1 Canadian Standards Association (CSA International):
 - .1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
 - .2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
 - .3 CSA C22.3 No. 1, Overhead Systems.
 - .4 CSA C22.3 No. 7, Underground Systems.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC):
 - .1 EEMAC 2Y-1, Light Gray Colour for Indoor Switch Gear.
 - .2 EEMAC Y1-2, Performance Specification for Finishing Systems for Outdoor Electrical Equipment.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
 - .1 Material Safety Data Sheets (MSDS).
- .4 Local Standards and Codes.
- .5 All References to latest edition.

1.3 Design Requirements

- .1 Operating voltages: to CAN3 C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard:
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates for control items in English.

1.4 Submittals

- .1 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 certificate of acceptance from authority having jurisdiction upon completion of Work to Contract Administrator.
- .2 Manufacturer's Field Reports: submit to Engineer manufacturer's written report, within three (3) days of review, verifying compliance of Work and electrical system and instrumentation testing.

1.5 Quality Assurance

- .1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license 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.

1.6 System Startup

- .1 Instruct Owner's personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Start-up of equipment with assistance of Owner's personnel and the Engineer.
- .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 familiar with aspects of its care and operation.

1.7 Site

- .1 Classification of Plant Areas:
 - .1 As Per Drawings.

PART 2 PRODUCTS

2.1 Materials and Equipment

- .1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to Site and submit such approval.

- .2 Factory assemble control panels and component assemblies.

2.2 Electric Motors, Equipment and Controls

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

2.3 Warning Signs

- .1 Warning Signs: in accordance with requirements of inspection authorities.
- .2 Provide 3 mm thick lamacoid nameplates with 6 mm black lettering on white background. Lamacoid signs, minimum size 175 x 250 mm.

2.4 Wiring Terminations

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors and for the applicable temperature and ampacity ratings of the conductors.

2.5 Equipment Identification

- .1 Identify electrical equipment with nameplates as follows:
- .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, white with black core, lettering accurately aligned and engraved into core mechanically attached with self-tapping stainless steel screws.
- .2 Lamacoids as follows:

Application	Text Size	Text
Electrical Equipment – General	5 mm	Line 1: Identifier
Disconnect Switch – Separate	5 mm	Line 1: Identifier Line 2: Load Identifier Line 3: Load Description
Motor Control Centre	8 mm	Line 1: Identifier Line 2: Description Line 3: System Voltage Line 4: Fed By
Motor Starter/VFD or MCC Bucket	5 mm	Line 1: Load Identifier Line 2: Load Description
Panelboards	8mm	Line 1: Identifier Line 2: Description Line 3: System Voltage Line 4: Fed By

- .2 Wording on nameplates to be approved Engineer prior to manufacture.

2.6 Wiring Identification

- .1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.7 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 15m intervals.
- .3 Colours: 25mm wide prime colour and 20mm wide auxiliary colour.
- .4 Cable Colour Codes

	Prime	Auxiliary
Power, 120/208/240 VAC	Black	
Control Wiring, 120VAC	Black	Orange
Low Voltage Communication/General	Blue	
Low Voltage Control Wiring, <50 V	Blue	Orange
Intrinsically Safe	Blue	White
Up to 600 V	Yellow	Green
Other Communication Systems	Green	Blue

2.8 Finishes

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two (2) coats of finish enamel:
- .1 Paint outdoor electrical equipment "equipment green" finish, alternatively refer to EEMAC Y1-2, Performance Specification for Finishing Systems for Outdoor Electrical Equipment.
- .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

Part 3 **EXECUTION**

3.1 Installation

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 and 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 Mounting Heights

- .1 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .2 Install electrical equipment at following heights unless indicated otherwise:
 - .1 Control panels: as indicated.

3.4 Co-ordination of Protective Devices

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.5 Field Quality Control

- .1 Conduct following tests:
 - .1 Circuits originating from branch distribution panels.
 - .2 Lighting and its control.
 - .3 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .2 Carry out tests in presence of Engineer.
- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of Project.

3.6 **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 Repair any galvanizing removed during installation.

END OF SECTION

PART 1 GENERAL

1.1 Section Includes

- .1 Materials and installation for wire and box connectors.

1.2 References

- .1 Canadian Standards Association (CSA International):
 - .1 CAN/CSA-C22.2No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2No.65, Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC):
 - .1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA).

PART 2 PRODUCTS

2.1 Materials

- .1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for stranded copper conductors.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper conductors.
 - .5 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2No.18.

PART 3 EXECUTION

3.1 Installation

- .1 Remove insulation carefully from ends of conductors and:

- .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.
- .2 Install fixture type connectors and tighten. Replace insulating cap.
- .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

- .1 Section 26 05 20 - Wire and Box Connectors – 0-1000 V.

1.2 References

- .1 CSA C22.1, Canadian Electrical Code.
- .2 CSA C22.2 No.0.3, Test Methods for Electrical Wires and Cables.
- .3 CAN/CSA-C22.2 No.131, Type TECK 90 Cable.

PART 2 PRODUCTS

2.1 Building Wires

- .1 Conductors: stranded Copper for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.
- .3 Copper conductors: size as indicated, with 1000 V insulation of cross-linked thermosetting polyethylene material rated RWU90 XLPE.
 - .1 RWU90 XLPE to also be used for all underground runs.
- .4 AC90 for drops from junction box to lighting fixture in areas with T-bar Ceiling (Drop).
- .5 SOW flexible copper for drops from junction box to suspended fixture in process areas.

2.2 Teck 90 Cable

- .1 Cable: to CAN/CSA-C22.2 No.131.
- .2 Conductors:
 - .1 Grounding conductor: stranded copper.
 - .2 Circuit conductors: stranded copper, size as indicated.
- .3 Insulation:
 - .1 Chemically cross-linked thermosetting polyethylene rated type XLPE, 1000 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum (AIA).
- .6 Overall covering: thermoplastic polyvinyl chloride (PVC) material, FT4 rated, and UV resistant.

- .7 Fastenings:
 - .1 One-hole stainless steel straps to secure surface cables 50 mm and smaller. Two-hole stainless steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two (2) or more cables at 900 mm centers.
 - .3 Stainless steel threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors:
 - .1 Thomas & Betts Star TECK connectors complete with locknuts.

2.3 VFD Drive Cable

- .1 Cable: to CAN/CSA C22.2 No. 123, 174.
- .2 Conductors:
 - .1 Sectored Grounding conductors: three (3) stranded, bare copper.
 - .2 Circuit conductors: copper, stranded, size as indicated.
- .3 Insulation:
 - .1 Type: ethylene propylene rubber.
 - .2 Chemically crosslinked thermosetting polyethylene XLPE rated 1000 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: heavy wall, continuously corrugated aluminum.
- .6 Overall covering: thermoplastic polyvinyl chloride (PVC) material, FT4 rated, flame, heat and moisture resistant, color black.
- .7 Connectors:
 - .1 Armoured cables: Thomas & Betts Star TECK aluminum connectors, Crouse-Hinds, and Appleton.
- .8 Nexan DriveRx or approved equal.

2.4 Control Cables

- .1 Type LVT: soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket.
- .2 600 V type: stranded annealed copper conductors, sizes as indicated with PVC insulation type TW, or cross-linked polyethylene type RW90 (x-link with shielding of metallized tapes over each pair of conductors and overall covering of thermoplastic jacket interlocked armour and jacket over sheath of PVC).

PART 3 EXECUTION

3.1 Installation of Building Wires

- .1 Install building wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34.
 - .2 Support cables independently of supports used for equipment of other trades; do not support or secure cables to ductwork or piping.
 - .3 Install cables in a neat and professional manner, so as to conserve headroom.
 - .4 Install cables parallel and perpendicular to building lines.
 - .5 In wet/damp areas and outdoors, cables to enter into the bottom of the equipment.
 - .6 Twist together stranded conductors at each termination.

3.2 Installation of Teck Cable 0 -1000 V

- .1 Teck cable to be only used for pump power or as approved by Contract Administrator.
- .2 Install cables:
 - .1 Group cables wherever possible on channels.
- .3 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors – 0-1000 V.

3.3 Installation of Control Cables

- .1 Install control cables in conduit.
- .2 Ground control cable shield at one end only.
- .3 Any control cables landed on control terminal blocks or PLC input/output, instrument, starter or VFD terminals to be terminated using wire ferrules.

3.4 Installation of VFD Drive Cable

- .1 Install drive cable between VFD output and motor load.
- .2 Install cables:
 - .1 Group cables wherever possible on channels.
- .3 Use approved connectors.
- .4 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 01000 V.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

- .1 Section 26 05 00 - Common Work Results - Electrical.

1.2 References

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE):
 - .1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.
- .2 Canadian Standards Association, (CSA International).

PART 2 PRODUCTS

2.1 Equipment

- .1 Clamps for grounding of conductor: size as required to electrically conductive grounding electrodes.
- .2 Rod electrodes: copper clad steel 20 mm dia. by 3 m long.
- .3 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .4 Insulated grounding conductors: green, type RW90. FT4 rated when installed in air.
- .5 Ground bus: copper, size as required, complete with insulated supports, fastenings, connectors.
- .6 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

PART 3 EXECUTION

3.1 Installation General

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories.

- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process:
 - .1 Cadweld or approved equal.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire in all conduit runs. In flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- .10 Ground secondary service pedestals.

3.2 Electrodes

- .1 Install rod electrodes and make grounding connections.
- .2 Bond separate, multiple electrodes together.
- .3 Use size #6 AWG copper conductors for connections to electrodes.

3.3 System and Circuit Grounding

- .1 Install system and circuit grounding connections to neutral of primary 600 V system, secondary 208 V system.

3.4 Equipment Grounding

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, distribution panels, outdoor lighting, process and instrumentation equipment, building steel and air ducts.
- .2 For telephone system install grounding per the telephone company's requirements. For data systems as recommended by the manufacturer.

3.5 Grounding Bus

- .1 Install copper grounding bus mounted on insulated supports on wall.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual green insulated stranded copper connections sized in accordance with the Canadian Electrical Code.

3.6 Field Quality Control

- .1 Perform tests in accordance with **Section 26 05 00 - Common Work Results - Electrical.**
- .2 Perform ground continuity and resistance tests using method appropriate to Site conditions and to approval of Contract Administrator, consultant, and authority having jurisdiction.
- .3 Perform tests before energizing electrical system.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

- .1 Not Used

PART 2 PRODUCTS

2.1 Support Channels

- .1 U shape aluminum, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended or set in poured concrete walls and ceiling.

PART 3 EXECUTION

3.1 Installation

- .1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps:
 - .1 One-hole stainless steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole stainless steel straps for conduits and cables larger than 50 mm.
 - .3 Beam clamps to secure conduit to exposed steel work.
- .6 Suspended support systems:
 - .1 Support individual cable or conduit runs with 6 mm dia. threaded rods and spring clips.
 - .2 Support two (2) or more cables or conduits on channels supported by 6 mm dia. threaded rod hangers where direct fastening to building construction is impractical.
- .7 For surface mounting of two (2) or more conduits use channels at 1 m on center spacing.
- .8 Provide metal brackets, frames, hangers, clamps, and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .13 Provide isolator pads between dis-similar metals as needed.
- .14 Follow Canadian Electrical Code for minimum spacing requirements for conduit support channels and equipment.

END OF SECTION

PART 1 GENERAL

1.1 Shop Drawings and Product Data

- .1 Submit Shop Drawings and product data for cabinets for review by Engineer prior to purchase.

PART 2 PRODUCTS

2.1 Splitters

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 At least three (3) spare terminals on each set of lugs in splitters less than 400 A.

2.2 Junction and Pull Boxes

- .1 Size as indicated, or as required by Canadian Electrical Code.
- .2 NEMA Type 1 boxes in dry indoor non-process areas, NEMA type 12 enclosure in dry process areas, NEMA type 4X Stainless steel (316SS) or PVC boxes, water and weather resistant with rigid PVC conduit in damp-wet areas and outdoor locations.
- .3 For hazardous classified locations, boxes must be rated and suitable for the specific hazardous area noted on the drawings.
- .4 Copper free Cast aluminium construction or PVC, with screw-on flat covers for surface mounting. Boxes shall be cast ferrous metal boxes with threaded connections when used with threaded galvanized steel conduit.
- .5 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.3 Cabinets

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.
- .2 Type T: sheet steel cabinet, with hinged door, latch, lock, two (2) keys, containing sheet steel backboard for surface mounting.
- .3 Primed and grey baked on enamel NEMA Type 1 steel cabinets in dry indoor non-process areas, primed and grey baked on enamel NEMA type 12 steel cabinets in dry indoor process areas, NEMA type 4/4X Stainless steel outdoors as indicated.
- .4 Holes for conduit entrances to be cut after cabinet is mounted in final position

PART 3 EXECUTION

3.1 Splitter Installation

- .1 Install splitters and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 Junction, Pull Boxes and Cabinets Installation

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes and as required by the Canadian Electrical Code.

3.3 Identification

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results – Electrical.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

PART 1 GENERAL

1.1 References

- .1 CSA C22.1, Canadian Electrical Code, Part 1.

PART 2 PRODUCTS

2.1 Outlet and Conduit Boxes General

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 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 (1) system are grouped.

2.2 Cast Aluminium Outlet Boxes

- .1 Cast aluminium single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one (1) conduit enters one side with extension and plaster rings as required.
- .2 Cast aluminium utility boxes for outlets connected to surface-mounted rigid aluminum conduit, minimum size 102 x 54 x 48 mm.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 Electro-galvanized steel concrete boxes for boxes flush mount in concrete.

2.3 Conduit Boxes

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.4 Fittings - General

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

- .5 Watertight bushings and connectors for cable/conduit terminating in NEMA 3R/4/4X pull and junction boxes, cabinets and panels.
- .6 Install a sealing ring to conduit connections in wet and damp areas.

PART 3 EXECUTION

3.1 Installation

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of Work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit and armored cables. Reducing washers are not allowed.

END OF SECTION

PART 1 GENERAL

1.1 References

- .1 Canadian Standards Association (CSA):
 - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
 - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2 Rigid PVC (Unplasticized) Conduit.

