THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

CONSTRUCTION CONTRACT

WASTEWATER TREATMENT PLANT EFFLUENT UV DISINFECTION UPGRADES

PROJECT NO. NWL-23008553

FEBRUARY 2025

OWNER:	The Corporation of the Town of Iroquois Falls ("Owner")
PROJECT TITLE:	Wastewater Treatment Plant Effluent UV Disinfection Upgrades
PROJECT LOCATION:	5 North Industrial Road, Iroquois Falls, ON P0K 1G0
PROJECT DESCRIPTION:	Work of this Contract includes, but not limited to, the concrete forming of a UV channel, chamber lid, and electrical pad. The installation of the UV disinfection modules, and a field service panel to be connected to the existing Motor Control Center (MCC) and PLC/SCADA.
PRIME CONSULTANT:	EXP Services Inc. 310 Whitewood Ave West, P.O. Box 1208 New Liskeard, ON P0J 1P0 (705) 647 4311 Attention: Bradley Legault, P.Eng., LEED GA
DOCUMENTS ISSUED:	Electronic Tender Documents may be obtained from Biddingo website no sooner than Tuesday**, February 18, 2025 @ 12:00 p.m**.
QUOTATIONS RECEIVED:	On or before **Friday, March 21, 2025 @ 12:00 p.m.** local time
QUESTION DEADLINE:	Question period will end on **Friday, March 14, 2025 @ 12:00 p.m.**
OPTIONAL SITE VISIT:	**Friday, March 7, 2025 @ 1:30 p.m**. Iroquois Falls, ON P0K 1G0 Register for optional site visit by emailing bradley.legault@exp.com.

END OF SECTION

OWNER: **The Corporation of the Town of Iroquois Falls ("Owner")**

PROJECT TITLE: **Wastewater Treatment Plant Effluent UV Disinfection Upgrade**

PROJECT LOCATION: **5 North Industrial Road, Iroquois Falls, ON P0K 1G0**

1. BID DOCUMENTS

1.1 The Bid Documents to be submitted are as follows:

(a) These Instructions to Bidders, together with the attached Bid Form. The following Appendices are to be included:

Appendix A	Agreement to Bond
Appendix B	Bid Bond
Appendix C	Cost Breakdown
Appendix D	Insurance Certificate
Appendix E	Insurer Letter
Appendix F	Schedule
Appendix G	WSIB Certificate
Appendix H	Bid Addenda
Appendix I	List of Proposed Sub-Contractors
Appendix J	CCDC Insurance Requirements

(b) CCDC 2 – 2020 Stipulated Price Contract

(c) General Requirements

(d) Project drawings, specification books and addenda prepared by, or on behalf of EXP Services Inc. ("Owner's Consultant")

1.2 The Bidder shall verify in its Bid that it has received and reviewed all Bid Documents and shall assume responsibility for the said Bid Documents received as being complete. Any missing Bid Documents shall be reported immediately, in writing, to the Owner's Consultant at the address set out above.

1.3 It is agreed that the Bid Documents are made available only for the purpose of obtaining Bids for this project. Their use does not confer a license or grant for any other purposes.

1.4 The drawings and specifications remain the property of the Owner and must be returned unmarked, in good condition, after the Bid has been awarded, except for the successful Bidder.

1.5 It is understood and agreed that the Bid Documents and information that the Bidder may learn regarding the business of the Owner is a corporate asset belonging to the Owner and is strictly confidential in nature. The Bidder agrees that in the event of a breach of this confidentiality, either by it, its employees, agents, or assigns, the Owner shall be entitled to seek all remedies at law and in equity.

2. BID SUBMISSION

2.1 Only electronic submissions will be accepted for the project. Bid documents must be submitted in the form of a password protected pdf document to Bradley.legault@exp.com. Subject line should include the Bid reference number. After the official closing time, Bidders will be requested to submit the password.

2.2 It is the Bidder's responsibility to ensure submissions are received by the Owner by the submission deadline. The Owner assumes no obligation for issues caused by electronic or telecommunications issues affecting the delivery of the submission, even if originating from the Owner's IT systems. Bidders are encouraged to submit their response early and to call the Owner contact person after submitting their proposal to confirm the Owner's receipt of the proposal.

2.3 Bids using the prescribed Bid Form supplied herewith, electronically submitted, will be received no later than **Friday, March 21, 2025, 12:00:00 PM** local time, according to the clock at the Owner's location for receiving Bids, which shall be the only measure for the exact time (*date and time*). Submit Supplementary Bid Information electronically and clearly marked within 1 hour after Tender Close.

2.4 Bid Forms and appendices shall be completed in ink or typewritten and shall provide the telephone number, address and name of the individual to be contacted. All blank spaces of the Bid Form and appendices must be filled in. Non-applicable sections must be lined out and initialled. Bid prices must be stated both in words and figures. Penciled entries may be considered invalid or informal by the Owner.

2.5 Bid Forms shall be signed by a Bidder's duly authorized signing officer under the Bidder's corporate seal. If the Bidder operates its business as a sole proprietorship, the Bid Form must contain the signature of the sole proprietor in the presence of a witness who will also sign the Bid Form. The words "Sole Proprietor" must be added below the signature.

2.6 Bid prices must include all government taxes (except HST), custom duties and excise taxes in effect at Closing.

2.7 Bids shall be irrevocable and shall remain open for acceptance by the Owner for a period of sixty (60) calendar days from Closing.

2.8 No oral, faxed or written transmitted Bid will be considered.

2.9 Bidders shall be solely responsible for the delivery of their Bids in the manner and time prescribed. Bids that are incomplete, unsigned, improperly signed or sealed, conditional, illegible, obscure, or that contain arithmetical errors, erasures, alterations, reservations, or irregularities of any kind, may, at the sole discretion of the Owner, be declared informal and rejected.

2.10 Bids that contain prices which appear to be so unbalanced that they may adversely affect the interests of the Owner may be rejected. Bids may also be rejected if they are based on an unreasonable period of time for completion of the work.

3. EVALUATION CRITERIA

3.1 **General**:

(i) The Owner will employ a phased approach to the evaluation of Bids received in response to this Tender for the purposes of determining which Tender offers the best overall value to the Owner. No scoring or weighting will be assigned to Step 1 of the evaluation process, which is solely an assessment of pass or fail against requirements of the Tender.

(ii) Step 2 of the evaluation process will represent 100% of the scoring for individual Bids.

(iii) The evaluation of Bids as set out above shall in no way restrict the rights of the Owner, as otherwise established under this Tender.

3.2 **Step 1 – Compliance with Tender Requirements**:

(i) In Step 1, the Owner will review individual Bids for compliance with the terms and conditions set out in this Tender Document, including determining whether any required forms or information have been properly delivered. If, following Step 1, a Bid is deemed not to comply with the requirements set out in this Tender Document, the Owner may, in its sole discretion, without liability, cost or penalty, eliminate the Bid from any further consideration. For the purposes of this Section 'comply' and 'compliance' mean that the Bid conforms to requirements of this Tender Document, without material deviation. A 'material deviation' in a Bid is any failure to meet the Tender Document requirements that in the sole discretion of the Owner:

(i) impedes, in any material way, the ability of the Owner to evaluate the Bid

(ii) affects the ability of the Owner to enforce obligations pursuant to this Tender

(iii) constitutes an attempt by a Bidder to revise the Owner's rights or obligations under this Tender Document

3.3 **Step 2 – Financial Scoring**:

(i) In Step 2, the Owner will review the Stipulated Price provided on page 1 of the Bid Forms of all qualified Bids. If at least one Bid does not exceed the Owner's construction budget for this project, the bids will receive an evaluated score based solely on the stated Stipulated Price. Where all Stipulated Bids exceed the Owner's construction budget assigned to this project, bids will be evaluated solely on the Separate Price. In either evaluation approach, a relative pricing formula will apply.

4. BID MODIFICATION AND WITHDRAWAL OF BIDS

4.1 A Bidder may withdraw its Bid at any time prior to Closing provided the withdrawal:

(i) is in the form of an Email and all pages are received by the Owner at the Email address specified in Section 2.1 above, by the Email receipt time recorded by the Owner's Email.

(ii) states the name of the Bidder and clearly identifies the Bid that is being withdrawn.

(iii) is signed by the Bidder's duly authorized signing officer.

No oral, or other means of Bid withdrawal will be considered by the Owner.

4.2 A Bid submitted in accordance with these Instructions to Bidders may be modified at any time prior to Closing provided the modification:

(i) is in the form of an Email and all pages are received by the Owner at the Email address specified in Section 2.1 above, by the Email receipt time recorded by the Owner's Email.