PART 2 PRODUCTS

2.1 Conduits

- .1 Rigid metal conduit: to CSA C22.2 No. 45, aluminum threaded.
- .2 Electrical Metallic tubing (EMT) to CSA C22.2 No. 83.
- .3 Rigid PVC conduit, and fittings: to CSA C22.2 No. 211.2.
- .4 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .6 Minimum power and control/instrumentation conduit size: 21 mm.
- .7 Rigid PVC conduit shall be FT4.

2.2 Conduit Fastenings

- .1 One-hole aluminum or stainless steel straps to secure surface conduits 50 mm and smaller. Two-hole aluminum or stainless steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two (2) or more conduits at 1 m on center (oc).
- .4 Stainless steel threaded rods, 6 mm dia., to support suspended channels.
- .5 Supply isolators between dis-similar metals.

2.3 Conduit Fittings

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

- .2 Factory "ells" where 90° bends are required for 27 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.
- .4 Type EYS and EYD Cast seal fittings with threaded hubs rated for the hazardous classification indicated on the drawings.

2.4 Expansion Fittings for Rigid Conduit

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panels and buildings.
- .4 Provide expansion fittings at the point where conduit exit from the ground (above-ground) of underground services, and as indicated on the drawings.

2.5 Fish Cord

- .1 Polypropylene or Nylon.

PART 3 EXECUTION

3.1 Installation

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 X-ray cast walls and floors before coring to confirm location of embedded items.
- .3 Use rigid aluminum threaded conduit in all areas (including hazardous areas) unless otherwise noted in the drawings or specifications.
- .4 Use EMT in dry non-process areas and in areas not subject to damage but not in concrete.
- .5 Use epoxy coated conduit underground and in cast concrete.
- .6 Use rigid PVC conduit in all direct buried services and below concrete floor slabs.
- .7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.
- .8 Minimum conduit size for lighting and power circuits: 21 mm.
- .9 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 19 mm dia. (for conduits less than 27mm).

- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .14 Dry conduits out before installing wire and seal ends to prevent dirt from entering before cable is pulled.
- .15 Conduit seal fittings shall be installed in hazardous areas per the Canadian Electrical Code. Seal fitting shall be filled with compound.
- .16 Seal conduit penetrations using non-shrink grout, duxseal, or leakseal as required.

3.2 Surface Conduits

- .1 Paint walls before installation of electrical equipment including conduits.
- .2 Run parallel or perpendicular to building lines.
- .3 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .4 Run conduits in flanged portion of structural steel.
- .5 Group conduits wherever possible on suspended or surface channels.
- .6 Do not pass conduits through structural members except as indicated.
- .7 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 Concealed Conduits

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.4 Conduits In Cast-In-Place Concrete

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

- .5 Do not place conduits in slabs in which slab thickness is less than four (4) times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

3.5 Conduits In Cast-In-Place Slabs On Grade

- .1 Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

3.6 Conduits Underground

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

END OF SECTION

PART 1 GENERAL

1.1 Section Includes

- .1 Materials and installation for fused and non-fused disconnect switches.

1.2 Related Sections

- .1 Section 26 05 00 - Common Work - Electrical.

1.3 References

- .1 Canadian Standards Association (CSA).

1.4 Submittals

- .1 Submit product data for review by Engineer prior to purchase.

PART 2 PRODUCTS

2.1 Disconnect Switches

- .1 Heavy duty non-fusible and fusible, horsepower rated disconnect switch, voltage and amps as indicated on drawings.
- .2 Provision for padlocking in OFF position.
- .3 Quick-make, quick-break action.
- .4 ON-OFF switch position indication on switch enclosure cover.
- .5 Outdoors, wet/damp, and process/chemical rooms locations: NEMA 4X (Stainless Steel).
- .6 Ordinary locations, electrical rooms, and non-process dry locations: NEMA 12.
- .7 Acceptable Manufacturer: Square D, Eaton, Siemens, Hubbell, Pass & Seymour, Leviton.

2.2 Equipment Identification

- .1 Provide equipment identification in accordance with **Section 26 05 00 - Common Work - Electrical**.

PART 3 EXECUTION

3.1 Installation

- .1 Install disconnect switches as indicated and as required by CSA C22.1.

- .2 Confirm disconnect switch has adequate clearance for handle operation and as required by Canadian Electrical Code CSA C22.1.

END OF SECTION

PART 1 GENERAL

1.1 References

- .1 Canadian Standards Association (CSA International):
 - .1 CSA-C22.2 No. 214, Communications Cables (Bi-National standard with UL 444).
 - .2 CSA-C22.2 No. 232, Optical Fiber Cables.
- .2 Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA):
 - .1 TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
 - .2 TIA/EIA-568-B.2, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.
 - .3 TIA/EIA-568-B.3, Optical Fiber Cabling Components Standard.
 - .4 TIA/EIA-606-A, Administration Standard for the Commercial Telecommunications Infrastructure.
 - .5 TIA TSB-140, Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
 - .6 TIA-598-C, Optical Fiber Cable Color Coding.

1.2 Definitions

- .1 Refer to TIA/EIA-598-C, Annex A for definitions of terms: optical-fiber interconnect, distribution, and breakout cables.

1.3 Product Data

- .1 Submit product data in accordance with Division 26.

1.4 Related Work

- .1 Refer to Supplementary Specifications and Division 26.

1.5 Inspection

- .1 Provide adequate notice to the Contract Administrator so that all cable installations can be inspected prior to energizing equipment.

1.6 Standards

- .1 All wire and cable shall be CSA approved.

PART 2 PRODUCTS

2.1 Twisted Pair Shielded Cables (Tpsh)

- .1 TPSH shall be constructed as follows:
 - .1 Two (2) copper conductors, stranded, minimum #16 AWG, PVC insulated, twisted in nominal intervals of 50 mm.
 - .2 Insulated for 600 V, 90°C.
 - .3 100 percent coverage aluminum foil or tape shield.
 - .4 Separate bare stranded copper drain wire, minimum #16 AWG.
 - .5 Overall flame retardant PVC jacket to CSA-C22.2.
 - .6 The entire cable assembly to be suitable for pulling in conduit or laying in cable tray.
 - .7 Interlocked aluminum armour and outer PVC jacket.
 - .8 Belden or equivalent.
- .2 Where multi-conductor TPSH cables are called for, each pair shall be individually shielded, continuous number coded, and the cable assembly shall have an overall shield and overall flame retardant PVC jacket.

2.2 RTD and Multi Conductor Shielded Cable

- .1 RTD cables shall be CSA approved and shall be constructed as follows:
 - .1 Three or more copper conductors, stranded, minimum # 16 AWG.
 - .2 PVC insulated for 600 V.
 - .3 One hundred (100) percent coverage aluminum foil or tape shield.
 - .4 Separate bare stranded copper drain wire.
 - .5 Interlocked aluminum armour and outer PVC jacket.
 - .6 Overall flame retardant PVC jacket to CSA-C22.2.

2.3 Teck Cables

- .1 As per Division 26.

2.4 Wire

- .1 As per Division 26.

2.5 100 Base TX Category 6 Communication Cable

- .1 Category 6 cable shall be CSA approved and constructed as follows:
 - .1 Four (4) bonded pairs, solid stranded, #24 AWG.
 - .2 Interlocked aluminum armour.
 - .3 Rip cord.
 - .4 PVC inner and outer jackets.

- .5 UL verified to Category 6.
- .6 Insulated for 300 V.
- .7 Shielded.

PART 3 EXECUTION

3.1 Analog Signals

- .1 Use TPSH cable for all low level analog signals such as 4-20 mA, pulse type circuits 24 VDC and under, and other signals of a similar nature.
- .2 Use RTD cable for connections between RTDs and transmitters or control system RTD inputs.

3.2 Digital Signals

- .1 Use TPSH cable for all low level input (24 V and below) and output signals to the control system or as indicated on the drawings.

3.3 Instrument Power

- .1 Use wire and conduit for power to instruments, for 120 V signals other than those mentioned above and as otherwise indicated on the Drawings. Use stranded wire and cable to supply power to instruments.

3.4 Installation

- .1 Install instrumentation cables in conduits. Use a minimum of 300 mm and a maximum of 1000 mm length of liquid tight flexible conduit to connect the field sensors to the conduit.
- .2 At each end of the run leave sufficient cable length for termination.
- .3 Do not make splices in any of the instrumentation cable runs.
- .4 Cable shields shall be terminated on insulated terminals and carried through to the extent of the cable.
- .5 Ground cable shields at one end only. Unless otherwise specified, ground the shields at the PLC control panel.
- .6 Protect all conductors against moisture during and after installation.

3.5 Cat 6 Installation

- .1 Always follow the Manufacturer's guidelines for minimum bend radius and tension.
- .2 All installations and terminations shall be performed by personnel experienced in Cat 6 cable installation.

- .3 Perform cable testing with time domain reflectometer instrument and provide complete detailed test report. Test all runs upon completion of permanent terminations, using instrumentation acceptable to Contract Administrator. Before commencing testing, submit sample test data sheets and information with respect to test instrumentation to be used.
 - .1 Test for the following:
 - .1 Continuity.
 - .2 Pair placement and polarity.
 - .3 DC resistance.
 - .4 Characteristics at highest contemplated frequency:
 - .1 Attenuation - data cable.
 - .2 Mutual Capacitance – data cable.
 - .3 Near-end crosstalk (NEXT) – data cable.
 - .5 Run length.
 - .2 Category 6 using certified level III tester to: TIA/EIA-568-B.2.
 - .3 Reconnect or re-install and retest as necessary to correct excessive variations.

3.6 Field Quality Control

- .1 Test horizontal UTP cables as specified below and correct deficiencies provide record of results as hard copy.
 - .1 Perform tests for Permanent Link on installed cables, including spares:
 - .1 Category 6 using certified level III tester to: TIA/EIA-568-B.2.
 - .2 Perform tests for Channel on 100% of cross-connected data horizontal cabling installed from each telecommunications room, including shortest and longest drops from each telecommunications room:
 - .1 Category 6 using certified level III tester to: TIA/EIA-568-B.

3.7 Conductor Terminations

- .1 All equipment supplied shall be equipped with terminal blocks to accept conductor connections. Stranded conductors terminated on terminal blocks shall be terminated with wire-end ferrules.
- .2 Instrumentation conductors, where terminated at equipment terminals other than clamping type terminal blocks, shall be equipped with Burndy-YAE-2 or STA-KON, self-insulated, locking type terminators, sized as required to fit conductors and screw terminals.

3.8 Testing

- .1 Test all conductors for opens, shorts, or grounds. Resistance values shall not be less than those recommended by the cable manufacturer.

3.9 Identification

- .1 Identify all instrumentation cables.
- .2 Identify each conductor with wire numbers using a machine printed Raychem TMS heat shrink wire marker or approved equal.

END OF SECTION

PART 1 GENERAL**1.1 Compliance**

- .1 Provide all labour, materials, equipment and services necessary to complete the Mechanical Work to the full intent of the Drawings and Specifications and to the satisfaction of the Contract Administrator.
- .2 The work to be performed under this Division of the Specifications shall comply with the applicable and latest regulations of the National Building Code of Canada, The Electrical Safety Authority, the Ministry of Labour, The Technical Standards and Safety Act 2000 (TSSA 2000), The Environmental Protection Act, The Occupational Health and Safety Act and all applicable Provincial and Municipal regulations.
- .3 Equipment and materials shall be installed in a neat and workmanlike manner following the best current procedures and practices of the trade and to the satisfaction of the Contract Administrator.
- .4 The Contractor shall obtain all permits required for the installation of the work and arrange and pay for all permits, inspections and tests. All costs involved in the installation of the work and any costs levied by the respective municipal authorities shall be included in the Contract. Submit all drawings and documents for official approval prior to construction as may be required by Provincial, Municipal or Fire Underwriting authorities. Copies of Drawings may be obtained from the Contract Administrator upon request for submission with application for permits or official approvals.
- .5 Before submission of Bid, each bidder shall visit and examine the site and local conditions affecting the work, and shall include all necessary materials, labour and services to complete the work. Each bidder shall examine the Drawings of other trades and adjust his work to conform. The drawings upon which the Contract is based show the general design and extent of the piping and other systems. These are suitably outlined with regards to size, location and general arrangement. All work shall be installed to avoid interferences from existing services and where interferences cannot be avoided, the Bidder shall adjust the cost of his work to alter the interference. No additional compensation will be allowed the Contractor for his failure to examine the site and adjust the cost of his work accordingly.

1.2 Approved Manufacturers

- .1 Where Approved Manufacturers are listed after a product or equipment specification, the product or equipment shall be in essential conformance to the specification and/or incorporate such alternate or equivalent features as to assure comparable performance, dependability and quality as an Approved Manufacturer's counterpart, to the satisfaction of the Contract Administrator.

1.3 Electrical Service

- .1 The electrical service available is 600 volts (nominal) 3 phase 60 hertz.

- .2 All electric motors 2 H.P. and larger shall be 575/3/60 hertz and a H.P. and less shall be 115/1/60 hertz. Frame sizes shall conform to CEMA standards and shall be T-rated or U-Frame or for variable frequency drive (VFD) services as specified for the respective equipment.

1.4 Cutting and Patching

- .1 Under no circumstances shall any cutting, removal or burning of structural parts of sections of the building, whether they are steel, concrete or masonry, be undertaken without the written authority of the Owner.
- .2 Should cutting, repairing, and patching be required to allow installation of mechanical work, pay all costs for the trade concerned to perform the work.

1.5 Equipment Bases and Anchor Bolts

- .1 Provide concrete bases and pads including grouting where necessary, for all concrete floor mounted mechanical equipment except bases detailed on the General Trades drawings. Grouting of bases is described under the General Trades Work.
- .2 Anchor bolts for securing mechanical equipment to concrete pads or building elements, shall be furnished by this Contractor for mounting in formwork by the General Contractor. Mechanical Contractor shall provide location drawing or template for locating bolts.

1.6 Installation of Equipment

- .1 Equipment shall be furnished complete with all accessories in ready-to-operate condition after installation. Equipment of a unitized or "package" nature shall be complete, serviced and in fully operable condition following connection of external power and/or utilities after installation. Servicing shall include on-site adjustment, alignment, lubrication, charging and start-up by qualified representatives of the manufacturer where such is required for safe and proper operation.

1.7 Installation of Piping

- .1 Unless specified otherwise herein, all power piping including steam, non-potable water and air shall be installed in accordance with the latest issues of the American National Standards Institute Code for Pressure Piping (ANSI B31.1 and B31.2).
- .2 All storm, sanitary and vent piping and potable hot and cold water piping shall be installed in accordance with National Plumbing Code of Canada.
- .3 To avoid unnecessary cutting of building elements, provide inserts, sleeves and anchors to other trades for building in as the work proceeds. Arrange with other trades to leave openings, slots and chases to accommodate later installation of mechanical work.
- .4 All vertical piping shall be installed plumb and all horizontal piping shall run parallel to building walls unless specifically shown otherwise on the Drawings.

- .5 All piping in finished areas and rooms shall be concealed in furred spaces or in walls or ceilings wherever practical. Provide flush access doors or panels for access to concealed piping specialties in walls or floors. Size of access doors shall permit free access, and shall be of finish and appearance to co-ordinate aesthetically with floor and wall finishes.
- .6 On bare piping through finished walls, provide escutcheon plates made of heavy chrome plated brass or stamped metal with tempered springs to ensure positive attachment to the pipe.
- .7 All piping shall be installed so as to be free from strains and distortion due to expansion and contraction. Expansion and contraction, in general, shall be taken up by offsets or expansion U-bends or loops. Generally, no other type of expansion joint shall be used unless specifically indicated on the Drawings or the Specifications. Provision for expansion and contraction shall be based on 1" movement per 100 feet of steel pipe and 12" movement per 100 feet of copper or brass pipe for each 100 °F temperature difference from 70 °F, ambient. Expansion bends in steel pipe shall be made from pipe sections and long radius welding elbows. Expansion "U" bends or loops shall be cold sprung and welded into the line, which shall be anchored before removing the spreader from the expansion "U" bend or loop. Provide necessary anchors and guides to secure and maintain alignment of piping subject to thermal expansion. Plastic piping shall be free of strains and distortion through normal temperature cycles after installation by employing clamp anchors, offsets or approved slip type expansion joints where there is no other option.
- .8 On long runs of horizontal hot water heating piping within convector and radiation enclosures, install packless compensator joints with stainless steel bellows on piping systems to control expansion. Joints shall be spaced on maximum 30 ft. centres and shall be aligned and installed with sliding strap loop hangers or positive guides on either side. Positive anchors shall be provided at both ends of the span serviced by the joint.
- .9 Piping, drains, and sewers shall slope in accordance with good engineering practice and in accordance with applicable Codes. Slope between elevations shall be even and consistent. All lines shall be free of pockets and pitched to drain at low points in the line with valves or traps provided as required for drainage of the lines.
- .10 Where slope is not shown on the Drawings, the lines shall be installed to provide slopes as follows:
 - .1 underground drains - both inside and outside the building, downward, 1 in 50 on drains of 3" size and less and 1 in 100 on drains 4" size and larger.
 - .2 aboveground drains - in accordance with the National Building Code of Canada and all current amendments thereto.

1.8 Pipe Joints

- .1 Ream and thoroughly clean all dirt, cuttings and foreign matter from pipe fittings, valves and equipment before connections are made. Copper tubing shall be cut with a tube cutter and the joining surfaces of the tubing and fittings shall be thoroughly cleaned with fine emery cloth and wiped clean with a dry cloth.

- .2 Screwed joints shall be sealed with non-toxic non-metallic joint sealant with the compound applied to the male threads only and particular care taken to prevent the compound from reaching the interior of the pipe fittings. Where conditions permit, unfused tetrafluoroethylene (Teflon) resin tape applied in accordance with the manufacturer's directions may be employed. Joint sealants and tapes shall be certified to CAN/ULC-S642 "Standard for Compounds and Tapes for Threaded Pipe Joints".
- .3 Soldered joints on copper tubing for aboveground drain lines and vent lines shall be made with 50/50 lead antimony solder and matching flux. Soldered joints on copper tubing for domestic hot and cold water and hot water heating piping aboveground, shall be made with soldered and fluxed joints having a lead content not exceeding 0.2 per cent such as tin antimony solder and matching flux. Joints on copper hot water heating tubing shall be made with 95/5 tin antimony solder. Joints on copper tubing for copper water and drainage tubing underground and compressed air and refrigerant tubing shall be made with high temperature silver solder. Core solder shall not be used. All solder shall conform to ASTM B32 "Solder Metal", in accordance with the recommended use.
- .4 Welded joints shall be in compliance with the latest acceptable practices, the ASME codes and the recommendations of the American Welding Society governing fusion welding. All welding shall be done by qualified welders, holding an up-to-date Provincial certificate for the rating required and certified within the last 12 month period for the particular services and rating for the province in which the welding is being performed. Sample welds shall be performed and submitted for inspection on site upon request of the Contract Administrator. All pipe for welding purposes shall have the ends scarfed at an angle of 37-2 deg. (plus or minus 22 deg.) for reception of welding material. The filler metal (welding rod or electrodes) shall be of the same materials as the pipe and fittings and all rods shall be "coated" stock.
- .5 Install couplings, fittings, valves and specialties on grooved end piping systems in accordance with manufacturer's printed instructions.
- .6 Fusion (solvent) welded plastic socket joints shall be cut straight and true by employing a tubing cutter or mitre box and hand saw. Deburr pipe joint by filing end and chamfer joint to manufacturer's directions where necessary. Clean joint with an approved cleaner and flow on solvent to fitting socket and pipe and before setting joint. Joints must not be less than a nor more than b interference fit depth of socket. Follow manufacturers' directions for making threaded or grooved joints.

1.9 Unions and Flanges

- .1 Provide unions or flanges at any item of equipment, which must be removed for servicing or maintenance unless the unions are an integral part of the equipment.
- .2 Unions shall not be concealed in walls, partitions or ceilings unless access thereto is provided.
- .3 Provide dielectric couplings or dielectric companion flanges at all connections between copper tubing and ferrous piping on potable and non-potable water service. Dielectric fittings shall be rated for the temperature service.

1.10 Valves

- .1 Install valves in all locations shown on the Drawings, at all piping connections to equipment, before control valves or control devices, and where required for sectionalizing a system or floor.
- .2 Valves, in general, shall be gate type for shut-off purposes and globe type for throttling purposes. Valves shall be designed for the respective service.

1.11 Pipe Hangers and Supports

- .1 All piping shall be substantially supported with necessary hangers, structural supports and/or brackets as shown on the Drawings and as required. Supporting and bracing of piping shall be such as to prevent sagging, warping and vibration and to allow for movement due to expansion and contraction. Hangers and supports shall be placed close to fittings, valves and/or other heavy parts.
- .2 "C" clamps for securing hanger rods to structural steel members must be furnished with a lock nut and a retaining clip to secure and prevent movement of the clamp.
- .3 Trapeze type hangers may be used where pipes are grouped together, with the piping secured to a substantial horizontal angle or channel with U-bolts unless specifically indicated otherwise on the Drawings. Horizontal member shall be suspended by threaded rods and lock nuts adjusted to maintain proper level and slope. Spacing of trapeze type hangers shall be based on the closest interval required by any individual pipe supported thereon.
- .4 Hangers for copper or non-ferrous metallic tubing shall be insulated with a plastic or non conductive tape to prevent direct metallic contact between the hanger and tube in order to avoid galvanic action between the dissimilar metals.
- .5 All insulated piping subjected to expansion or contraction shall be suspended or provided with roller supports and pipe protection saddles to allow for expansion and contraction.
- .6 Spacing of hangers for horizontal runs of steel pipe, either black, or galvanized, excluding plumbing piping shall not exceed the maximum distances between hangers and with minimum diameter rods as follows:

Pipe Size	Distance	Diameter of Rod
Up to 1"	7' – 0"	d"
1 ¼" to 2"	10' – 0"	d"
2 ½" to 3"	12' – 0"	½"
4"	14' – 0"	e"
6"	17' – 0"	¾"
8"	19' – 0"	f"

- .7 Additional hangers shall be used in locations where there are concentrated loads such as valves, specialties, etc., or as required to meet hanger spacing regulation under any applicable Provincial or Territorial Regulations.

- .8 Spacing of hangers for horizontal runs of copper tubing, excluding plumbing piping, shall not exceed 6 ft. for lines up to and including 1" size; 8 ft. for lines of 1 1/2" size thru 2" and 12 ft. for lines 2 1/2" and larger.
- .9 Horizontal runs of aboveground cast iron soil pipe for plumbing service shall be supported adjacent to each hub or joint at intervals no greater than 9'-10" and at intervals not exceeding 3'-3" if the pipe has mechanical joints and the lengths of pipe between adjacent joints or fittings is 12" or less.
- .10 Spacing of hangers for horizontal runs of black and galvanized steel pipe for plumbing service shall be supported at intervals no greater than 8'-2" if pipe size is less than 6" and 12'-4" if pipe size is 6" or larger.
- .11 Spacing of hangers for horizontal runs of copper tubing for plumbing service shall be supported at intervals no more than 8'-2" for pipe 1" size and less and 9'-10" for pipe larger than 1" size.
- .12 Spacing of hangers for aboveground ABS or PVC plastic DWV piping for plumbing service shall be not more than 3'-11" and 3'-3" for plastic water piping.

1.12 Pipe Testing

- .1 Make pressure tests on all piping included in this Contract in accordance with ANSI B31.1 Power Piping Code and all applicable codes and regulations.
- .2 All tests shall be made in the presence of the Contract Administrator and all other personnel or governing authorities having jurisdiction; thereover, all of whom shall be notified in ample time to permit them to be present. All pumps, compressors, and gauges and all connections necessary for the tests shall be provided by the Contractor.
- .3 Hydrostatic tests shall be carried out at a test pressure not less than 1-1/2 times the maximum working pressure unless specified otherwise, or required by mandatory regulations, and for a minimum period of two hours or longer when requested by the Contract Administrator or governing authority. During this time the pressure shall remain constant. Should the exterior surfaces of pipe or fittings show any cracks or other form of leak, the defects shall be promptly remedied and tests again made to the complete satisfaction of the Contract Administrator and other parties involved.
- .4 Pneumatic tests shall consist of first pressurizing the system with air to approximately one-half the specified pressure but not to exceed 50 psig and examining all joints for leaks with a soap suds solution. After any repairs have been made and the soap test has been met satisfactorily, the system shall then be pressurized with air to the test pressure specified under the respective subsection of the Specifications.
- .5 Conduct final tests on fuel gas piping in accordance with the requirements of the local Utility or Supplier and the governing Code and Authority.
- .6 Equipment or specialties not designed to withstand the test pressure shall be disconnected and/or removed during the tests and reconnected after completion of same.

1.13 Sterilization of Potable Water Systems

- .1 Newly installed, repaired or altered potable water systems shall be thoroughly cleaned and flushed to ensure cleanliness and freedom from contamination.
- .2 Flush system after completion of work allowing full flow of water through the system for a period of fifteen minutes or longer when directed by the Contract Administrator.
- .3 Provide contact sterilization treatment of potable water piping by treating water with chlorine solution in accordance with the requirements of the local Utility. Flush system thereafter to remove chlorine content to an acceptable level.

1.14 Cleaning

- .1 The Contractor shall keep the premises in a clean and orderly condition during construction. All waste and unusable material shall be promptly removed from the site.
- .2 Upon completion of his work, the Contractor shall go over the entire installation, clean and polish all fixtures and equipment, remove all surplus materials and rubbish of every description incidental to his work, leaving the installation neat, and orderly and in complete satisfactory working condition subject to the approval of the Contract Administrator.
- .3 Should any pipe, duct or other part of the system be stopped by foreign matter, disconnect, clean and reconnect wherever necessary. Repair work damaged in the course of removing obstructions.

1.15 Pipe Identification

- .1 Furnish and install approved proprietary pipe identification labels with plastic coated tape with self-adhesive backing surface on all new piping including fire protection piping. Labels shall conform to CAN/CGSB-24.3. Clean "dusty" attachment surfaces with calcium silicate solution and band all labels around piping for added securement. Where the size of pipe, either bare or insulated is 2" O.D. or larger (inclusive of insulation), letter size shall be not less than 12" high and where the size of pipe is less than 2" O.D. (inclusive of insulation), letter size shall be not less than : " high. Install labels at each 50 ft. of straight pipe, at each riser at every floor, at exit and entry points through walls and at each stop valve and access panel. Install arrows indicating direction of flow where necessary.
- .2 Identification of piping by painting and stencilling is under the "Painting" Section of the Specifications. The Mechanical Contractor shall co-operate with and assist the Painting Trades in the execution of this work by instructing the Painting Trades where such identification is required.
- .3 The Contractor shall be responsible for ensuring that the following services are painted and identified by the Painting Trades.

- .4 All aboveground natural gas piping to be painted with one primer coat and one final coat of high visibility yellow orange paint in accordance with the latest issue of the Natural and Propane Gas Installation Code CSA B149.1-00.
- .5 All aboveground fire protection piping with one primer coat and one final coat of red paint in accordance with National Fire Protection Association (NFPA Standard No. 13).

1.16 Equipment Identification

- .1 All equipment shall be identified with permanently secured, laminated phenolic- white finish or corrosion resistant metal nameplates clearly indicating the manufacturers name, size, class and/or model, serial or shop number and electrical characteristics of the equipment.
- .2 Upon completion of the work, furnish and install, in connection with all important valves of each major piping system (excepting drainage systems), a metal tag of approved size and shape. Tags shall be attached to valves by a key chain and each shall bear on it an index number designating the valve.
- .3 Provide a neat typewritten directory for each of the major piping systems showing the valve index number, the "service", and the location of the valve.
- .4 Provide a flow and control diagram of each of the major piping systems showing the locations of all important valves and their corresponding index numbers.
- .5 Directories and flow diagrams shall be installed in each mechanical room or in an area otherwise selected by the Contract Administrator and each shall be laminated in plastic and enclosed in a frame under glass. Photostatic prints subject to fading from age or exposure to light will not be acceptable for directories or diagrams. Offset reproductions are acceptable.

1.17 Operation and Maintenance Manuals

- .1 Provide three (3) copies of complete installation, start-up, operating and maintenance instructions for equipment furnished under this Contract.
- .2 These instructions shall be bound in a suitable loose leaf binder, or in separate volumes as required for ease of handling and reference:
 - .1 Shop drawings and product data.
 - .2 Schematic diagrams of energy management and automatic temperature control systems.
 - .3 Operating instructions, including start-up and shut-down procedures for mechanical systems.
 - .4 Maintenance instructions including lubrication and preventative maintenance instructions for components of the equipment.
 - .5 Complete parts list showing manufacturer's name and catalogue number, including parts list for major mechanical equipment.
 - .6 List of recommended spare parts and quantity of each item to be stocked.