(ii) states the name of the Bidder and the nature of the modification, subject to the requirements of Section 4.3, below.

(iii) is signed by the Bidder's duly authorized signing officer.

4.3 Where a modification directs a change to the Bid price, the modification shall not reveal the original Bid price nor the revised Bid price and:

(i) on lump sum Bid prices, only the amount to be added to or deducted from the original Bid price shall be stated.

4.4 The Owner has no responsibility for the content of modifications or modifications that are, for any reason, delayed, illegible or otherwise improperly submitted or received, and the Owner may, in its sole discretion, disregard any modifications that are improperly submitted or received.

5. ALTERNATIVE MATERIALS AND PROCEDURES

5.1 If, for any reason, the Bidder should propose to use different materials, equipment, or methods which, in the Bidder's opinion, would improve the operation of the installation specified, the Bidder shall:

(i) base its Bid on the exact requirements of the Bid Documents.

(ii) submit with it's Bid, a proposal, in the prescribed form, describing in full detail the different materials, equipment or methods which the Bidder is proposing, the Bidder's reasons for such deviation from the requirements of the Bid Documents and any increase or decrease applicable to the Bidder's price or completion time resulting from the alternative proposal. The Bidder agrees that the use of alternatives will not affect the Bidder's base bid amount, and that the Bidder will be responsible for any cost charges relating thereto, as all alternatives may be deemed inappropriate, but that the Owner may consider the Bidder's alternative proposal and indicate at the time of the acceptance of a Bid, whether or not the alternative proposal is acceptable to the Owner.

5.2 The Owner reserves the right, in its sole discretion, to accept or reject any or all substitutions and alternatives.

6. EXAMINATION OF CONDITIONS

6.1 In submitting a Bid, it will be assumed that the Bidder has carefully examined the site of the proposed work and the Bid Documents including the provisions of the Contract, has fully informed itself as to the existing conditions and limitations under which the work is to be performed, the conditions which may be encountered, the materials it will be required to supply and other materials which are required in carrying out the Contract to a satisfactory conclusion, and has included in its Bid the complete cost of the work shown and/or specified in the Bid Documents.

6.2 No claims or allowances will be considered based on the assertion by the Bidder that it was not aware of existing site conditions, or the provisions or conditions covered by the Bid Documents.

6.3 Drawings may not reflect all existing elements, and exact locations of those elements may vary: Bidders are responsible for reviewing site conditions and reporting in writing any discrepancies which may affect the Bid Price and/or Contract schedule. Extra's will not be allowed for discrepancies unless reported during the Bid period.

6.4 Bidders and other persons intending to carry out investigations relative to the proposed work shall make arrangements with the Owner before entering and carrying out investigations on the site.

6.5 Bidders and other persons wishing to carry out destructive investigations relative to the proposed work shall be bonded and shall obtain the Owner's consent in writing before entering and carrying out such investigations on the site.

7. INTERPRETATIONS AND ADDENDA

7.1 Bidders finding discrepancies, ambiguities, or omissions in the drawings, specifications or other Bid Documents, or having doubt as to the meaning or intent thereof shall immediately address all queries, in writing, to the Owner's Consultant at:

310 Whitewood Avenue West, P.O. Box 1208, New Liskeard, ON P0J 1P0
Attention: Bradley Legault, P.Eng.; email: Bradley.legault@exp.com

7.2 The Owner's Consultant may issue instructions and/or clarifications in the form of addenda. Bidders may also be advised by addenda of any other additions, deletions or alterations to the drawings and specifications. All such addenda shall become part of the Bid Documents.

7.3 No oral interpretation or instructions shall be effective to modify the provisions of the Bid Documents. Neither the Owner nor the Owner's Consultant will be responsible for any oral interpretation or instruction.

7.4 All addenda, if issued, during the bid period shall become part of the Bid Documents and shall supersede and amend the Bid Documents, as required.

8. BONDS

8.1 The Bidder shall include with its Bid an Agreement to Bond issued by a Surety Company licensed to operate in the Province of Ontario, stating that a 100% Performance Bond and a 100% Labour and Material Payment Bond will be provided to the Owner. If a Bid is accepted by the Owner within the aforementioned time period by written notification of acceptance of the Bid, the successful Bidder shall deliver to the Owner's Consultant a 100% Labour and Material Payment Bond and a 100% Performance Bond issued by the Surety Company. The cost of the bonds shall be included in the Bid price. The contractor shall also include a bid Bond State in Appendix B.

9. ACCEPTANCE OF BID

9.1 The Owner reserves the right, in its sole discretion, to reject any or all Bids as the interests of the Owner may require, without stating the reasons therefore, including without limitation, the lowest priced Bid.

9.2 The Owner reserves the right, in its sole discretion, to accept the Bid that in the Owner's sole discretion it deems the most advantageous, notwithstanding any custom, usage or agreement in the industry or trade, or any other policy or practice. The successful Bid, if any, will be selected

by the Owner based on any number of criteria that the Owner, in its sole discretion, considers relevant, including without limitation (and not listed in order of importance), any combination of: stipulated price, separate prices, alternative prices and product options, schedule, proposed subcontractors, proposed supervision and project management, related qualifications and experience with similar work projects, and any other factor the Owner deems relevant. The submission of Bids does not obligate the Owner to accept any Bid or to proceed further with this invitation, or with the Project.

9.3 By submitting a Bid, the Bidder acknowledges the Owner's rights as stated herein and absolutely waives any right of action against the Owner and the Owner's Consultant for the Owner's failure to accept the Bidder's Bid whether such right of action arises in contract, negligence, bad faith, or any other cause of action.

9.4 Bidders shall bear all costs of preparing and submitting Bids in response to this Invitation. The Owner will not be responsible for any costs, expenses, loss, damage or liabilities incurred by the Bidder as a result of or arising out of tendering for the proposed Contract, or due to the acceptance or non-acceptance of any Bid.

9.5 It shall be understood by all Bidders that the Bids shall be valid and irrevocable subject to acceptance by the Owner and that no adjustment shall be made to the Bid amount for a period of up to and including sixty (60) calendar days from Closing.

9.6 Bids not received by the stated Closing will not be considered and will be returned.

9.7 If a Bid is accepted by the Owner within the aforementioned time period by written notification of acceptance of the Bid, the successful Bidder shall execute and deliver to the Owner the Contract within seven (7) calendar days of receipt of such Contract from the Owner and shall commence work immediately thereafter.

9.8 It is understood and agreed that if the successful Bidder fails to commence work immediately after the written notification of acceptance of its Bid, the Owner will be entitled to all remedies available at law and in equity, including but not limited to damages amounting to the difference between the accepted Bid and the price of the Contract that is subsequently and consequently signed.

9.9 Without limiting the foregoing, the Owner further reserves the right, in its sole discretion, to cancel this invitation if the Bid prices received exceed the Owner's internal budget for the Project, or should the Owner not receive any satisfactory Bids, or should the Owner receive an insufficient number of Bids, or should unforeseen circumstances arise at any time before the Bid irrevocability period expires, or for any other reasons relevant to the Owner.

9.10 Where the Owner does not receive any satisfactory Bids, including any number of Bids which the Owner deems non-compliant with any aspect of the invitation, these Instructions, or the requirements set forth in the Bid Documents, the Owner may, at its sole discretion, either: revise the Project work scope identified in the Bid Documents and invite one or more of the Bidders to resubmit revised prices; or enter into negotiations for the whole or any part of the Project work with any Bidder, or with more than one Bidder, concurrently. The Owner is not required to offer any revised scope of work or negotiations to any Bidder and shall incur no obligation or liability to any Bidder in the exercise of this right.

9.11 Bid Irregularities and Owner's Response:

	IRREGULARITY	RESPONSE
1	Late Bid.	Automatic rejection and not opened or read publicly.
2	Unsealed Submission.	Not applicable.
3	No agreement to bond or insufficient agreement to bond.	Automatic rejection.
4	Bids completed and/or signed in erasable medium.	Not applicable.
5	All required sections of Bid documents not completed.	Automatic rejection unless, in the consensual opinion of the Owner and the Owner's Solicitor, the incomplete nature is trivial or insignificant.
6	Qualified Bids (Bids qualified or restricted by an attached statement).	Automatic rejection unless, in the consensual opinion of the Owner in charge of the Bid Solicitation and the Owner's Solicitor, the incomplete nature is trivial or insignificant.
7	Bids received on documents other than those provided or specified.	Automatic rejection.
8	Bids Containing Clerical Errors, which are trivial or insignificant.	48 hours to correct and initial errors. The determination of what constitutes trivial or insignificant errors shall be made in the consensual opinion of the Owner and the Owner's Solicitor
9	Failure to execute Agreement to Bond (Surety's Consent) or Bonding company corporate seal or signature missing from Agreement to Bond.	Automatic rejection.
10	Failure to execute Bid Bond by Bidder and Bonding Company.	Automatic rejection.
11	Documents - Execution	
(a)	Corporate seal or signature missing; signatory's authority to bind the corporation or signature missing.	48 hours to rectify situation.