- .7 Equipment manufacturer's guarantees and warranties.
 - .1 All the above shall apply to component parts of equipment whether they are manufactured by the supplier of the equipment or are supplied as a component part of an item of equipment.
 - .2 The Contractor shall arrange for competent personnel to instruct Owner's operating personnel in all aspects of proper operation and maintenance of systems and equipment installed under this Contract, at the completion of the work.

1.18 Commissioning

- .1 All testing, adjusting and balancing work shall be performed prior to commissioning. Ensure that all equipment and systems are operable for safe and normal operation. Operational tests on equipment, ductwork, piping and control systems shall be performed prior to commissioning to verify that pressure and flow rates meet design requirements.
- .2 Conduct functional performance tests of mechanical equipment and systems by qualified personnel acceptable to the Contract Administrator. Ensure participation and coordination of all associated specialty trades such as electrical, balancing, energy management and automatic controls. Tests shall be witnessed by the Contract Administrator. Submit a Functional Test Report after all tests have been completed which shall include remarks and a space for the Contract Administrators signature of acceptance.
- .3 Operate all mechanical equipment in all modes of system operation, seasonal, occupied, unoccupied, start-up and shut-down including all individual interlock and conditional control logic, control sequence, full and part load conditions and simulation of abnormal conditions for which there is a specified system or control response. Impose temporary upsets of systems such as setpoint change and equilibrium upset to determine system stability and recovery time:
- .4 If verification of functional performance cannot be completed due to seasonal conditions, lack of occupancy or deficiencies beyond the scope of the mechanical work or any other reason, this shall be noted with provision to indicate when tests will be rescheduled.
- .5 Tests which fail to verify acceptable performance of mechanical equipment and systems shall be repeated after corrective measures are carried out until acceptable performance is achieved.
- .6 Provide to the Contract Administrator and ensure that the following documents are complete and correct:
 - .1 Functional Test Reports.
 - .2 Operation and Maintenance Manuals.
 - .3 As-Built Drawings.
- .7 Arrange and provide for competent personnel to provide classroom type training sessions to fully instruct operating and maintenance personnel in the care, adjustment and operation of the mechanical systems. Training shall include the following:

1. Documentation included in and the use and application of Operation and Maintenance Manuals.
2. Operational procedures and adjustments for all modes of operation of mechanical equipment and systems including acceptable limits and tolerances for system adjustments.
3. Procedures for dealing with abnormal and emergency situations.

PART 2 PRODUCTS

2.1 This section does not apply

PART 3 EXECUTION

3.1 This section does not apply

END OF SECTION

PART 1 GENERAL

1.1 References

- .1 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME):
 - .1 ANSI/ASME B31.1- 1989, Power Piping, (SI Edition).
- .2 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS):
 - .1 MSS SP-89-1991, Pipe Hangers and Supports - Fabrication and Installation.

1.2 Design Requirements

- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.3 Shop Drawings and Product Data

- .1 Submit shop drawings and product data in accordance with Section.
- .2 Submit shop drawings and product data for following items:
 - .1 All bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.

1.4 Closeout Submittals

- .1 Provide maintenance data for incorporation into manual.

PART 2 PRODUCTS

2.1 General

- .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP-58.

- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 Pipe Hangers

- .1 Finishes:
 - .1 Pipe hangers and supports: painted with zinc-rich paint after manufacture.
 - .2 Ensure steel hangers in contact with copper piping are epoxy coated.
- .2 Upper attachment structural: Suspension from lower flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: Malleable iron C-clamp with hardened steel cup point setscrew, locknut.
 - .2 Rod: 9 mm UL listed 13 mm FM approved.
 - .3 Cold piping NPS 2 1/2 or greater, all hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed FM approved to MSS-SP-58 and MSS-SP-69.
- .3 Upper attachment structural: Suspension from upper flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed FM approved to MSS-SP-69.
 - .2 Cold piping NPS 2 1/2 or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed FM approved.
- .4 Hanger rods: threaded rod material to MSS SP-58:
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
- .5 Pipe attachments: material to MSS SP-58:
 - .1 Attachments for steel piping: carbon steel galvanized.
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.
- .6 Adjustable clevis: material to MSS SP-69 UL listed FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis:
 - .1 Ensure "U" has hole in bottom for riveting to insulation shields.
- .7 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP-69.
- .8 U-bolts: carbon steel to MSS SP-69 with 2 nuts at each end to ASTM A 563:
 - .1 Finishes for steel pipework: galvanized.
 - .2 Finishes for copper, glass, brass or aluminum pipework: with formed portion epoxy coated.
- .9 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP-69.

2.3 Riser Clamps

- .1 Steel or cast iron pipe: galvanized carbon steel to MSS-SP-58, type 42.
- .2 Copper pipe: carbon steel copper plated to MSS-SP-58, type 42.
- .3 Bolts: to ASTM A 307.
- .4 Nuts: to ASTM A 563.

2.4 Insulation Protection Shields

- .1 Insulated cold piping:
 - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
- .2 Insulated hot piping:
 - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP-69.

2.5 Constant Support Spring Hangers

- .1 Springs: alloy steel to ASTM A 125, shot peened, magnetic particle inspected, with +/- 5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.
- .2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.
- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 Variable Support Spring Hangers

- .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.
- .3 Variable spring hanger to be complete with factory calibrated travel stops.

- .4 Steel alloy springs: to ASTM A 125, shot peened, magnetic particle inspected, with $\pm 5\%$ spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 Equipment Supports

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.

2.8 Equipment Anchor Bolts and Templates

- .1 Provide templates to ensure accurate location of anchor bolts.

2.9 House-keeping Pads

- .1 For base-mounted equipment: Concrete, at least 100 mm high, 50 mm larger all around than equipment, and with chamfered edges.

PART 3 EXECUTION

3.1 Installation

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, elsewhere as indicated.
- .3 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to be to industry standards.
 - .3 Steel pipes: Install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: Install below joint.
- .4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .6 Use approved constant support type hangers where:
 - .1 Vertical movement of pipework is 13 mm or more.
 - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .7 Use variable support spring hangers where:

- .1 Transfer of load to adjacent piping or to connected equipment is not critical.
- .2 Variation in supporting effect does not exceed 25% of total load.

3.2 Hanger Spacing

- .1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.
- .2 Fire protection: to applicable fire code.
- .3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.
- .4 Copper piping: up to NPS 1/2: every 1.5 m.
- .5 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.
- .6 Within 300 mm of each elbow.

Maximum Pipe Size: NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7 m	2.4 m
2	3.0 m	2.7 m
2-1/2	3.6 m	3.0 m
3	3.6 m	3.0 m
3-1/2	3.9 m	3.3 m
4	4.2 m	3.6 m
5	4.8 m	
6	5.1 m	
8	5.7 m	

3.3 Hanger Installation

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.4 Horizontal Movement

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4° from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 Final Adjustment

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.
- .2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
 - .1 Hammer jaw firmly against underside of beam.

END OF SECTION

PART 1 GENERAL

1.1 Description

- .1 This Section specifies requirements for the supply of all materials, labour, plant and equipment for the installation, testing and putting into satisfactory operation of all piping, fittings and appurtenances as shown on the Drawings. Connections to all equipment are included. Contractor to coordinate with the manufacturer of the owner supplied equipment as required. Contractor to supply and install and test miscellaneous fittings and connections for the owner supplied equipment.
- .2 In-line devices are specified under other Sections of these Specifications. The physical installation of all these devices in the lines, including the supply of all jointing materials, couplings, etc., unless otherwise noted, is specified under this Section. These devices include, but are not limited to, the following:
 - .1 Gauges.
 - .2 Flow metering devices.
 - .3 Valves.
 - .4 Analyzers.
- .3 Plant piping is all piping inside structure, above ground, exposed or underground to 0.5 m outside of structure.
- .4 Pipes 50 mm and less may not be shown on the piping drawings. Line to be field routed with the approval of the Contract Administrator. Use P&ID as guide for size, material, and inline devices. The drawings designate the site and line service specifications of all pipes, fittings, valves and equipment to be supplied by the Contractor.
- .5 Refer to Division 23 for general requirements for this Section.

1.2 Installation of Piping, Joints, etc.

- .1 Install all piping, joints, fittings, valves and other items covered in this Section in accordance with the manufacturer's recommendations, except where there is conflict between the Contract Specifications and the manufacturer's recommendations, in which case the Contract Specifications shall govern.
- .2 Contractor to submit welding procedures and copies of "Record of Qualifications" for each welder in accordance with ASME Code, Section IX and TSSA to the Contract Administrator. Welders shall be qualified for each separate material group.
- .3 All piping, fittings, and inline components used for Chlorine service (gas, liquid, or solution) shall adhere to The Chlorine Institute Manual, latest edition and The Chlorine Institute Piping Systems for Dry Chlorine (Pamphlet 6), latest edition.

1.3 Pipe List

- .1 P&ID Diagrams specify pipe diameters, materials, service and accessories.

- .2 P&ID specify valves and inline devices.
- .3 Piping drawings indicate routing of pipe and joint connections.

1.4 Handling and Storage of Materials

- .1 Assume complete responsibility for the safe delivery to the site of all pipe and fittings.
- .2 Store pipe and fittings on timber platforms or in a manner approved by the Contract Administrator and protect by weatherproof housings.
- .3 Inspect all fabricated material for damage in transit before installation in the work.
- .4 Exercise particular care to avoid damage to internal and external coating on pipe and fittings. Repair damaged coating to the satisfaction of the Contract Administrator before installation.
- .5 The Contract Administrator reserves the right to reject pipe and fittings that are damaged or defective.

1.5 Fabricated Items

- .1 The Contractor shall assume full responsibility for detailed layout, co-ordination of system and field measurement for fabricated items.

1.6 Project Record Drawings

- .1 Maintain "Project Record Drawings" to **Section 01 78 39**.

1.7 Submittals

- .1 Produce Shop Drawings for Contract Administrator's review, as per **Section 01 33 00**. Details to include spool length, welds, unions, flange positions, and articulation or expansion joints.
- .2 Contractor to produce pipe support drawing for all piping sealed by a Professional Engineer registered in Nova Scotia. Details to include location, size and type of supports. Pipe supports shown on drawings are a minimum requirement. All appropriate supports shall be detailed, supplied and installed by the Contractor.

1.8 Material Certification

- .1 At least ten (10) business days prior to commencing work, submit manufacturer's test data and certification that pipe materials meet the requirements of this Section. Include manufacturer's Drawings, information and Shop Drawings where pertinent.

1.9 Pipe Identification

- .1 Follow Owner's Standards for pipe identification.

PART 2 PRODUCTS

2.1 Pipe and Fittings

- .1 This specification may include materials that are not required for the specific project or provide alternatives, which may be considered. The drawings take precedence for dictating piping for specific uses or applications unless otherwise indicated.

2.2 Interior Finishes

- .1 Provide products with factory applied coatings and finishes unless otherwise noted.
- .2 Do not shop coat the internal surface of stainless steel or plastic piping.
- .3 Provide No. 1 or No. 2B standard finish for gauge stainless steel pipe, as specified in ASTM A480. Finish heavier pipe to No. 1 mill finish or better, as specified in ASTM A480.
- .4 Cement Mortar Lining: as the basic specification apply cement mortar lining and an asphaltic seal to the internal surface of ductile iron piping in accordance with AWWA C104; and to the internal surface of steel piping in accordance with AWWA C205.
- .5 Where specified, provide asphaltic varnish for ductile iron and cast iron pipe, in accordance with AWWA C151.
- .6 Coal Tar Epoxy: where specified, apply coal tar epoxy to the internal surface of piping in accordance with AWWA C210, to a minimum dry film thickness of 350 microns, including interior coating at field-weld joints. Coal Tar Epoxy is not permitted for potable water applications.

2.3 Exterior Finishes – Shop Applied

- .1 Provide products with factory applied coatings and finishes as specified in the detailed pipe specification sheets.
- .2 Coal Tar Epoxy: apply coal tar epoxy to the exterior of ductile iron piping in accordance with AWWA C210.
- .3 Where piping is to be galvanized, hot dip zinc coat to CSA G164 with a minimum coating of 550 g/m².

2.4 Exterior Finishes - Field Applied

- .1 Generally speaking, piping systems shall be field coated as specified in Division 9 except as provided for below or in other Sections of this Division.
- .2 Use field applied finishes only for: short lengths of metal pipe in a piping system where the length of pipe which requires coating is less than 3.0 metres unless otherwise specified; to repair shop-applied exterior finishes; to make up cutback distances at joints; and for fittings, couplings, valves and other appurtenances.

- .3 For welded joints on Yellow jacketed pipe and at other indicated locations apply tape to buried pipe and fittings. Use Polyken, Polyguard 600 or Denso Clad consisting of primer and tape applied to minimum thickness of 0.90 mm in accordance with AWWA C209.
- .4 For flanged or coupled joints and for fittings use petrolatum primer, mastic and tape; Tec-Tape or Denso, in accordance with AWWA C217. (Use for underground, corrosive atmosphere, submerged applications and as specified).
- .5 Shrink Sleeve: as an alternative to tape wrap, shrink sleeves are acceptable if material and method of installation is reviewed and accepted by the Contract Administrator prior to use.

2.5 PVC Pressure Pipe (PVC)

- .1 Material: PVC (polyvinyl chloride) pressure pipe and fittings.
- .2 Use Schedule 80, Type 1, Grade 1, PVC conforming to ASTM D 1784. Pipe shall conform to CSA B137.3.
- .3 Fittings:
 - .1 Valves, elbows, flanges and tees PVC Schedule 80, socket (for solvent welding) to ASTM D 2467.
 - .2 PVC Schedule 80 to ASTM D 2464 for threaded fittings, unions, and other equipment connections.
 - .3 Threaded male adapters shall not be used.
- .4 Joints:
 - .1 If buried use bell and spigot joints (with the exception of chemical lines). Bell and spigot pipe shall be Class 150. Lines for chemical pipe shall use solvent cement.
 - .2 Indoor, socket solvent joints for pipe and fittings to ASTM D 2564.
 - .3 For flanged connections:
 - .1 Bolting to ASTM A 193/A 193M.
 - .2 Nuts to ASTM A 194/A 194M, Grade 2.
- .5 Gaskets:
 - .1 Garlock Stress Saver 6800, or approved equal.
 - .2 Flat face flanges to have full face gaskets.
 - .3 Raised face flanges shall not be used.
- .6 Painting:
 - .1 Do not paint process PVC pipe unless specified.

2.6 Stainless Steel Pipe (SS)

- .1 Material: Type 304 stainless steel pipe and fittings.

- .2 Pipe: to ASTM/A778 for diameter larger than 150 mm, and ASTM A 312, PE (plain end) for 150 mm diameter or less. Minimum wall thickness as follows:
 - .1 13 mm to 50 mm diameter: Schedule 40.
 - .2 75-300 mm diameter: Schedule 10.
 - .3 350-600 mm diameter: 3.18 mm (11 gauge).
 - .4 750-1200 mm diameter: 4.76 mm (7 gauge).
- .3 Fittings: to ANSI B16.9 or MSS SP-43. Materials to conform to ASTM A 403. Smooth flow elbows shall be used where available from manufacturer. Larger elbows not manufactured in smooth flow type can be 5-piece section type.
- .4 Joints:
 - .1 Maintenance: flanged, or groove coupling where necessary for ease of installation, disassembly and maintenance.
 - .2 Normal: buttweld.
 - .3 Instrument connections: threaded nipple.
 - .4 Expansion: flexible stainless steel couplings by Straub Flex 2, or approved equal.
- .5 Fabricate stainless steel pipe systems as completely as possible in the shop to minimize connections by field welding.
- .6 Welding materials, methods, operations and inspection shall be in accordance with current Provincial and Federal Regulations for welding of stainless steel. Use automatic welding techniques - Tungsten inert gas or metal inert gas method. Make circumferential welds using metallic arc process.
- .7 Use welding rod or wire of the same composition or superior to the pipe and fittings material.
- .8 Weld deposit at the seams shall have a slight crown on both sides of the weld. No cracks or crevices shall be allowed.
- .9 Remove excessive weld deposits, slag, weld spatter and projections into the interior of the pipe by grinding.
- .10 Secure all backing rings on spools to pipe flanges to prevent damage during shipment.
- .11 Mark all spool items in the shop with Drawing and Item Numbers. Mark the type of stainless steel used.
- .12 Flanges: Mild steel galvanized backing flanges drilled to ANSI B16.5 class 150# for all indoor locations. All other locations shall have 304SS flanges drilled to 150#. All flange connections on stainless steel pipes in tanks shall be 316 stainless steel flanges or 316 stainless Type B stud ends backing flanges with stainless steel bolts and nuts. Stainless steel grooved flanges and couplings installed in Sch. 40 spool pieces are an approved alternate.

- .13 Bolting: to latest edition of ANSI/AWWA C207 (ASTM A 307 Grade B, ANSI B18.2.1) for diameters 150 mm and larger or ASTM A 193/A 193M for smaller diameters. Corresponding nuts to be ASTM A 194/A 194M, Grade 2.
- .14 Gaskets:
 - .1 Garlock 7797, or approved equal.
- .15 Fabricated stainless steel pipe to be as supplied by one of the following, or approved equal:
 - .1 Douglas Barwick Inc.
 - .2 The Robert Mitchell Company Ltd.
 - .3 Atlas Alloys.
- .16 Provide reinforcing saddles (re-pad) at all pipe support locations of similar material, tack welded to pipe.

2.7 Galvanized Pipe (GALV)

- .1 Manufacture fabricated continuous weld or electric resistance welded galvanized carbon steel pipe to ASTM A53/A53M, Grade B.
- .2 Temperature range: 1°C to 30°C.
 - .1 Minimum wall thicknesses for pipe and fittings:
 - .2 75 mm and smaller: Schedule 80.
 - .3 100 mm to 200 mm: Schedule 40.
- .3 Fittings:
 - .1 75 mm and smaller: Class 125 cast iron screwed, galvanized, conforming to latest editions of ASTM A 126-95el, Class A, and ASME B16.1-1998.
 - .2 100 mm and larger: Class 150 galvanized malleable iron screwed fittings conforming to latest editions of ASTM A 197/A197M-98 and ASME B16.3-1998.
 - .3 Complete with 2100 kPa screwed, malleable iron unions.
- .4 Flanges:
 - .1 Class 125 cast iron galvanized flat-face, screwed flanges conforming to latest editions of ASTM A 126-95el, Class A and ASME B16.1.
- .5 Joints:
 - .1 Maintenance: flanged or grooved coupling.
 - .2 Normal: welded to AWWA C206.
 - .3 Instrument connections: threaded.
 - .4 Expansion: Rockwell, Dresser flexible coupling, or Victaulic Flex coupling, or approved equal.
- .6 Bolting: to ASTM A307-97 Grade B, ANSI B18.2.1.

- .7 Gaskets:
 - .1 Garlock 7797, or approved equal.

2.8 Copper Pipe (CU)

- .1 This Specification covers Copper Piping 65 mm and smaller (2.5" and smaller).
- .2 Material: Type L hard drawn copper tubing to ASTM B 88M.
- .3 Fittings:
 - .1 Cast bronze threaded fittings, Class 125 and 250 to ANSI B16.15.
 - .2 Cast bronze, solder type to ANSI B16.18.
 - .3 Wrought copper and copper alloy, solder type to ANSI B16.22.
- .4 Joints: lead free solder/brazing.

2.9 Flexible Hose - Up to 32 mm Diameter

- .1 Material: EPDM tubing with textile reinforcement and EPDM cover up to 32 mm diameter.
- .2 Fittings: NPT threaded nipples, as supplied by tubing manufacturer.
- .3 Acceptable products: "Comanche L81" as manufactured by the Goodall Rubber Co. of Canada Limited.

2.10 Flexible Hose – Up to 32 mm Diameter

- .1 Material: EPDM tubing with textile reinforcement and EPDM cover up to 32 mm diameter.
- .2 Fittings: NPT threaded nipples, as supplied by tubing manufacturer.
- .3 Acceptable products: "Comanche L81" as manufactured by the Goodall Rubber Co. of Canada Limited.

2.11 Flexible Hose - Above 32 mm Diameter

- .1 Hose shall be collapsible and constructed from the following:
 - .1 Tube: PVC.
 - .2 Reinforcement: Polyester fibre wrap.
 - .3 Cover: high density PVC.
- .2 Hose shall be suitable for outside application.
- .3 Pressure rating shall be at least 1050 kPa.
- .4 Acceptable products: "Blue Life V136" by Goodall Rubber Co., of Canada Limited.

2.12 Pipe Couplings

- .1 As a general rule, Piping ≥ 100 mm will be flanged, welded or grooved to provide rigid connections of "ferrous" piping. Smaller piping will be typically welded or have threaded connections. Other piping materials such as the various forms of plastic, non-ferrous metals etc. will be joined as recommended by the manufacturer and/or to suit project conditions as required by Codes or good trade practice.
- .2 Drawings will show where joints are required for serviceability. These will be required as a minimum. Because the Contractor will be allowed some flexibility on the type of material to be used, additional joints will be as required to suit the material e.g. welded steel piping vs. flanged ductile iron.
- .3 Notwithstanding the previous comment, provide joints which may be disassembled within 1.0 metre of any connection to equipment, on both sides of structural penetrations and within 0.6 metres of all threaded end valves.
- .4 Where noted on the Drawings to allow for serviceability or flexibility, the Contractor shall supply and install "Vicalic" or Smith-Blair flange adapter couplings. The Vicalic couplings shall be compatible with pipe material (or as indicated). Stainless steel adapters are required for all outdoor applications. Smith-Blair flange adapters shall be Type 912 up to 300 mm and 913 for pipes greater than 300 mm. Type 913 shall be hot dipped galvanized.
- .5 Do not use slip-on flanges that are attached to a pipe by means of set screws and gaskets (Uni-flange, etc.) except as approved by the Contract Administrator. They may be considered within a restrained run of pipe or where connections are made to existing pipe where there may be no other means to make the connection and as long as the joint can be restrained in other ways.
- .6 At the exterior side of concrete walls, install underground pipes (≥ 75 mm) with "Dresser" couplings located within 450 mm of the outside face of the wall for protection against deflection due to ground settlement. Alternatively two (2) mechanical joints may be located 300 mm and 1200 mm from the wall face. Provide joint harnesses on all such connections on pressure pipes.
- .7 Provide for other methods of connection to external pipes as detailed on the Drawings or as directed by the Contract Administrator.

2.13 Flexible Wall Sleeve

- .1 Provide flexible wall sleeves that allows for linear rotational and deflectional realignment on pipes as shown on the Drawings to the satisfaction of the Contract Administrator.
- .2 Product: Link Seal.

2.14 Protective Coatings

- .1 Wrap and seal all underground transition couplings and restrained joints with corrosion-resistant waterproof coating system.

- .2 The coating system to be “The Denso System” as supplied by Denso of Canada Limited, or approved equal.
 - .1 Primer: Denso Paste or Denso Primint Solution.
 - .2 Sealing Compound: Denso Mastic.
 - .3 Outer Wrap: Denso PVC Self-Adhesive Tape.

2.15 Concrete

- .1 Concrete for anchor blocks, thrust block and other pipe supports: to be Class I.

2.16 Pipe Supports and Hangers

- .1 Refer also to **Section 15061** and attached detail sketch drawings (as applicable) of typical hanger details.
- .2 Design hangers and supports to provide sufficient support to retain the piping system without exerting undo strain on the pipe, the attached equipment or the supporting structure. Design hangers and supports to the building code and ASME 31.3 at pipe pressure rating.
- .3 The systems are to allow for pipe movement related to thermal expansion. Sagging or excessive movement from system operation is not acceptable.
- .4 Provide details of the proposed support system sealed by a professional engineer to the Contract Administrator. The Contractor Administrator's review of the proposed support system does not relieve the Contractor from overall responsibility of the system integrity under design operating conditions. Supports may utilize fabricated steel components or poured-in-place reinforced concrete bases.
- .5 Support systems are to allow for the partial dismantling of the piping system especially around equipment or fittings without having to provide supplementary supports. Specific supplementary supports of fittings such as valves are to be provided in addition to piping supports using the support provisions of the fitting.
- .6 Provide piping supports, whether indicated on the Drawings or not, where necessary, to the satisfaction of the Contract Administrator.
- .7 All supports shall be stainless steel, unless otherwise noted.

2.17 Fittings

- .1 Fittings for piping systems to be compatible for the piping material and service.
- .2 Provide fittings with a wall thickness equal to or greater than the pipe.
- .3 Provide eccentric reducers in horizontal lines with the flat side on top, unless indicated otherwise. Provide concentric reducers in vertical lines unless indicated otherwise.

- .4 Provide long radius elbows unless otherwise shown. Provide smooth flow carbon or stainless steel elbows 350 mm and less. Provide mitred elbows greater than 350 mm unless otherwise shown or specified.

2.18 Y-Strainer Specification

- .1 This Specification covers PVC Y-strainers in sizes 13 mm to 100 mm (1/2" to 4").
- .2 Pressure - temperature rating: 1050 kPa at 40°C.
- .3 Body and trim material: PVC to be a transparent Type I, Grade 1, cell classification 12454-A, with minimum suffix "A" designation for chemical resistance as per ASTM D 1784.
- .4 End connections: Schedule 80 with socket end connections, conforming to ASTM D 2467.
- .5 PVC compound and EPDM seals shall meet CSA B137 paragraph 5.2.1 environmental requirements for toxicity.
- .6 Filter screen: replaceable 24 mesh PVC screen.
- .7 Acceptable products: Chemline YST Series or approved equal.

2.19 Expansion Joints

- .1 Design and fabricate expansion joints in accordance with EJMA standards.
- .2 Provide expansion joints as shown and unless otherwise shown provide elastomer spool type expansion joints.
- .3 Ensure corrugated type expansion joints are capable of a minimum 10,000 pressure, temperature and deflection cycles, not concurrent.
- .4 For metal expansion joints of the metal bellows type, in systems handling gases, air, water or other liquids, provide liners to produce a smooth flow path, reduce vibration and reduce noise through the expansion joint.
- .5 Provide sufficient bends and expansion joints to allow for thermal movement of piping from 0°C to maximum service temperature.
- .6 Provide factory pre-compressed expansion joints where required to suit installation temperature.

2.20 Flexible Joint Specification

- .1 Flexible expansion and deflection joint shall be installed in the location shown on the Drawings.
- .2 Material: Ductile iron to ANSI/AWWA C153/A21.53.

- .3 Joint shall be able to expand and deflect simultaneously at least 100 mm expansion and 15° deflection.
- .4 Acceptable products: "Ex-Tend 200" and "Flex-Tend", as manufactured by EBAA Iron Sales Inc. - 800-433-1716, with flanged restrained connection.

2.21 Swivel Joints

- .1 Provide OPW flange connection swivel joints. Swivel joints shall be Series 40, Style 3640FJ, in locations indicated on Drawings, cast aluminum with 860 kPa ANSI flange connections.

2.22 Quick Couplings

- .1 This Specification covers quick couplings in sizes 13 mm to 100 mm (1/2" to 4").
- .2 Construction: easy coupling action using twin cam arm design.
- .3 Material: stainless steel.
- .4 Gasket: Buna-N.
- .5 Ends: threaded to NPT.
- .6 Dust cap: stainless steel cap and chain.
- .7 Acceptable products: OPW Twin-Cam Camlock Couplers or approved equal.

2.23 Yard Hydrants

- .1 This Specification covers non-freezer self-draining yard hydrants.
- .2 Maximum non-shock working pressure - 1400 kPa (175 psig) cold water.
- .3 Bronze head and valve casting to ASTM B 62-93, galvanized steel casing, bronze working parts, decorative cast aluminum housing, standard complete with tapped drain hole.
- .4 Pipe ends shall be 50 mm male pipe thread.
- .5 Hose ends shall have 40 mm male hose threads.
- .6 Acceptable products: Ancon Series HY-600 or approved equal.

2.24 Tapping for Pressure Gauges or Instruments

- .1 Provide 12 mm diameter tapping with ball valve for temporary pressure gauge connections both on suction and discharge side of each pump.
- .2 The material of the tapping pipe and ball valve shall be compatible with the material of the pipe.

- .3 Provide a tapping as described above compatible with pipe material for instrument connections or sampling points where shown complete with local isolation ball valve.