(b)	Corporate seal and signature missing; signatory's authority to bind the corporation and signature missing.	Automatic rejection.
12	Erasures, Overwriting or Strike- Outs which are not initialed:	
(a)	Uninitialed changes to the Tender documents, other than unit prices, which are trivial or not significant.	48 hours to initial. The determination of what constitutes trivial or insignificant uninitialed changes shall be made in the consensual opinion of the Owner and the Owner's Solicitor.
(b)	Unit prices in the Schedule of Prices have been changed but not initialed and the Contract totals are consistent with the price as changed.	48 hours to initial change in unit price. The determination of what constitutes trivial or insignificant uninitialed changes shall be made in the consensual opinion of the Owner and the Owner's Solicitor.
(c)	Unit prices in the Schedule of Prices which have been changed but not initialed and the Contract totals are inconsistent with the price as changed.	Automatic rejection.
13	Mathematical errors which are not consistent with unit prices.	48 hours to initial corrections.
14	Bids, in which all necessary Addenda, which have financial implication, have not been acknowledged.	Automatic rejection.
15	Any other irregularities.	The Owner and the Owner's Solicitor acting in consensus shall have authority to waive other irregularities or grant 48 hours to initial such other irregularities, which they jointly consider to be trivial or insignificant.

10. INSURANCE

10.1 If a Bid is accepted by the Owner within the aforementioned time period by written notification of acceptance of the Bid, the successful Bidder shall deliver to the Owner within seven (7) calendar days of receipt of the Owner's notification of acceptance, certificate(s) of insurance from an approved insurance company licensed to carry on business where the Work is to be performed, evidencing the insurance coverage as required under the Contract.

10.2 The Owner and Owner's Consultant shall be named as additional insured.

11. MATERIAL SAFETY DATA SHEETS

11.1 The successful Bidder shall submit material safety data sheets for all trades to the Owner's Consultant for review by the Owner, in accordance with the Canada Labour Code regulations for toxic and hazardous substances that will be used on the project. Material safety data sheets must be submitted to the Owner's Consultant at least three (3) weeks prior to the hazardous substances being delivered to the site. The successful Bidder shall keep on site at all times copies of the material safety data sheets in a binder which will be handed over to the Owner at completion of the project.

12. QUALIFICATIONS

12.1 Bidders submitting Bids shall be actively engaged in the type of work required by the Bid Documents and, on request, shall provide the Owner with a list of similar work performed by the Bidder.

12.2 The resumé of the Bidders' proposed superintendent is to be provided to the Owner on request.

13. WORK SEQUENCE

13.1 Time shall be of the essence of the contract. The Contractor shall begin work immediately after receiving written instructions to do so and shall diligently execute the Work on this contract to substantial completion indicated by the Contractor as per submission requirement.

13.2 The above date is based on contract award no later than *March 1, 2025*.

13.3 If the time limit above specified is not sufficient to permit completion of the work by the Contractor working a normal number of hours each day or week on a single shift basis, it is expected that additional shifts will be required throughout the life of the contract to the extent deemed necessary by the Contractor to ensure that the work will be completed within the time limit specified. Any additional costs occasioned by compliance with these provisions will be considered to be included in the prices for the various items of work and no additional compensation will be allowed therefor.

14. SUBMISSION CHECKLIST

14.1 The following checklist has been included to ensure that all of the Owner's requirements have been met:

1. Each bidder shall submit with their Tender an Agreement to Bond (Surety's Consent) in the amount of specified. ❑

   The successful General Contract bidder shall supply, within ten (10) days of written notification by the Owner of the acceptance of his Tender, guarantee bonds made in favour of the Owner, as follows:

   - Performance Bond
     100% of the Stipulated Sum Contract ❑
   - Labour and Material Payment Bond
     100% of the Stipulated Sum Contract ❑

- Bid Bond 10% of Bid Price ❑

Delivery by the Bidder to the Owner of such bonds shall be a condition precedent to formalization of a contract. ❑

2. The successful Bidder will be required to submit Proof of Insurance as noted in the tender document. ❑

3. The successful Bidder will be required to submit to the Owner, a W.S.I.B. Clearance Certificate ❑

4. Bidders have completed the Addendum Acknowledgement section if an addendum(s) has been issued. Failure to acknowledge the receipt of an addendum on the Tender Bid Form could result in your tender being rejected. ❑

5. The successful Bidder will be required to enter into and execute a CCDC2 -2020 Contract with Supplemental conditions. ❑

6. The work will commence upon award/authorization to proceed with substantial completion as specified from date of commencement. ❑

7. Evaluation Criteria – Refer Instructions to Bidders Section 3. Evaluation Criteria. ❑

8. Validity of Tenders – Refer Instructions to Bidders Section 9. Acceptance of Bid. ❑

9. The Tender Bid Form provided must be used. Alteration of the Tender Bid Form is prohibited. If white out is used, please initial your corrections. ❑

10. The Terms and Conditions and Specifications have been carefully reviewed and all requirements have been submitted with your tender. ❑

15. COVID PROCEDURES

15.1 The Contractor must provide a copy of their COVID-19 specific health and safety policy before any work is undertaken. Government Health Canada guidelines for the construction sector are available at https://news.ontario.ca/opo/en/2020/04/health-and-safety-association-guidance-documentsfor-workplaces-during-the-covid-19-outbreak.htm & https://www.ihsa.ca/Urgent-Notices/COVID-19-Links-Resources.aspx. As applicable, the Contractor's policies and procedures should address communication, project meetings, site access for visitors, transfer of documents, physical distancing, personal hygiene, personal protective equipment, portable restrooms, site cleaning, worksite monitoring and worker self–assessment. It is the responsibility of the Contractor to communicate this policy to subcontractors and all other persons on site. The Contractor may be required to update its COVID-19 safety policy during the contract if the government policies and recommendations due to COVID-19 change.

The Owner reserves the right to cancel and/or postpone this contract at any time as a result of the current and ongoing COVID-19 Pandemic.

END OF SECTION

PROJECT NUMBER: **NWL-23008553**

PROJECT TITLE: **Wastewater Treatment Plant Effluent UV Disinfection Upgrade**
(Project)

PROJECT LOCATION: **5 North Industrial Road, Iroquois Falls, ON P0K 1G0**

Submitted To: **The Corporation of the Town of Iroquois Falls** *("Owner")*

We, _____
(Company Name)

of _____
(Business Address)

_____

having examined the Bid Documents for the Project and Addenda No. _____to No. _____ inclusive, all as issued by EXP Services Inc. *(Consultant)* and listed in Appendices (the "Bid Documents") and having visited and examined the Project site, hereby offer to enter into a contract to perform the work required by the Bid Documents (the" Work") inclusive of all specified allowances for the stipulated price as follows:

Contract Submission
The Contract Price, which excludes Value Added Taxes, is:

_____/100 Dollars $_____

in Canadian funds, any specified allowances, and all applicable taxes in force at this date, excluding H.S.T., except as may be otherwise provided in the Bid Documents.

Appendices to Bid:

The information provided in the attached Appendices form an integral part of this Bid.

Declarations:

We hereby declare that:

1. We acknowledge and agree to abide by all of the terms and conditions as set out in the Instructions to Bidders.

2. We agree to perform the Work in compliance with the terms and conditions stated in the Bid Documents and within the required completion schedule stated in the Bid Documents, or if no schedule is stated, to attain Substantial Performance of the Work within _____ weeks after receiving notice of Contract award.

3. No person, firm or corporation other than the undersigned has any interest in this Bid or in the proposed Contract for which this Bid is made.

4. This Bid is irrevocable and open to acceptance for a period of Sixty (60) calendar days from the date of Bid closing, irrespective of the acceptance by the Owner of any other Bid or the issuance of a notice of acceptance of any other Bid.

5. We agree that the Owner has the absolute right to accept or to reject the offer that this Bid comprises, for any reason whatsoever, without explanation, including if it contains the lowest stipulated price of the Bids received by the Owner.