PART 3 EXECUTION

3.1 General Pipe Installation and Layout

- .1 Contractor must verify all dimensions and new equipment locations in the field prior to the start of work. Install all piping and appurtenances to the dimensions indicated on the Drawings, square, straight, plumb and level.
- .2 Carefully position pipe and fittings without strain or deflection and using proper appliances.
- .3 Make due allowance for dimensional variation of equipment. Bring any dimensional discrepancies to the Contract Administrator's attention.
- .4 The detailed layout of the piping, etc. is the responsibility of the Contractor. If required by the Contract Administrator, produce Field Drawings to show relative positions of various services, and receive Contract Administrator's approval before the work is started.
- .5 Clear all foreign matter from inside piping and dispose of in accordance with **applicable AWWA Standards**.
- .6 For pressure piping 75 mm diameter and under, the Contractor may, subject to the Contract Administrator's prior approval, deviate locally from the layout indicated on the Drawings to suit local conditions and preserve proper headroom of 2.1m minimum under all exposed pipes, unless otherwise noted.
- .7 P&ID to govern other Piping Plans.
- .8 Where piping is not shown or is shown diagrammatically, install the pipes neatly to suit the structure, subject to the Contract Administrator's prior approval.
- .9 Bolt piping to equipment before grouting piping into walls.
- .10 Use appropriate bending tools (cold bending only) for copper pipe to produce smooth, even curves. Review and be familiar with all applicable codes pertaining to the works. The Contractor will be responsible to comply with all applicable Codes whether there has been a specific reference to the Code or not.
- .11 Before commencing installation, determine specific piping support and thrust restraint requirements to suit the materials of construction, the piping materials and the operating conditions. Prepare and submit a detailed schedule of piping supports for the Contract Administrator's review.
- .12 Make adequate provision in piping and pipe support systems for expansion, contraction, slope, and anchorage.

- .13 Install expansion joints where shown and at other locations as necessary to allow piping expansion and contraction.

3.2 Pipes through Walls, Floors and Roofs

- .1 Unless indicated otherwise on the Drawings, for pipes cast in through concrete walls or floors with a hydrostatic head condition on either one or both sides and pipes cast in walls for structural support, use special "wall pieces" constructed with puddle flanges continuously welded on, of adequate size and thickness for the service intended, and in no case less than 6 mm thick.
- .2 Provide sleeves as shown on the Drawings.
- .3 Provide the structural steel fabricator with the size and location of holes required in steel beams, etc. prior to fabrication. Any additional holes required during construction must be approved by the Contract Administrator prior to cutting.
- .4 Holes, sleeves and pipe chases for insulated pipes shall be large enough to permit free movement of pipe without crushing the insulation.
- .5 Couple piping passing from a rigid structure to trench conditions with a flexible sleeve type coupling or push-on type joint within 450 mm of the external face of the structure. Locate a further flexible pipe joint a maximum of 1.5 m from the first joint. Refer to Contract Drawings for details.
- .6 Where the new piping goes through a wall, repair the wall to match the inside/outside of the existing building. Make good all redundant wall and floor openings.
- .7 Bed and backfill pipe beneath structural slabs with fill concrete (Class II).

3.3 Pipe Connections to Equipment, Tanks, etc.

- .1 The Contractor shall fully inform himself of the installation requirements and dimensions of equipment required to be connected to piping. Where piping is to tie into equipment, preliminary dimensions have been shown and are not guaranteed.
- .2 Any change in such dimensions shall not relieve the Contractor of his responsibility to make the piping fit the equipment.
- .3 Any fitting shown on the Drawings by a consistent symbol, but not described or scheduled, shall be incorporated into the work by the Contractor, who shall first determine from the Contract Administrator the requirements for such fitting.
- .4 All connection fittings to tanks, equipment, etc. shall be such that the fittings may be easily removed from and replaced in the lines, or lines easily disconnected from equipment or tanks for maintenance purposes.
- .5 Make connections compatible with that specified or shown on the Drawings for fittings, tanks or equipment, etc. or for intended service.

- .6 In the event that the type of connection is not indicated on the Drawings or in the Specifications, use an approved flange, union or coupling.
- .7 Unless otherwise shown or specified, install gauge taps on the suction and discharge of all pumps, fans, blowers, compressors and vacuum pumps. Attach gauge taps with a threaded nipple and valve to the pipeline, duct or equipment.

3.4 Pipe Supports, Anchors and Guides

- .1 All pipe supports shall be 304 SS unless specified differently on the drawings.
- .2 Adequately support all piping, fittings and valves either from the floor on concrete piers or approved supports or from above with approved hangers.
- .3 Design and place supports so that no weight will be taken directly on the equipment sleeve coupling or sleeves through walls, and will be satisfactory for the service intended.
- .4 Adequately brace pipes and fittings cast into concrete floors, walls, etc. at each joint, to resist all buoyant or lateral forces imposed on the piping during concrete pours. Replace any piping or fittings found to yield from their intended position.
- .5 Attach hangers to steelwork with approved clamps or welded tabs. Submit the proposed method of attaching pipe hangers to structural steelwork for approval.
- .6 Attach hangers to concrete with approved threaded rod sockets cast into the concrete. Cinch anchor sockets may be permitted by the Contract Administrator in light duty service.
- .7 Isolate supports and pipes of dissimilar materials using neoprene sheet or other approved material.
- .8 Contractor to size and provide reinforcing saddles (re-pad) at all pipe support locations of similar material.
- .9 Locate anchors and guides as shown on the Drawings and install elsewhere, as required by the piping systems. Design shall be adequate so that no stress is imposed on equipment and allowable stress in piping is not exceeded. Contractor to provide pipe support Drawings for Contract Administrator's review. Details to include location, size and type of supports.

3.5 Pipe Joining

- .1 Conform to requirements of ANSI B31 code for pressure 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 i.e., with flat side up.
- .5 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment. Reducing bushings are not permitted.
- .6 Install flanged or welded nozzles, branch connections, welding outlets, adapters and taps, true and faced at right angles to the axis of the pipe. Do not extend connection inside of pipe.
- .7 Make pipe ends round and true, suitable for weld connection as applicable. Prepare pipe ends in accordance with ANSI B16.25 for butt welding.
- .8 Copper pipe and tubing to be free from surface damage. Replace damaged pipe or tubing. Lay copper tubing so that it is not in contact with dissimilar metal and will not be kinked.
- .9 Ream ends of pipe and tubes before being made up.
- .10 Use non-corrosive lubricant or Teflon tape applied to male thread only.
- .11 Groove pipe ends, cut square, seating surface clean and free from indent and score marks.
- .12 Install dielectric fittings wherever piping of dissimilar metals are joined.
- .13 Clean ends of pipes or tubing and recesses of fittings to be brazed or soldered. Assemble joints without binding.
- .14 Support piping during construction to prevent abnormal stresses on the pipe works.
- .15 Do not weld adjacent to valves when the valve is in place to avoid heat damage to seats.

3.6 Pipe Drainage

- .1 At the low points in piping systems and at other locations indicated on the Drawings, install drains to permit draining any system without breaking a joint.
- .2 Drains shall be 25 mm IPS for pipes larger than 50 mm diameter, and 13 mm IPS for pipes 50 mm diameter and under or as shown on drawings. Terminate drains 150 mm from the pipe in a valve suitable for the particular service and approved by the Contract Administrator. Plug or cap valves on the atmospheric side.
- .3 Drain valves shall be accessible from the floor. Run drains to the collection point or provide quick disconnects at easily accessible locations.

3.7 Cutting of Pipe

- .1 Whenever cutting of pipe is required, cut pipes as recommended by pipe manufacturer.
- .2 Method of cutting and cutting equipment to be subject to the approval of the Contract Administrator.

3.8 Painting and Protective Coatings

- .1 Painting and protective coatings for pipe shall be in accordance with the foregoing and Division 9.

3.9 Pipe Inspection and Testing

- .1 General:
 - .1 Provide all necessary equipment and perform all work required in connection with the tests.
 - .2 Bear the cost of all testing, location and remedying of leaks and any necessary retesting and alignment.
 - .3 All pipes shall be thoroughly flushed prior to pressure testing.
 - .4 All tests shall be documented on application forms provided by the Contract Administrator.
- .2 Testing of pressure piping systems:
 - .1 Hydrostatically test all plant piping, other than non-pressure piping, in accordance with ANSI B31.1.0 at 1.5 times working pressure.
 - .2 All liquid and chemical carrying pipes shall be watertight under the test pressure and all suction piping shall be straight. Test pressure shall be 1.5 times the maximum operating pressure, minimum 420 kPa (60 psi).
 - .3 Test shall confirm to the requirements of ASME B31.1.0.
 - .4 Leave pipes uncovered in every part of the building until approved by the Contract Administrator.
 - .5 Should any leak develop in any of the pipes, repair the leaks or replace the defective Section at no cost to the Owner.
 - .6 Continue repairs and testing until the leakage has been stopped.
 - .7 Extend each test over a period of at least two hours, unless a short period complies with ANSI B31.1.0.
- .3 X-ray inspection of welds:
 - .1 Piping welding shall be X-rayed at the discretion of the Contract Administrator. If the Contract Administrator is not satisfied with the welding or suspects pin holes in the weld, he will request the welds be x-rayed. The percentage to be tested depends on the workmanship and quality of the welding being done.
 - .2 Cost of X-ray inspection shall be borne by the Owner. Re-inspection will be paid by the Contractor.
- .4 Chlorine System Cleaning:
 - .1 Chlorine service piping systems must be free of water, oil, debris, and other contaminants before service as per the Chlorine Institute Manual, 6th Ed. (or latest edition).

3.10 Flushing, Swabbing, and Disinfection

- .1 Flushing and disinfecting operations: witnessed by local water work department:

- .1 Notify Engineer at least 4 days in advance of proposed date when disinfecting operations will begin.
- .2 Flush water mains 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 Flushing flows as follows:

Pipe Size NPS	Flow (L/s) Minimum
6 and below	38
8	75
10	115
12	150
- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, hydrants and service connections to ensure thorough flushing.
- .6 When flushing has been completed to Engineer approval, introduce strong solution of chlorine as approved by Engineer into water main and ensure that it is distributed throughout entire system.
- .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 main and to occur at same time.
- .9 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- .10 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.
- .11 Flush line to remove chlorine solution after 24 hours.
- .12 Measure chlorine residuals at extreme end of pipe-line being tested.
- .13 Perform bacteriological tests on water main, after chlorine solution has been flushed out:
 - .1 Take samples daily for minimum of two days.
 - .2 Should contamination remain or recur during this period, repeat disinfecting procedure.

- .14 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.

END OF SECTION

PART 1 GENERAL

1.1 Description

- .1 This Section specifies the requirements for supplying and complete installation of valves, valve operators, and gates. This specification is intended primarily for application to process valves and has precedence over other mechanical specifications for process valves and gates.

1.2 References

- .1 Bases, Hangers and Supports. Section 40 05 07.
- .2 Process Piping. Section 40 05 13.

1.3 Scope of Work

- .1 Supply, install and test all valves and valve systems shown on the drawings.

1.4 Submittals

- .1 Submit Shop Drawings in accordance with the contract documents.
- .2 Shop Drawings, in metric units, shall be submitted including:
 - .1 Gates, Valves and Frames.
 - .2 Operators and Actuators.
 - .3 Pedestals.
- .3 Design calculations according to AWWA C513 and C561 latest edition shall be submitted with shop drawings.

1.5 Handling and Storage of Materials

- .1 General Contractor shall assume complete responsibility for the safe delivery to the site of all equipment specified herein.
- .2 Inspect all fabricated material for damage in transit before installation in the work.
- .3 Exercise particular care to avoid damage to equipment.
- .4 The Contract Administrator reserves the right to reject equipment that is damaged or defective.

1.6 Quality Assurance and Guarantees

- .1 Provide a performance guarantee to meet the treatment objectives outlined herein. The manufacturer shall identify specific needs, tolerances, requirements or alterations in order to achieve the treatment objectives.

- .2 The Manufacturer shall have experience in the production of substantially similar equipment, and shall show evidence of satisfactory operation in at least 50 installations.
- .3 All welding procedures and welders shall be qualified and certified in accordance with the latest version of ASME, Section IX.

1.7 Operation and Maintenance Data

- .1 Submit operation and maintenance data in accordance with the contract documents.

1.8 Warrantee

- .1 Manufacturer to warrant valves free of defects in workmanship and materials, and that valve will not leak in the process conditions indicated in the Specifications and Drawings, for a period of two (2) years. Warrantee shall cover all costs associated with the repair, replacement and/or installation due to defect in valve.

PART 2 PRODUCTS

2.1 PVC Ball Valves

- .1 This specification covers PVC ball valves in sizes 12.5 mm (1/2") to 100 mm (4") for PVC pipe systems.
- .2 Pressure-temperature ratings: 150 psi (1.03 MPa) @ 500C.
- .3 Body and trim material: PVC to ASTM D-1784, Type 1, Grade 1, Cell Classification No. 12454-A.
- .4 Construction: true union, full port.
- .5 End connections:
 - .1 VBA106-1, Schedule 80 threaded to ASTM D-2464.
 - .2 VBA106-2, Schedule 80 socket to ASTM D-2467.
 - .3 VBA106-3, flanged to ANSI B16.5, Class 150.
 - .4 Seat: TFE.
 - .5 Seal: EPDM.
 - .6 Actuator: Lever type.
- .6 Acceptable products:
 - .1 Chemline Series CTU.
 - .2 Chemtrol Series TU.
 - .3 Plastics Canada Series 300.
 - .4 Approved equal.

2.2 Butterfly Valves

- .1 Air Service:
 - .1 Wafer or lug type with cast iron body compatible with ANSI B16.1, 125# flanges. Bodies to have flange bolt guides.
 - .2 Valves to have bronze bearings or delerin above and below bronze disk.
 - .3 Seat to be EPDM or equal, suitable for use with air at 100 C.
- .2 Water service:
 - .1 Butterfly valves for submerged service shall be flanged to ANSI B16.1, 125#, conforming to AWWA C504.
 - .2 Fasteners to be stainless steel.
 - .3 Valve body to be cast iron with two coats epoxy, inside and out, 10 mil, to SSPC-SP5.
 - .4 All materials in contact with process fluid to be NSF 61 certified.
 - .5 Disk to be cast iron with 316SS edge and 304SS shaft.
 - .6 Seats to be Acrylonitrile-Butadiene with non- adjustable packing.
 - .7 Provide neck and shaft extensions as required.
- .3 Manually operated valves to be equipped as follows:
 - .1 4" and smaller to be equipped with lever actuators.
 - .2 6" and larger to be equipped with hand wheel and gear actuators.
- .4 Acceptable manufacturers:
 - .1 Pratt
 - .2 Keystone
 - .3 Bray
 - .4 Approved equal.