6. If this Bid is accepted by the Owner within the time period stated, we undertake and agree to furnish the following documents, in addition to the signed Contract, all within seven (7) days from the date of acceptance:

   (a) Deliver to the Owner's Consultant a 100% Labour and Material Payment Bond and a 100% Performance Bond issued by the Surety Company. The cost of the bonds shall be included in the Bid price.

   (b) Deliver to the Owner's Consultant certificate(s) of insurance from an approved insurance company licensed to carry on business where the Work is to be performed, evidencing the insurance coverage as required under the Contract.

7. We acknowledge and agree that we shall not be entitled to any compensation for the cost of preparing this Bid, nor shall the Owner have any obligation to compensate us for the cost of preparing this Bid. We further acknowledge that neither the Owner, nor the Consultant, nor their representatives or agents, shall be liable to us for any cost, loss or damages suffered or incurred as a result of the rejection of this Bid.

Signatures:

Signed, sealed, and submitted for and on behalf of:

Company: _____
(Name)

_____
(Street Address or Postal Box Number)

_____
(City, Province & Postal Code) *(Apply SEAL above)*

Signature: _____

Name & Title: _____
(Please Print or Type)

Witness: _____

Dated at _____ this _____ day of _____, 202__.

N.B. Where legal jurisdiction or Owner requirement calls for proof of authority to execute this Bid, proof of such authority in the form of a certified copy of a resolution naming the person or persons in question as authorized to sign this Bid for and on behalf of the Corporation or Partnership should be attached.

END OF SECTION

SUPPLEMENTARY GENERAL CONDITIONS TO CCDC 2 (2020), SECTION 00 73 00

These Supplementary Conditions contain modifications or additions to the General Conditions of the *Contract* - CCDC No. 2, 2020 edition. Where any part of the General Conditions are modified or deleted by the Supplementary Conditions, the unaltered provisions remain in effect.

This Contract is being managed by the Owner and as such, any reference to the Consultant is considered as a responsibility of the Owner.

AGREEMENT BETWEEN OWNER AND CONTRACTOR

1. Article A-1 The Work

.1 Add new Article A-1.4 as follows:

"1.4 Attain *Substantial Performance of the Work* by the _____ day of _____ in the year _____ or in the event that no date of *Substantial Performance of the Work* is specified, in accordance with a date mutually agreed upon in writing after signing of this *Contract* or end the obligation to perform the *Work* no later than the _____ day of _____ in the year _____."

2. Article A-5 Payment

.1 Delete Article A-5.1.2 and replace it with the following:

".2 Upon *Substantial Performance of the Work*, as certified jointly by the *Owner* and the *Contractor*, and upon the expiry of the holdback period that follows the publication of the certificate of *Substantial Performance of the Work*, as stipulated in the *Construction Act*, there being no claims for lien registered against the title to the *Place of the Work* and no written notices of lien delivered to the *Owner*, pay the *Contractor* the unpaid balance of the holdback, together with such *Value Added Taxes* as may be applicable to such payment, less any amount stated in any *Notice of Non-Payment* that is published by the *Owner* in accordance with the *Construction Act*."

.2 Add new Article A-5.1.4 as follows:

".4 Upon a progress draw being submitted by the *Contractor* to the *Owner* for review, within three (3) *Working Days* the draw will be returned to the *Contractor*. If the *Owner* approves the draw, it will be signed or if not approved by the *Owner*, comments will be provided as to why it is not being approved. Once the progress draw is approved, the *Contractor* will then submit the approved progress draw to the *Owner's* accounts payable department at Bradley.legault@exp.com. Payment terms are thirty (30) days from the date of an approved progress draw received by the *Owner's* accounts payable department."

3. Article A-7 – Language of the Contract

.1 Remove the following from Article A-7.2:

"La présente convention est rédigée en anglais à la demande des parties."

DEFINITIONS

4. Add a new definition as follows:

"**Addendum**
Addendum means any document that adds to, modifies, interprets, supplements, or clarifies the *Contract Documents*.

5. Add a new definition as follows:

"**Adjudication**
Adjudication means construction dispute interim adjudication as defined under the *Construction Act*."

6. Add a new definition as follows:

"**Bona fide**
Bona fide means legitimate or an honestly held and good faith belief or intention, without deception or fraud.

7. Add a new definition as follows:

"**Construction Act**
Construction Act means the *Construction Act,* R.S.O. 1990 c. C.30*,* as amended, including all regulations passed under it that are enforceable as of the date of execution of this *Contract*."

8. Add a new definition as follows:

"**Construction Manager**
Construction Manager means responsibility comprises of overseeing the construction process for buildings and other pieces of infrastructure i.e., bridges and roads. Construction Managers are responsible for planning, organizing, and managing all aspects of the construction process, from project initiation to completion.

9. Add a new definition as follows:

"**Construction Schedule**
Construction Schedule means the construction schedule submitted by the *Contractor* and approved by the *Owner* pursuant to and as defined in GC 3.4.1, including any amendments or updates to such schedule approved in writing by the *Owner*."

10. Add a new definition as follows:

"**Delay**
Delay means any event, act, or omission that impedes either the *Construction Schedule* or any critical path item of the Project, or that impedes a *Subcontractor* or *Supplier* from commencing its work or delivering *Product*.

11. Add a new definition as follows:

"**Excess Soil**
Excess Soil means "excess soil" as defined in the *Excess Soil Regulation*."

12. Add a new definition as follows:

"**Excess Soil Regulation**
Excess Soil Regulation means O. Reg. 406/19: On-Site and Excess Soil Management to the *Environmental Protection Act*, R.S.O. 1990, c. E.19."

13. Add a new definition as follows:

"**Force Majeure**
Force Majeure means any cause, beyond either parties' control, other than bankruptcy or insolvency, which prevents the performance by a party, or both, of any of their respective obligations under the *Contract* and the event of *Force Majeure* did not arise from a party's default and could not be avoided or mitigated by the exercise of reasonable effort or foresight. *Force Majeure* includes: labour disputes; fire; unusual delay by common carriers or unavoidable casualties; delays in obtaining permits or licenses; civil disturbance; emergency acts, orders, legislation, regulations or directives of any government or other public authority; acts of a public enemy; war; riot; sabotage; blockage embargo; lightning; earthquake; acts of God; or declared epidemic or pandemic outbreak or other public health emergency (e.g. SARS, COVID-19)."

14. Add a new definition as follows:

"**Notice of Non-Payment**
Notice of Non-Payment means a notice of non-payment of holdback (Form 6) or a notice of non-payment (Form 1.1) under the *Act*, as applicable to the circumstances."

15. Add a new definition as follows:

"**OHSA**
OHSA means the *Occupational Health and Safety Act*, R.S.O. 1990, c. O.1, as amended, and all regulations passed thereunder."

16. Add a new definition as follows:

"**Payment Period**

Payment Period or "payment period" means the fixed segments of time, agreed upon by the *Owner* and the *Contractor* at the first pre-construction meeting, for which the *Contractor* shall be entitled to claim payment for *Work* performed during such period. To be effective, such agreement must be in writing or reflected in the final and approval pre-construction meeting minutes. In the event that the *Owner* and the *Contractor* do not fix the segment of time for each *Payment Period* at the first pre-construction meeting, then each *Payment Period* shall be a one (1) month period during which *Work* was performed, with the start and end dates of each *Payment Period* deemed to be the first (1st) calendar day of the applicable month and the last calendar day of the same month, respectively."

17. Add a new definition as follows:

"**Pre-Invoice Submission Meeting**
Pre-Invoice Submission Meeting has the definition given to it under GC5.2.1."

18. Add a new definition as follows:

"**Proper Invoice Submission Date**
Proper Invoice Submission Date has the definition given to it under GC5.2.2"

19. Add a new definition as follows:

"**Proper Invoice**
Proper Invoice means an invoice or application for payment submitted by the *Contractor* that satisfies the requirements for a "proper invoice" as that term is defined in Section 6.1 of the *Act*, with the minimum requirements set out in **Appendix A** to this *Contract*."

PART 1 - GENERAL PROVISIONS

20. GC 1.1 Contract Documents

.1 Delete GC 1.1.5.1 and replace it with the following:

".1 the order of priority of documents, from highest to lowest, shall be:

- the Agreement between the *Owner* and the *Contractor*;
- Addenda
- Supplementary Conditions;
- the Definitions;
- the General Conditions;
- Division 01 of the *Specifications*;
- technical *Specifications*;
- material and finishing schedules;
- the *Drawings*."

21. GC 1.4 Assignment

.1 Delete GC 1.4.1 in its entirety and replace it with the following:

"1.4.1 The *Contractor* shall not assign the *Contract* or any portion thereof without the advance written consent of the *Owner*, which consent may be withheld at the sole and unfettered discretion of the *Owner,* and the *Owner* shall not be required to provide any reasons for a decision to decline to consent to an assignment. No assignment by the *Contractor* shall relieve the *Contractor* from its obligations and liabilities hereunder."

PART 2 - ADMINISTRATION OF THE CONTRACT

22. GC 2.1 Authority of the Consultant

.1 Delete GC 2.1.2 in its entirety and replace it with the following:

"2.1.2 Nothing in this *Contract* shall limit the *Owner's* ability to perform the responsibilities assigned to the *Consultant* in this *Contract* (including giving notices to the *Contractor* which the *Consultant* is permitted to give) or otherwise restrict the *Owner's* right to revoke the *Consultant's* authority to act on behalf of the *Owner*.

23. GC 2.4 Defective Work

.1 Amend clause 2.4.1 by adding the following to the end of the paragraph:

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

PART 3 - EXECUTION OF THE WORK

24. GC 3.1 Control of the Work

.1 Add new GC 3.1.3 as follows:

"3.1.3 The *Contractor* represents that prior to entering into the *Contract*, the *Contractor* has conducted such investigations and examinations of the *Place of the Work*, the *Contract Documents* and any other documents made available to the *Contractor* by the *Owner* (which include legal descriptions, results of tests, reports of independent testing agencies and surveys and documents indicating the location of utilities and other structures to the extent obtained by the *Owner*), so as to ascertain the nature and location of the *Work*, possible delays in commencing the phases of the *Work*, conditions relating to the transportation, handling and storage of materials, and facilities needed to perform the *Work*. However, nothing in this paragraph 3.1.3 is intended to restrict the application of GC 6.4 - CONCEALED OR UNKNOWN CONDITIONS."

25. GC 3.2 Construction by the Owner or Other Contractors

.1 Delete GC 3.2.2.1 in its entirety and replace it with "[Intentionally left blank]."

.2 Delete GC 3.2.2.2 in its entirety and replace it with "[Intentionally left blank]."

.3 Add new GC 3.2.7 as follows:

"3.2.7 Where the *Contract Documents* identify work to be performed by other contractors or the *Owner's* own forces, the *Contractor* shall co-ordinate and schedule the *Work* with the work of other contractors and the *Owner's* own forces as specified in the *Contract Documents*."

26. GC 3.4 Construction Schedule

.1 Delete GC 3.4.1 and all subparagraphs thereunder in their entirety and replace it with the following:

"3.4.1 The *Contractor* shall, within five (5) *Working Days* of executing this *Contract*, submit to the *Owner* for approval, a baseline schedule in Gantt Chart format (prepared using a scheduling software program approved by the *Owner*) indicating the critical path for the *Project*, including all predecessor activities and manpower loading expressed in man hours, and further demonstrating that the Work will be performed in conformity with the *Contract Time* and the *Contract Documents*. The *Contractor* shall provide the schedule information required by this paragraph 3.4.1 both electronically in native format and in hard copy format. The schedule shall be prepared in collaboration with *Subcontractors* and *Suppliers* whose activities affect the critical path for the *Project*. Once accepted by the *Owner*, such schedule shall become the "Construction Schedule". The *Construction Schedule* shall make reference to and include, at a minimum, the following completion milestones:

.1 Mobilization

.2 A *Products* delivery schedule with respect to *Products* whose delivery is critical to the schedule for the *Work* or are required under the specifications to be included in the *Products* delivery schedule.

.3 *Substantial Performance of the Work* is achieved by no later than the date specified in Article A-1.4.

.4 Total performance of the *Work*.

.5 Such other interim completion milestones stipulated in the *Contract Documents* or as the *Owner* may specifically request in writing prior to the execution of the *Contract*.

The *Construction Schedule* shall not be amended without the prior written consent of the *Owner*."

.2 Add new GC 3.4.2 as follows:

"3.4.2 The *Contractor* shall:

.1 Provide the expertise and resources, including labour and equipment, as are necessary to maintain progress under the *Construction Schedule* referred to in GC 3.4.1 or any successor or revised schedule that may be approved of in writing by the *Owner*.

.2 Continuously monitor the progress of the *Work* on a weekly basis relative to the baseline *Construction Schedule* and provide the *Owner* with a weekly update to the *Construction Schedule* covering all of the baseline activities including the actual start, actual finish and percentage completion of those activities, and submit to the *Owner* for review and approval, any changes made to the baseline logic and activity durations.

.3 Promptly notify the *Owner*, in writing, as to any delays or potential delays in the *Construction Schedule*.

.4 If after applying the expertise and resources required under subparagraph 3.4.2.1 the *Contractor* forms the opinion that any slippage in schedule reported in paragraph 3.4.2.3 cannot be recovered by the *Contractor*, it shall, in the same notice provided under GC 3.4.2.3, indicate to the *Owner* if the *Contractor* intends to apply for an extension of *Contract Time* as provided in PART 6 —CHANGES IN THE WORK."

27. <u>GC 3.5 Supervision</u>

.1 Add the following to the end of GC 3.5.1:

"… and with the prior written approval of the *Owner.* If the *Owner*, acting reasonably, requests in writing that the *Contractor's* site supervisor or appointed representative be replaced, the *Contractor* shall appoint an acceptable replacement within a period of fourteen (14) days from the Owner's request."

28. <u>GC 3.8 Shop Drawings</u>

.1 Add the following to the end of GC 3.8.1:

"… or as the *Owner* may reasonably request."

.2 Add the following paragraphs GC 3.8.8, GC 3.8.9, and GC 3.8.10:
"3.8.8 The *Contractor* shall provide *Shop Drawings* in the form specified, or if not specified, as directed by the *Consultant*."

"3.8.9 *Shop Drawings* provided by the *Contractor* to the *Consultant* shall indicate by stamp, date and signature of the person responsible for the review that the *Contractor* has reviewed each one of them."

"3.8.10 The *Contractor* shall provide revised *Shop Drawings* to correct those which the *Consultant* rejects as inconsistent with the *Contract Documents*, unless otherwise directed by the *Consultant*. The *Contractor* shall notify the *Consultant* in writing of any revisions to the *Shop Drawings* other than those requested by the *Consultant*."

29. GC 3.9 Document Review

.1 Add the following new section:
"**GC 3.9 Document Review**

3.9.1 The *Contractor* shall review the *Contract Documents* and shall report promptly to the *Consultant* any error, inconsistency or omission the *Contractor* may discover. Such review by the *Contractor* shall be to the best of the *Contractor's* knowledge, information and belief. If the *Contractor* does discover any error, inconsistency or omission in the *Contract Documents*, the *Contractor* shall not proceed with the *Work* affected until the *Contractor* has received corrected or missing information from the *Consultant*."

30. GC 3.10 Documents at the Site

.1 Add the following new section:
"**GC 3.10 Documents at the Site**

3.10.1 The *Contractor* shall keep one copy of current *Contract Documents*, submittals, reports, and records of meetings at the *Place of the Work*, in good order and available to the *Owner* and the *Consultant*."

PART 5 - PAYMENT

31. GC 5.1 Financing Information Required of the Owner

.1 Delete GC 5.1 in its entirety, including all subparagraphs thereunder and any reference throughout the *Contract* to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER.

32. GC 5.2 Applications for Payment

.1 Delete GC 5.2.1 in its entirety and replace it with the following:

"5.2.1 On a *Working Day* that is not more than ten (10) calendar days prior to the end of each *Payment Period*, a representative of the *Contractor* and the *Owner* shall attend a meeting to discuss and review the work completed during the *Payment Period* (the "Pre-Invoice Submission Meeting"). The *Contractor* shall bring to the *Pre-Invoice Submission Meeting* the following:

.1 A draft of its anticipated application for payment for the applicable *Payment Period*.

.2 *Subcontractor* and *Supplier* invoices and supporting materials.

.3 Receipts for reimbursable expenses (where expressly permitted by the *Contract*, if at all).

.4 Accounts and records documenting the cost of performing the *Work* attributable to any *Change Order* or *Change Directive*.

.5 Any visual documentation (photos, videos, diagrams) evidencing the progress of the *Work*.

.6 Any other documents reasonably required by the *Contract Documents* or the *Owner*."