2.3 Stainless Steel Ball Valves

- .1 This specification covers stainless steel ball valves in sizes 12.5 mm (1/2") to 50 mm (2").
- .2 Pressure-temperature ratings: 150 psi (1.03 MPa) @ 1800C.
- .3 Body and trim material: Stainless steel Type 316.
- .4 Ball: Stainless steel to ASTM A276 Type 316.
- .5 End connections: Threaded ends unless noted otherwise.
- .6 Gasket: PTFE.
- .7 Actuator: Lever type, stainless steel Type 304, vinyl covered.
- .8 All materials in contact with process fluid to be NSF 61 certified.

- .9 Acceptable products:
 - .1 Crane Capri Ball Valves, Figure No. 9502.
 - .2 Approved equal.

2.4 Solenoid Valves

- .1 Solenoid valves shall be suitable for the intended use on compressed and blower air supplies.
- .2 General purpose, pilot operated, moulded epoxy encapsulated continuous duty coil, class F with type 3 enclosure; 120 VAC, Seal Viton, c/w cable plug. CSA approved.
- .3 Materials of construction:
 - .1 Body: brass.
 - .2 Core tube: 305 Stainless steel.
 - .3 Disc and seals: Buna N.
 - .4 Core and plug nut: 430F stainless steel.
 - .5 Solenoid enclosure: NEMA 3.
 - .6 Core springs: 302 SS.
- .4 Status upon power failure shall be confirmed on shop drawings.
- .5 Valve Actuator Solenoids: Integral with valve as indicated, c/w manual override.
- .6 All materials in contact with process fluid to be NSF 61 certified.
- .7 Provide a latching manual override for each solenoid valve.
- .8 Acceptable manufacturers:
 - .1 Ascoelectric Ltd
 - .2 Burkert
 - .3 Approved equal

2.5 Valve Accessories

- .1 Accessories to be used as required and as specified.
- .2 Valve stands - flange based for bolting to the floor or the valve stand support bracket. Use the valve manufacturer's stands. Mark valve stands "open-closed" and fit with stops.
- .3 Provide valves located in floor trenches below grating with gear operators and hand wheels.
- .4 Unless otherwise indicated, for valves with centre lines located 2.1 m (7'0") or more above floor level, exchange specified manual operators, with operators as follows:

- .1 For gate, plug and butterfly valves - sprocket rim complete with chain guide and chain to extend to within 1.5 m (5'0") of floor level. Each link shall be smooth, fully enclosed and one piece (twisted wire links not acceptable).
- .5 Provide valves located in chambers below concrete slabs with extension stems and cast iron floor boxes. Floor boxes by Flow Controls Limited or approved equal. Size extension stems for particular installation requirements.
- .6 Valves located below grating: Provide with square nut and fabricated tee-handled key/wrench, unless otherwise noted.

2.6 Drain Valves

- .1 Locate at low points of mains, branches and risers.
- .2 At domestic water branch isolation valves, provide drain unless branch can be drained through a fixture.
- .3 Equipment drain valves line size.
- .4 Minimum NPS 1/2 unless otherwise specified.
- .5 Ball valve with hose end male thread and cap with chain.
- .6 All materials in contact with process fluid to be NSF 61 certified.
- .7 Acceptable Material for NPS 3/4:
 - .1 Dahl 50.430 w/cap and chain.
 - .2 Jenkins Valves 92 Inc. 901 CJ.
 - .3 Red-White/Toyo 5046
 - .4 Kitz 58CC
 - .5 Newman Hattersley 1969F w/cap and chain.
 - .6 Nibco S/T-585-70-HC
- .8 Acceptable Material for NPS 1 to 2:
 - .1 Jenkins Valves 92 Inc. 901CJ
 - .2 Red-White/Toyo 5046

2.7 Gauge Cocks

- .1 NPS 1/4 screwed:
 - .1 Application:
 - .2 Pressure Gauge
 - .3 Air vents
 - .4 Where indicated
 - .5 Quarter-turn: 250 psi W.O.G., bronze.
 - .6 Acceptable Material:

.7	Crane Canada Inc.	9302
.8	Jenkins Valves 92 Inc.	901 J
.9	M. A. Stewart	B-3
.10	Red-White/Toyo	5044 A
.11	Watts Regulator	B-6000
.12	Kitz	58
.13	Milwaukee	BA100
.14	Newman Hattersley	1969F
.15	Dahl	121-51-51
.16	Nibco	T-FP-600

2.8 Shear Gate Valves

- .1 Shear gates shall be of the heavy duty design.
- .2 The body, disc and removable wedge shall be cast iron.
- .3 The seat rings, disc ring, hinge bolt and hinge nut shall be bronze.
- .4 Shear gate shall have a flanged frame design.
- .5 Lift rod shall be 20 mm (3/4 in) diameter carbon steel at a length easily operable from above trench. Lift rod shall have cast iron catch hook to allow the rod to be hung on a hanger placed in the trench wall.
- .6 Acceptable manufacturers:
 - .1 Troy Valve.
 - .2 Approved equal.

2.9 Motorized Actuators

- .1 Valve actuators shall be electrically operated. Valves and actuators shall be factory assembled, mounted and tested prior to delivery to the site. Actuators to be rated for maximum torque requirement for the application under all conditions.
- .2 Actuators to be provided with following features:
 - .1 Watertight NEMA 4X enclosure, Class F insulation.
 - .2 Two gear train limit switches for open and closed indication. FEEDBACK
 - .3 Two torque switches.
 - .4 Declutchable manual handwheel operator to allow operation of the valve independent of the motor.
 - .5 Local position indicator.
 - .6 CSA Approved.
- .3 ON/OFF applications; rated and geared for slow closing of 1/4 turn valves.

- .4 Modulating applications; modulating actuators shall be capable of setting the position of the valve at any point between fully open and fully closed in response to a signal from the control system. Modulating actuators shall have the following features:
 - .1 4-20 mA input.
 - .2 Return signal to indicate position and/or percentage open.
 - .3 Capable of at least 1200 starts per hour.
- .5 Acceptable manufacturers:
 - .1 Bray.
 - .2 Rotork.
 - .3 Flowserve Limitorque.

PART 3 EXECUTION (CONSENSUS DRAFT)

3.1 Delivery to Site

- .1 The equipment shall be packaged in containers constructed for normal shipping, handling and storage.
- .2 The General Contractor will provide machinery and labour to unload and store the equipment in accordance to manufacturer's requirements.

3.2 Painting and Protective Coatings

- .1 All painting and coatings to meet Manufacturer's standard of Section 09900 whichever is of higher standard.
- .2 All equipment is to be finish painted in accordance with the Manufacturer's standard coatings.
- .3 On site painting as specified under Section 09900 will be required.

3.3 Installation

- .1 The General Contractor shall install the equipment where shown on the Drawings and in strict accordance with the Manufacturer's instructions and in compliance with applicable local, provincial and federal codes and regulations, and to the satisfaction of the Engineer.
- .2 Provide all labour, equipment, supports and appurtenances necessary to complete the installation.
- .3 Manufacturer to provide installation instructions, in accordance with the Manufacturer's requirements, including details for supports and frames prior to the installation of the equipment.

- .4 Manufacturers' representatives are to test and certify automated valve installations, and shall be available for customer service during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.
- .5 Vic flange washers to be used in conjunction with the Vic flange when the flange is to be mated to a valve with a flat-faced connection.
- .6 After the equipment has been installed and prior to final acceptance, protect the equipment from damage. Ensure that protection measures are to the satisfaction of the Contract Administrator.
- .7 The manufacturer shall provide a Certificate of Installation in accordance with Section 01 33 00 to the Contract Administrator when the equipment has been satisfactorily installed.

3.4 Identification

- .1 Clearly mark valves and/or provide a materials list with the following:
 - .1 Manufacturer.
 - .2 Valve Size.
 - .3 Valve Class.
 - .4 Year of Manufacture.
- .2 Markings shall be either cast on the body or be on suitable non-corrosive plates attached to the body of the valve.
- .3 Provide lamicoid/nameplates or brass valve tags with valve service and number.

3.5 Testing

- .1 Before delivery to site, test valves and valve actuator assemblies both for operation and tight-seat requirements to meet these specifications. Tag valves and indicate the designated use and location and indicating the test conditions.
- .2 The General Contractor shall notify the Owner in writing when the installation is ready for inspection. The General Contractor and Contract Administrator shall agree upon a time for Testing.
- .3 Prior to initiation of production, the Manufacturer shall submit a testing plan, for the Contract Administrator's approval.
- .4 Pressure test valves and valve and actuator assemblies after installation (in conjunction with the testing of pipe systems).
- .5 Equipment shall be adjusted as required, during testing, to ensure proper operation.

- .6 The Manufacturer shall make any adjustments and/or repairs to the equipment and materials to ensure proper operation.

END OF SECTION

PART 1 GENERAL

1.1 Description

- .1 This Section specifies requirements for supplying, installing and commissioning monitoring equipment.

1.2 References

- .1 Mechanical General Requirements. Section 40 05 00.

1.3 Submittals

- .1 Submit Shop Drawings in accordance with the contract documents.
- .2 Shop Drawings to indicate, but not be limited to:
 - .1 Final dimensions indicating all pertinent dimensions and the sizes and locations of all monitoring equipment as indicated herein, identifying factory and field assembled.
 - .2 Diagrams of electrical connections.
 - .3 Complete detailed schedules listing all elements and materials supplied, including motors and accessories.
 - .4 All Shop Drawings to use the metric system of dimensions.
 - .5 Shop Drawings of assemblies shall be prepared and stamped by a Professional Engineer licensed in the Province of Nova Scotia.
- .3 Submit operation and maintenance data in accordance with the general conditions.
- .4 Maintenance Data to include:
 - .1 Manufacturer's name, type, model, year, capacity and serial number
 - .2 Recommended spare parts list.
 - .3 List of special tools required.
 - .4 List of supplied special tools.
 - .5 Supplied spare parts list.
 - .6 Service representative contact information.
 - .7 Supplier contact information.
- .5 Attached Data Sheets must be completed and submitted as part of the Shop Drawings.
- .6 Calibration certifications shall be submitted with the Shop Drawings.
- .7 At least three (3) weeks prior to delivery of the equipment, provide four (4) copies of detailed and comprehensive installation, operating and maintenance manuals to the Contract Administrator. One copy shall be available on site at the time of commissioning.

1.4 Scope of Work

- .1 The installation and commissioning of pressure transducers, turbidimeters, pH meters, flow meters, and float switches, included in the owner supplied process equipment package as described herein or on the drawings.

PART 2 PRODUCTS

2.1 Turbidimeters (Owner Supplied)

- .1 General:
 - .1 Install one (1) on-line turbidity sensors as follows:
 - .1 1 unit - Filter Effluent.

2.2 Turbidimeter:

- .1 The turbidimeter shall be a microprocessor-based, continuous-reading, on-line nephelometric instrument meeting all design and performance criteria specified by USEPA method 180.1.
- .2 Optical components shall be mounted in a sealed head assembly that can be removed easily for calibration/service, without disturbing sample flow.
- .3 The turbidimeter body shall be constructed of corrosion-resistant polystyrene, and shall include an internal bubble trap to vent entrained air from the sample stream.
- .4 The turbidimeter shall offer the choice of formazin- based (20 or 1 NTU) or instrument comparison-based calibration methods.
- .5 Accuracy shall be $\pm 2\%$ of reading or ± 0.020 NTU (whichever is greater) from 0 to 40 NTU, and $\pm 5\%$ of reading from 41 to 100 NTU. Resolution shall be 0.001 NTU and repeatability shall be better than $\pm 1.0\%$ of reading or ± 0.002 NTU (whichever is greater).
- .6 Provide user selectable signal averaging, bubble rejection, alarm and recorder output hold, and self- test diagnostics.

2.3 Safety and Electrical Design Standards:

- .1 All system components shall be NRTL listed to UL3101- 1, certified to CSA C22.2 No. 1010.1, and CE certified by manufacturer to EN 61010-1.
- .2 For immunity and emissions, system components shall be CE certified by manufacturer to EN50082-2 (European Generic Immunity Standard) per 89/336/EEC EMC, and EN50081-2 per 89/336/EEC EMC.
- .3 System components shall also meet FCC Part 15, Class A and Canadian Interference-Ca using Equipment Regulation ICES-003, Class A standards.

- .4 Acceptable Manufacturers:

- .1 Hach.

2.4 Flow Meters (Owner Supplied)

- .1 Install flow meters as indicated on the P&ID

- .1 New Equipment raw water 1 unit
.2 New equipment treated water 1 unit
.3 New equipment recycle 1 unit

- .2 Magnetic Type Flow Meters shall be permanently installed as shown on the Drawings:

- .1 The flow monitors shall be suitable for the pipe size indicated in the drawings and capable of monitoring sludge with suspended solids of about 1 to 4% solids.
.2 The flow monitors shall not have any direct contact with the liquid.
.3 The flow meter shall have the following features. Other components not specifically listed but necessary for the completion of this work shall be provided:
.1 Line size: as indicated in the drawings for the application.
.2 150 lb. flanged connection.
.3 Minimum accuracy of $\pm 1\%$
.4 Primary element enclosure Fibreglass NEMA 4X enclosure.
.5 Electrode Material: 316 SS or hastelloy electrodes.
.6 Hard rubber liner.
.7 Integral transmitter with display 2 line illuminated and 4-20 mA current output.
.8 Full communication capability with PLC's.
.9 Power supply of 120 Vac, 60 hz.
.10 Standard transducer temperature range from -25 to 60oC.
.11 Intrinsically safe construction.
.12 Empty pipe detection.
.13 Acceptable Products:
.4 Seimens.

2.5 Ultrasonic Level Meters (Owner Supplied)

- .1 Ultrasonic level monitor shall be provided as indicated on the P&ID.