.2 Delete GC 5.2.2 in its entirety and replace it with the following:

"5.2.2 Within five (5) calendar days following the *Pre-Invoice Submission Meeting*, the *Contractor* shall deliver to the *Owner,* with a copy to the *Consultant*, its application for payment that complies with the requirements of GC 5.2.1 for *Work* performed during a *Payment Period* (the "Proper Invoice Submission Date"), provided that if the fifth (5th) calendar day following a *Pre-Invoice Submission Meeting* falls on a calendar day that is not a *Working Day*, the *Proper Invoice Submission Date* shall be deemed to fall on the next *Working Day*. However, the following shall apply to the delivery of all *Contractor* applications for payment:

.1 If the *Contractor* fails to deliver its application for payment, at the interval prescribed in GC 5.2.2, subject to written approval by the *Owner*, the *Contractor* shall not be entitled to submit its application for payment until the next prescribed interval. Should the *Owner* decide to accept an application for payment submitted after the applicable *Proper Invoice Submission Date* (which the *Owner* is under no obligation to do), such acceptance shall not be construed as a waiver of any of the *Owner's* rights, or as a waiver or release of the *Contractor's* obligations to strictly comply

with the requirements prescribed in this GC 5.2 – APPLICATIONS FOR PAYMENT.

.2 If an application for payment is delivered by the *Contractor* to the *Owner* on a day that is prior to an eligible *Proper Invoice Submission Date*, the application for payment will not be considered or reviewed by the *Owner* until the earliest eligible *Proper Invoice Submission Date* as identified in GC 5.2.2, at which point the application for payment will be deemed to have been received by the *Owner* for the purpose of review and evaluation.

.3 The *Owner* and the *Contractor* hereby consent to the giving and receiving of *Proper Invoices* electronically and in accordance with the requirements of this GC 5.2 – APPLICATIONS FOR PAYMENT."

.3 Add new GC 5.2.9 as follows:

"5.2.9 Upon receipt of an application for payment submitted by the *Contractor* in accordance with GC 5.2 – APPLICATIONS FOR PAYMENT, the *Owner* will assess whether all of the criteria for a *Proper Invoice* are satisfied and, if not, the *Owner* will return the application for payment to the *Contractor* with reasons setting out why the application for payment does not meet the requirements for a *Proper Invoice*. The *Contractor* may resubmit the application for payment with all required information within three (3) *Working Days*. For clarity,

.1 If the *Contractor* fails, refuses, or neglects to resubmits its application for payment within three (3) *Working Days* after it is returned in accordance with GC 5.2.9, the *Contractor* shall be deemed to have failed to deliver its application for payment and GC 5.2.2.1 shall apply.

.2 The *Owner* reserves the right, in its sole, absolute, and unfettered discretion, to waive an error or minor irregularity in any application for payment delivered by the *Contractor* for the purposes of deeming an application for payment a "Proper Invoice" within the meaning of the *Construction Act*, but the *Owner* shall be under no obligation to exercise this right."

33. GC 5.3 Payment

.1 Add new GC 5.3.2, 5.3.3, and 5.3.4 as follows:

"5.3.2 In the event that the application for payment delivered by the *Contractor* pursuant to GC 5.2 - APPLICATIONS FOR PAYMENT does not include the requirements for a *Proper Invoice* or where the *Owner* disputes the amount claimed as payable in the *Proper Invoice*, then the *Owner* shall, within fourteen (14) calendar days of receipt of the application for payment, issue a *Notice of Non-Payment*.

5.3.3 Where the *Owner* has delivered a *Notice of Non-Payment*, and the *Contractor* does not agree with same, the *Owner* and the *Contractor* shall first engage in good faith negotiations to resolve the disagreement. If within five (5) calendar days following the issuance of a *Notice of Non-Payment*, despite good faith efforts by both parties the *Owner* and the *Contractor* cannot resolve the disagreement, only then shall the parties have a dispute as that term is used in section 13.5 of the *Construction Act*, and either party may commence an *Adjudication* in accordance with the procedures set out in the *Construction Act*. Any portion of the *Proper Invoice* which is not the subject of the *Notice of Non-Payment* shall be payable within the time period set out in Article A-5.1.4.

5.3.4 Provided that the *Owner* complies with its obligations under the *Construction Act,* and subject to any interim determination of an adjudicator in accordance with any *Adjudication* and, where applicable, a final determination made in accordance with the dispute resolution processes prescribed by this *Contract*, the *Owner* shall be entitled to claim, in a *Notice of Non-Payment*, a right to deduct from or, set off against, any payment of the *Contract Price*:

.1 Any amount expended by the *Owner* in exercising the *Owner's* rights under this *Contract* to perform any of the *Contractor's* obligations that the *Contractor* has failed to fulfil.

.2 Any damages, costs, or expenses (including, without limitation, reasonable legal fees, disbursements, and HST and any other expenses) incurred by the *Owner* as a result of the failure of the *Contractor* to perform any of its obligations under the *Contract*.

.3 Any other amount owing from the *Contractor* to the *Owner* under this *Contract.*"

34. GC 5.4 Substantial Performance of the Work and Payment of Holdback

.1 Add new GC 5.4.7 as follows:

"5.4.7 The *Contractor* shall, within seven (7) calendar days of receiving a signed copy of the certificate of *Substantial Performance of the Work* referred to in GC 5.4.1, publish a copy of such certificate in the Daily Commercial News and deliver suitable evidence of such publication to the *Owner*. If the *Contractor* fails to publish the certificate and to deliver evidence of same to the *Owner*, the *Owner* may publish the certificate and back-charge the *Contractor* its reasonable costs for doing so."

35. GC 5.5 Final Payment

.1 Delete GC 5.5.1 and replace it with the following:

"5.5.1 When the *Contractor* considers the *Work* complete, and after the *Contractor* and the *Owner* have attended a *Pre-Invoice Submission Meeting* analogous to the requirement in GC 5.2.1, the *Contractor* may submit an application for final payment to the *Owner* and to the *Consultant*, which application for payment shall:

.1 Include all of the requirements listed in APPENDIX "A" - PROJECT SPECIFIC REQUIREMENTS FOR A PROPER INVOICE that are specific to an application for final payment.

.2 Be accompanied by any documents or materials not yet delivered pursuant to the *Contract Documents*, including any undelivered as-built drawings."

.2 Delete GC 5.5.2 and replace it with the following:

"5.5.2 After receipt by the *Owner* of an application for final payment that is a *Proper Invoice*, the *Owner* shall make payment to the *Contractor* on account as provided in Article A-5 PAYMENT, in the amount applied for in the *Proper Invoice*, or if disputed by the *Owner*, an amount (if any) less such amount stated in the Owner's *Notice of Non-Payment* issued pursuant to GC 5.5.3 upon the expiry of the holdback period that follows total completion of the *Work*."

.3 Delete GC 5.5.3 and replace it with the following:

"5.5.3 In the event that the application for final payment delivered by the *Contractor* does not include the requirements of GC 5.5.1 (including the requirements for a *Proper Invoice*) or where the *Owner* disputes the amount claimed as payable in the *Proper Invoice*, then the *Owner* shall within fourteen (14) calendar days of receipt of the application for payment, issue a *Notice of Non-Payment*. Where the *Owner* has delivered a *Notice of Non-Payment*, as specified under this GC 5.5.3, the *Owner* and the *Contractor* shall first engage in good faith negotiations to resolve the dispute. If within five (5) calendar days following the issuance of a *Notice of Non-Payment*, despite good faith efforts by both parties with the assistance of the *Consultant*, the *Owner* and the *Contractor* cannot resolve the dispute, either party may commence an *Adjudication* in accordance with the procedures set out in the *Construction Act*. Any portion of the *Proper Invoice* which is not the subject of the *Notice of Non-Payment* shall be payable within the time period set out in GC 5.5.2."

.4 Delete GC 5.5.4 in its entirety and replace it with "[Intentionally left blank]."

36. GC 5.7 Non-Conforming Work

.1 Add the following to the end of GC 5.7.1:

"Furthermore, no review or approval of any *Shop Drawings* and no inspection, examination, or test conducted by or on behalf of the *Owner*, nor any failure to do any of the foregoing, shall constitute acceptance of any *Work* or *Products* that are not in accordance with the requirements of the *Contract Documents*."

37. GC 5.8 Construction Liens

.1 Add new GC 5.8 CONSTRUCTION LIENS as follows:

"**GC 5.8 CONSTRUCTION LIENS**

5.8.1 In the event a construction lien arising from the performance of the Work is registered or preserved against the Project lands by a Subcontractor or a Supplier, or a written notice of a lien is given or a construction lien action is commenced against the Owner by a Subcontractor or a Supplier, and provided that such lien does not arise as a direct result of the Owner's failure to pay in accordance with the terms of the Contract Documents, the Owner shall be entitled to withhold any payment otherwise due to the Contractor until such time as such claims have been dealt with as provided in this GC 5.8 – CONSTRUCTION LIENS.