- .1 Electronics enclosure: NEMA 4X, fiberglass.
.2 Accuracy: $\pm 0.25\%$ FS; Repeatability: $\pm 0.1\%$ FS.
.3 Programming: 2-button keypad with menu selection, stored parameters capable of withstanding power failure without loss.
.4 Power Input: 120 VAC, 60 Hz.
.5 Output: Isolated 4-20 mA, 1000 ohm load, programmable offset.
.6 Maximum Operating Range: 1.8m.

- .7 Minimum Operating Range: 400mm.
- .8 Length of Sensor Cable: 4.6m (min) or as required to reach the panel.
- .9 Display: Large 3/4" high, 4 digit LCD.
- .10 One (1) 1 amp, programmable for level alarm, echo loss alarm or other parameter.
- .2 The sensor shall be suspended from a stainless steel bracket, mounted on the tank. Where necessary, galvanized steel posts shall be provided and anchored to the floor or wall for supporting the sensors. The sensors shall be attached to a PVC conduit (sized to suit the sensor cable) and held in place by a rubber grommet, and capable of vertical adjustment. The sensor shall be capable of being submerged indefinitely without damage.

2.6 pH Analysers (Owner Supplied)

- .1 pH analysers to be provided as indicated on the P&ID:
 - .1 Type: 2 wire, 4-20 mA dc output pH transmitters c/w remote mount probe.
 - .2 Transmitter accuracy: +- 0.009 units, =- 0.1 C
 - .3 Temperature compensation range -5 to 105C for pH or ISE only
- .2 Acceptable Products:
 - .1 Hach
 - .2 Prominent

2.7 Pressure Transmitters

- .1 Provide pressure transmitters as indicated on the P&ID and as require by the unit design to provide a complete and functional system.
- .2 Type: 2-wire, 4 to 20 mA dc output pressure transmitter suitable for field mounting.
- .3 Accuracy +- 0.20% of calibrated span.
- .4 Electronics housing: IEC IP66 (NEMA 4X); stainless steel or aluminum housing with Epoxy finish; two compartments (electronics and field wiring; housing to be sealed with O- rings for double protection against moisture or other contamination.
- .5 Damping: Settable range of 0 to 8 seconds.
- .6 Modular Electronics: Easily replaceable modular electronics.
- .7 LCD Indicator: Liquid Crystal Display (LCD) Indicator, with on board pushbuttons for calibration and configuration.
- .8 Acceptable Products:
 - .1 E&H.
 - .2 Approved Alternate.

PART 3 EXECUTION

3.1 Installation

- .1 Installation of equipment under this Section shall be carried out by skilled workers, experienced in work of the type and quality specified herein. Electrical work shall be carried by Division 26.
- .2 A factory-trained representative of the manufacturer shall inspect, setup and make final adjustments after the installation of the equipment and train the operator in the proper operation adjustment calibration and maintenance of the system. Certify acceptance to the engineer.
- .3 The manufacturer shall provide a Certificate of Installation in accordance with Section 01 33 00 to the Contract Administrator when the equipment has been satisfactorily installed.

END OF SECTION

PART 1 GENERAL

1.1 Description

- .1 This section covers the installation of the owner supplied pre-engineered packaged water treatment units and appurtenances as specified herein. Without limiting other specified requirements, the Contractor is generally responsible for coordinating shipment with the Owner; accepting and offloading delivered equipment; temporary heated and secure storage (if required); installation of all Owner-supplied equipment; supply and installation of interconnecting spool pieces, miscellaneous fittings (e.g., flanges); flushing, cleaning, disinfection and microbiological testing; start-up, testing, commissioning and training (with the assistance of the Equipment Manufacturer/Supplier) and preparation of closeout submittals.
- .2 The new process equipment package generally consists of: one (1) train of tankage for rapid mix, coagulation, flocculation and Dissolved Air Flotation (DAF) clarification for treatment of surface water; one (1) train of rapid sand filtration unit. A control system shall be provided to control all the equipment provided in this specification and to control new equipment necessary to the operation of the water treatment system.
- .3 The process equipment also includes valves, instrumentation and control systems. Associated connections, spool pieces, miscellaneous instrumentation, miscellaneous metals, and fittings as noted on the drawings to be supplied and installed by the contractor. The existing system generally consists of hydraulic flocculation followed by clarification in a settling tank equipped with tube settlers, followed by dual media filtration. The upgrade will generally consist of the replacement of influent, effluent and backwash flow control valves and the sludge valve from the clarifier section.
- .4 The owner supplied equipment includes the following items:
 - .1 Factory built, modular tanks suitably equipped for process operations as follows; mixing, coagulation, flocculation, clarification and filtration of the raw water.
 - .2 Equipment required for providing adequate mixing within the tankage.
 - .3 DAF Sludge Handling including skimming mechanisms, troughs and bottom sludge removal.
 - .4 Dissolved air saturation and recycle system(s).
 - .5 Filter appurtenances including media, under-drain system, air scour, and backwash troughs.
 - .6 Actuated valves for the diversion and control of all air and water flows to new treatment units including inlet flow control to the DAF clarification unit, flow isolation to the filter, filter effluent flow control to the filter, filter to waste flow control for the filter, backwash selection for the filter and air scour selection for the filter.
 - .7 Upgrades to the system control panel(s) as specified herein to operate and monitor all equipment supplied in this contract as well as other equipment existing or supplied by others and necessary to properly automate and operate the plant.
 - .8 The provision of integration and programming services to incorporate the new systems into the existing SCADA system owned by the municipality. The new

systems in the Control Panel HMI shall be replicated in the SCADA system such that the system is fully controllable remotely via access to the SCADA computer.

- .5 The general arrangement of the process equipment shall conform to the layout shown on the drawings.
- .6 The intent is for the installed units to be complete in every respect to achieve the specified treatment performance requirements, even though the configuration or individual components of the system may not be specifically identified or detailed.

1.2 Handling and Storage of Materials

- .1 General Contractor shall coordinate with the owner to manage the safe delivery to the site of all equipment specified herein.
- .2 Inspect all fabricated material for damage in transit before installation of the work.
- .3 Exercise particular care to avoid damage to equipment.
- .4 The Owner or Engineer reserves the right to reject equipment that is damaged or defective.

1.3 References

- .1 Monitoring and Control Equipment. Section 40 70 00.
- .2 Valves and Actuators. Section 40 05 52.
- .3 Mechanical General Requirements. Section 40 05 00.
- .4 Bases, Hangers and Supports. Section 40 05 07.

1.4 Submittals

- .1 Shop Drawings for the owner supplied equipment are provided for confirmation of coordination needs.
- .2 Contractor shall provide submittal documents for components included in their supply (e.g., piping, fittings, miscellaneous metals).

1.5 Definitions

- .1 Net production is the volume of water produced by the treatment process determined as the difference between the gross water volume supplied to the plant minus the losses due to process requirements including backwash, surface wash, sludge removal, and other process demands. All volumes taken on an equivalent daily basis.
- .2 Yield is the net production volume divided by the gross water volume.

1.6 Electrical Standards

- .1 All electrical wiring shall conform to requirements specified in Division 26.
- .2 All instrumentation and control requirements shall conform to Division 29.
- .3 All motors shall conform to the requirements specified in Division 26.

1.7 Standards

- .1 Have equipment comply with the latest edition of the applicable codes and regulations including, but not limited to, the following:
 - .1 American Society of Mechanical Engineers (ASME)
 - .2 Canadian Standards Association (CSA)
 - .3 American Gear Manufacturers Association (AGMA)
 - .4 Canadian Electrical Manufacturers Association (CEMA)
 - .5 National Electrical Manufacturers Association (NEMA)
 - .6 National Electrical Code (NEC)
 - .7 Underwriters Laboratory (UL and cUL)
 - .8 American Society for Testing and Materials (ASTM)
 - .9 American Iron and Steel Institute (AISI)
 - .10 American National Standard Institute (ANSI)
 - .11 Electrical and Electronic Manufacturing Assoc. of Canada (EEMAC).
 - .12 Electrical Safety Authority (ESA)
 - .13 Canadian Electrical Code (CEC)
 - .14 Canadian Welding Bureau (CWB)
 - .15 Nova Scotia Treatment Standards for Municipal Drinking Water Systems
- .2 Have all electrical equipment comply in every respect with the rules and regulations of the authorities having jurisdiction and be acceptable to their local inspector.
- .3 In case of any conflict between these specifications and any of the above standards, the most stringent standard will have precedence.

1.8 Quality Assurance

PART 2 PRODUCTS

- 2.1 Refer to Appendices and Contract Documents for complete information on Owner Supplied Equipment/Products. Contractors shall satisfy themselves during the tender period regarding any discrepancies regarding material and equipment supplied under this contract.

2.2 Interconnecting Piping

- .1 All interconnecting piping, fittings, flanges, appurtenances and valves between the DAF, filter units, recycle system and control valves for the new process train will be supplied and installed by the General Contractor as part of this contract. Including interconnections between new treatment train and existing treatment system tie-in points. Interconnecting piping to be SCH 80 PVC unless noted otherwise.

- .2 Refer to Process Piping specification for additional requirements.

PART 3 EXECUTION

3.1 Delivery to Site

- .1 The Contractor shall coordinate with the Owner and Equipment Manufacturer for arrival of the equipment within the time lines required for construction.
- .2 The Manufacturer shall provide the General Contractor with detailed written instructions for the handling and storage of the equipment.
- .3 The equipment will be packaged in containers constructed for normal shipping, handling and storage.
- .4 The General Contractor is responsible to provide machinery and labour to unload and store the equipment in accordance to Manufacturer's requirements.

3.2 Painting and Protective Coatings

- .1 All painting to be Manufacturer's standard.
- .2 All equipment is to be finish painted in accordance with the Manufacturer's standard coatings.

3.3 Installation

- .1 The General Contractor is responsible for complete installation of the Owner Supplied equipment.
- .2 All equipment and material shall be installed in a workmanlike manner in accordance with the Manufacturer's recommendations.
- .3 The Manufacturer will provide the General Contractor with detailed written and diagrammatic instructions for the installation of the equipment supplied, including details where specified for anchor bolts, frames, and other items to be cast into concrete work, prior to the installation of the equipment.
- .4 The Manufacturer shall provide the services of factory trained technical staff to provide on-site advice to the General Contractor for the installation of the equipment.
- .5 The Manufacturer will supervise the installation/commissioning of any equipment for which the lack of such supervision, in their opinion, could compromise the Manufacturer's warranty.
- .6 The General Contractor shall install the equipment where shown on the drawings and in strict accordance with the Manufacturer's instructions and in compliance with applicable local, provincial and federal codes and regulations.

- .7 Contractor to provide appurtenances, fittings, connecting piping, framing, accessories and anchor bolts not herein or elsewhere specifically mentioned or included, but necessary for the operation of the equipment package.
- .8 The General Contractor shall provide concrete and grout, final piping and electrical connections and other appurtenances not herein or elsewhere specifically mentioned or included, but necessary for the installation, operation and testing of the equipment, without additional payment.
- .9 The Contractor shall coordinate the start-up visits, as required, of any third party Manufacturers whose equipment has been included in the project but not part of the Owner's Supply.
- .10 After the equipment has been installed and prior to final acceptance, protect the equipment from damage. Ensure that protection measures are to the satisfaction of the Contract Administrator.
- .11 The Manufacturer shall provide a Certificate of Installation to the Contract Administrator when the equipment has been satisfactorily installed.

3.4 Commissioning

- .1 The equipment shall be commissioned by an authorized representative of the Manufacturer. The Manufacturer shall provide a pre-commissioning checklist in the installation manual for General Contractor to complete.
- .2 Provide skilled labour (e.g., electrical, mechanical) during the commissioning period to assist with modifications required by the Manufacturer.
- .3 Prior to and after the equipment has been installed, factory trained service representatives shall inspect the installation of equipment and be present at start-up.
- .4 In addition to supervision and inspection, include allowances for the Manufacturers to physically set-up and align if necessary, the equipment before or during the initial operation period so that the equipment performs its intended function normally with the most efficiency during normal operating conditions. No additional payment will be made by the Owner to an Equipment Supplier, Manufacturer or the General Contractor for this work.

3.5 Testing

- .1 The General Contractor shall notify the Owner in writing a minimum of two weeks in advance when the installation is ready for inspection. The General Contractor and Contract Administrator shall agree upon a time for testing in consultation with the Manufacturer.
- .2 The Contractor shall submit a testing plan, in consultation with the Manufacturer, for the Contract Administrator's approval.
- .3 Testing shall consist of the following:

- .1 Installed leak test – inspect all wetted equipment including but not limited to: tanks, joints, fittings, valves, instrument connection points, etc.
- .2 Pump start-up test.
- .3 Verification of instrument operation, accuracy and logging through HMI and MCP.
- .4 Equipment and instrumentation shall be adjusted as required, during testing, to ensure proper operation.
- .5 The Contractor shall make any adjustments and/or repairs to the equipment and materials to ensure proper operation.

3.6 Trial Operation

- .1 After plant start-up, the equipment shall be tested for one week in accordance with the Manufacturer's instructions, to ensure the equipment is operating as intended.
- .2 The Contractor shall assist the Manufacturer with any adjustments and/or repairs to the equipment to ensure proper operation.
- .3 Contractor shall submit a letter to the Contract Administrator following successful start-up and testing confirming equipment has been installed correctly and in full accordance with Manufacturer's instructions.

3.7 Training

- .1 The Manufacturer shall provide operating training, which shall include familiarization with the equipment, its maintenance and operation requirement, safety measures, and review of the Operation and Maintenance Manuals.
- .2 Once the plant is operational, the Manufacturer shall provide the services of a factory trained technician to train the operator and other staff as directed by the Engineer. A period of not less than 24 hours of training will be provided on-site during normal working hours of the Municipal staff. This period will not coincide with other commissioning activities. Training will cover all aspects of operation of the plant, safety measures, maintenance of equipment and operation of the HMI.

3.8 Maintenance Materials and Spares:

- .1 Perform the complete initial lubrication of all equipment in accordance with the Manufacturer's instructions. Provide all grease, oil, lubricants, etc., as required for the initial operation of the equipment.
- .2 All spare parts shall be packaged in containers suitable for long term storage and shall bear labels clearly designating the content and equipment for which they are intended.

3.9 Warranty

- .1 The Owner has purchased a two year warranty for the Owner Supplied Equipment. The Contractor shall also provide a two year warranty for their associated work.

END OF SECTION