5.8.2 If the *Owner* receives a claim for lien or written notice of a lien is given or a construction lien action is commenced against the *Owner* by a *Subcontractor* or a *Supplier*, the *Contractor* shall:

.1 Within ten (10) calendar days of registration of the construction lien, vacate or discharge the lien from title to the premises (i.e. the *Place of the Work*). If the lien is merely vacated, the *Contractor* shall, if requested, undertake the *Owner*'s defence of any subsequent action commenced in respect of the lien, at the *Contractor*'s sole expense.

.2 Within ten (10) calendar days of receiving notice of a written notice of a lien, post security with the Ontario Superior Court of Justice so that the written notice of a lien no longer binds the parties upon whom it was served.

.3 Satisfy all judgments or settlements and pay all costs arising from such construction liens and actions and fully indemnify and save harmless the *Owner* against all costs and expenses arising from same, including legal costs, disbursements, and HST on a full indemnity basis.

5.8.3 If the *Contractor* fails or refuses to deal with a claim for lien or written notice

of a lien within the time prescribed above, the *Owner* shall at its option, be entitled to take all steps necessary to vacate and/or discharge the lien, and all costs incurred by the *Owner* in doing so (including, without limitation, legal fees on a solicitor and their own client basis and any payment which may ultimately be made out of or pursuant to security posted to vacate the lien) shall be for the account of the *Contractor*, and the *Owner* may deduct such amounts from the amounts otherwise due or owing to the *Contractor*.

5.8.4 Without limiting the generality of the foregoing, the *Contractor* shall satisfy all judgments, orders, and settlements, and pay all costs resulting from any liens or any actions brought in connection with any liens, or in connection with any other claim or lawsuit brought against the *Owner* by any person that provided services or materials to the *Project* lands which constituted part of the *Work*, and the *Contractor* shall fully indemnify and save harmless the *Owner* for any and all costs (including, without limitation, legal fees on a solicitor and his own client basis, disbursements, and HST) and the *Owner* shall be entitled to deduct such costs from any amounts otherwise owing to the *Contractor.*

5.8.5 Nothing in this GC 5.8 – CONSTRUCTION LIENS serves to preclude the *Contractor* from preserving and perfecting its lien in the event of non-payment by the *Owner*."

38. GC 5.9 Withholding of Payment

.1 Add the following Section:

"5.9 Withholding of Payment

5.9.1 Upon *Substantial Performance of the Work* and notwithstanding any other provision in this Agreement, the *Owner* may withhold payment of any amounts otherwise due under the *Contract* on account of any costs or damages the *Owner* has incurred or is likely to incur by reason of:

.1 defective or incomplete portions of the *Work* not rectified in accordance with the *Contract*.
.2 failure of the *Contractor* to indemnify the *Owner* in accordance with the terms of the *Contract*.
.3 failure of the *Contractor* to fulfil its obligations in respect of construction liens in accordance with GC 5.8.
.4 evidence of the *Contractor's* failure to make payments to *Subcontractors* or *Suppliers*.

In each case, the existence of which failure (and amounts owing as a result thereof) has been fully and finally determined either by mutual agreement of the parties or by a final and binding order of a court of competent jurisdiction or arbitral tribunal that is not subject to rights of appeal."

PART 6 - CHANGES IN THE WORK

39. GC 6.1 Owner's Right to Make Changes

.1 Add new GC 6.1.3 as follows:

"6.1.3 *Work* performed by the *Contractor* outside of the existing scope of work shall not proceed unless the *Owner's* approval is received. The *Owner* shall not be liable for any claim for compensation in the event that work outside of the existing scope is performed by the *Contractor* without an approved *Change Directive*."

40. GC 6.2 Change Order

.1 Add the following to the end of GC 6.2.1:

"Lump sum quotations for changes to the *Work* provided by the *Contractor* shall be accompanied by itemized breakdowns together with detailed, substantiating quotations or cost vouchers from *Subcontractors* and *Suppliers*, and shall be in such form as the *Owner* may reasonably require."

.2 Add new GC 6.2.3 as follows:

"6.2.3 The adjustment to the *Contract Price* and *Contract Time* recorded in a *Change Order* shall be the only adjustment made to the *Contract Price* and *Contract Time* for the proposed change in the *Work* referred to in the *Change Order,* and the *Contractor* will not be entitled to be paid any additional amount (including, without limitation, on account of cumulative impact of changes to the *Work*) or to be granted any additional time to perform the *Work* as a result of or arising in any way, either directly or indirectly, from the proposed change in the *Work* other than that adjustment of the *Contract Time* and/or *Contract Price* agreed to and recorded in the *Change Order*."

41. GC 6.5 Delays

.1 Delete GC 6.5.3 and all subparagraphs thereunder in their entirety and replace it with the following:

"6.5.3 If the performance of the *Work* or the performance of any other obligation(s) of a party to this *Contract* is delayed by *Force Majeure*, then the *Contract Time* shall be extended for such reasonable time as the parties shall agree. The extension of time shall not be less than the time lost as a result of the *Force Majeure* event causing the delay, unless the *Contractor* agrees to a shorter extension. Neither party shall be entitled to payment for its costs or reimbursement of its expenses incurred by such delays. Upon reaching

agreement on the extension of the *Contract Time* attributable to the *Force Majeure* event, the *Owner* and the *Contractor* shall execute a *Change Order* indicating the length of the extension to the *Contract Time* and confirming that there are no costs payable by either party to the other for the extension of *Contract Time*.

Notwithstanding the foregoing, the *Contractor* shall not be entitled to any extension of the *Contract Time* or any other relief for:

.1 Late performance by the *Contractor* caused by: (i) the acts or omissions of *Subcontractors* or *Suppliers* (other than acts or omissions caused by event permitting relief under this GC 6.5.3), (ii) the *Contractor*'s failure to hire an adequate number of personnel or labour, and (iii) by inefficiencies by the *Contractor* or shortages of plant, goods or materials.

.2 Economic hardship of the *Contractor* or its inability to pay debts.

.3 The late payment of money by the *Owner*."

.2 Delete GC 6.5.4 and replace it with the following: "[Intentionally left blank]."

42. GC 6.6 Claims for a Change in Contract Price

.1 Add the following to the end of GC 6.6.1:

"Failure to give such *Notice in Writing* of intent to claim that only increases the contract to the other party in strict compliance with any express time period stipulated in the *Contract Documents* will constitute a waiver of the right to make such a claim."

PART 7 - DEFAULT NOTICE

43. GC 7.1 Owner's Right to Perform the Work, Terminate the Contractor's Right to Continue with the Work or Terminate the Contract

.1 In GC 7.1.2 delete the words "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,"

.2 Add new GC 7.1.7 as follows:

"7.1.7 The *Owner* may terminate the *Contractor's* right to continue with the *Work* at any time for any or no reason upon fifteen (15) days' *Notice in Writing*. In the event of such termination by the *Owner*, the following provisions shall apply:

.1 The *Contractor* shall:

(1) stop the performance of the *Work* to the extent directed by the *Owner* in the *Notice in Writing*.

(2) if required by the *Owner*, cancel to the extent possible all outstanding contracts with *Subcontractors* or *Suppliers*.

(3) use its best efforts to minimize all costs incurred by the *Contractor*, all *Subcontractors,* and all *Suppliers* as a result of such termination of the *Work*.

(4) take any other action toward cancellation of the *Work* which the *Owner* may direct.

.2 Upon the *Contractor* delivering or making available to the *Owner* all components and items of the *Work* as they exist at the effective date of termination without a lien having been filed in respect thereof (or if filed, such lien having been removed), the *Owner* will pay to the *Contractor* the value of the *Work* performed to the effective date of cancellation (including reasonable profit on *Work* performed) calculated with reference to the *Contract Documents*, plus all actual and verifiable direct expenses, charges and liabilities necessitated by the cancellation. The *Contractor* shall not be entitled to any consequential, indirect, or special damages, including loss of opportunity or loss of productivity.

.3 The *Owner* shall have the right to elect by notification to the *Contractor* to assume the *Contractor's* contractual rights with any third party as to the performance of any aspect of the *Work* to the extent such contracts are assignable, and upon such notification the *Contractor* shall execute and deliver to the *Owner* an assignment sufficient for such purposes and shall sign and deliver all other such documents as may be necessary to give effect to this paragraph."

44. GC 7.2 Contractor's Right to Suspend the Work or Terminate the Contract

.1 Delete GC 7.2.2 and replace it with the following: "[Intentionally left blank]."

.2 Delete GC 7.2.3.1 and replace it with the following: "[Intentionally left blank]."

.3 In GC 7.2.3.3 add the words ", except where the *Owner* has a *Bona Fide* claim for set off" after the word "court."

.4 In GC 7.2.3.4 delete the words ", except for GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER,"

PART 8 – DISPUTE RESOLUTION

45. GC 8.1 Authority of the Consultant

.1 In GC 8.1.2 replace "8.3.8" with "8.3.6".

46. GC 8.3 Negotiation, Mediation and Arbitration

.1 Delete GC 8.3.6, 8.3.7, and 8.3.8 and all subparagraphs thereunder in their entirety and replace with the following:

"8.3.6 Upon termination of the mediated negotiations according to paragraph 8.3.4, either the *Owner* or the *Contractor* may refer the unresolved dispute to the courts, or they may by an agreement in writing refer the unresolved dispute to any other form of dispute resolution, including binding arbitration.

8.3.7 Save and except where the *Contractor* has given an undertaking, in accordance with the *Act*, to refer a dispute to *Adjudication*, prior to delivering a notice of *Adjudication* in a form prescribed by the *Act*, the parties agree to first address all disputes with at least one in-person meeting with the *Owner's* representative and the *Contractor's* representative. The parties agree that such steps will be taken to resolve any disputes in a timely and cost-effective manner.

8.3.8 Where either party has delivered a notice of *Adjudication* in a form prescribed by *Act*, the procedures and rules set out under the *Act* and the regulations thereto shall govern the *Adjudication*."

PART 9 – PROTECTION OF PERSONS AND PROPERTY

47. GC 9.4 Construction Safety

.1 Delete GC 9.4.1 and replace it with the following:

"9.4.1 The *Contractor* shall be solely responsible for construction safety at the *Place of the Work* and for compliance with the rules, regulations, and practices required by *OHSA*, including, but not limited to those of the "constructor", and shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the *Work*. Without limiting the foregoing, on a case-by-case basis with approval of the *Contractor*, the *Contractor* shall be solely responsible for construction safety in respect of the *Subcontractors* and *Suppliers*, the *Owner's* own forces, and other *Contractors, Subcontractors*, and *Suppliers* during the course of the *Project*. If the *Owner* changes the nature of the project in such a way as to modify the safety requirements the *Contractor* reserves the right to negotiate with the *Owner*."

.2 Add new GC 9.4.6 and 9.4.7 as follows:

"9.4.6 Prior to the commencement of the *Work*, the *Contractor* shall submit to the *Owner*:

.1 A current Workplace Safety Insurance Board clearance certificate.

.2 Copies of the *Construction Manager's* insurance policies having application to the *Project* or certificates of insurance, at the option of the *Owner.*

.3 Prior to site mobilization, a copy of the "Notice of Project" filed with the Ministry of Labour naming the *Contractor* as the "constructor" under *OHSA*.

9.4.7 The *Contractor* shall fully indemnify and save harmless the *Owner*, their agents, officers, directors, employees, consultants, successors and assigns from and against the consequences of any and all health and safety infractions committed directly by the *Contractor* under *OHSA*, or any other occupational health and safety legislation in force at the *Place of the Work*, including the payment of all legal fees, disbursements, and HST on a substantial indemnity basis. Such indemnity shall apply to the extent to which the *Owner* is not covered by insurance."

PART 12 – OWNER TAKEOVER

48. GC 12.3 Warranty

.1 Add new GC 12.3.7, 12.3.8, and 12.3.9 as follows:

"12.3.7 If the *Contractor* fails to promptly correct defects or deficiencies in the *Work* as provided in GC 12.3.4, and in any event by no later than fifteen (15) *Working Days* following receipt of a *Notice in Writing* from the *Owner* identifying a defect or deficiency in the *Work*, then the *Owner* may carry out, or have others carry out, correction or rectification work at the *Contractor*'s cost, unless the nature of the defect or deficiency is such that it cannot be corrected within fifteen (15) *Working Days* and the *Owner*, acting reasonably, agrees to an extension of such time.

12.3.8 The *Contractor* shall assign to the *Owner* all warranties, guarantees or other obligations for *Work*, services or *Products* performed or supplied by any *Subcontractor*, *Supplier* or other person in connection with the *Work* and such assignment shall be with the consent of the assigning party where required by law or by the terms of that party's contract. Such assignment shall be in addition to, and shall in no way limit, the warranty rights of the *Owner* under the *Contract Documents*. Until the expiry of the relevant warranty periods enforceable against the *Contractor*, the *Owner* shall have in its custody all warranties, guarantees and other obligations to third parties respecting the *Work*.

12.3.9 The *Contractor* shall provide to the *Owner*, consolidated in a binder, fully and properly completed and signed, copies of all warranties and guarantees required

by the *Contract Documents*, containing:

.1 The proper name of the *Owner*.

.2 The proper name and address of the *Project*.

.3 The date the warranty commences, which shall be at the "date of *Ready for Takeover*" unless otherwise agreed upon by the *Owner* in writing.

.4 A clear definition of what is being warranted and/or guaranteed as required by the *Contract Documents*.

.5 The signature and seal of the company issuing the warranty."

PART 13 – INDEMNIFICATION AND WAIVER

49. GC 13.2 Waiver of Claims

.1 GC 13.2.3, 13.2.4, 13.2.5, and 13.2.9 (the "**Deleted Waiver Provisions**") and all subparagraphs thereunder are deleted in their entirety, together with all references to the *Deleted Waiver Provisions* throughout the *Contract*. For clarity, all provisions of the *Contract* that reference the *Deleted Waiver Provisions* otherwise remain in full force and effect.

END OF SUPPLEMENTARY CONDITIONS AND AMENDMENTS TO CCDC 2 - 2020

END OF SECTION

THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

WASTEWATER TREATMENT PLANT EFFLUENT UV DISINFECTION UPGRADES

PROJECT NO. NWL-23008553

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THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

WASTEWATER TREATMENT PLANT EFFLUENT UV DISINFECTION UPGRADES

APPENDIX A: AGREEMENT TO BOND

Bidders shall include with their bid, an Agreement to Bond (ATB) document (signed and sealed by their insurer) The ATB shall be valid for sixty (60) days from the date of tender.

FEBRUARY 2025

THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

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APPENDIX B:
BID BOND

Bidders shall Include with their Bid a 10% Bid Bond.

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THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

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APPENDIX C: COST BREAKDOWN

Bidders shall include with their bid a detailed cost breakdown of their submitted bid price for each contract.

FEBRUARY 2025

Cost Breakdown Part A – General

Item No.	Item	Amount
A1	**Contract Requirements (Bonding, Insurance, etc.)**	
A2	**Mobilization/Demobilization**	
A3	**Waste Management and Disposal**	
A4	**Coordination, Supervision and Contract Requirements.**	

Part B – Mechanical/Electrical/Architectural/Structural Upgrades

Item No.	Item	Amount
B1	**Mechanical Removals**	
B2	**Electrical Removals**	
B3	**Structural Removals**	
B4	**Civil Removals**	
B5	**Complete By-Pass, Plan and Execution**	
B6	**Concrete Works Including Cap/Grating and Forming**	
B7	**Concrete Slab For Electrical Panel**	
B8	**Mechanical Installation of UV System**	
B9	**Electrical Installation of UV System**	
B10	**Instrumentation Installation of UV System**	
B11	**Integration/Programing Into Existing SCADA**	
B12	**Gate Valve Replacement**	
B13	**Electrical Trenching & Conduit Run**	
B14	**Fence & Railing Installation**	
B15	**Commissioning**	

THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

WASTEWATER TREATMENT PLANT EFFLUENT UV DISINFECTION UPGRADES

APPENDIX D: INSURANCE CERTIFICATE

Bidders shall submit a Certificate of Insurance in the name of the bidder, naming the Owner and Consultant as Certificate Holder

FEBRUARY 2025

THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

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APPENDIX E: INSURER LETTER

Bidders shall provide a letter from their insurer indicating that their account with the insurer is in good standing.

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THE TOWN OF IROQUOIS FALLS

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APPENDIX F:
SCHEDULE

Bidders shall submit a detailed schedule showing individual tasks and construction activities for the entire project. The Bidder is to provide a Substantial Completion date, the project cannot extend past December 31, 2025. The task list shall match up with the tasks in the cost breakdown (see Appendix "C"). The schedule shall be complete with major milestones, completion dates, linkages and task dependencies.

FEBRUARY 2025

THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

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APPENDIX G: WSIB CERTIFICATE

Bidders shall submit a current, valid WSIB Clearance Certificate indicating that their account is in good standing.

FEBRUARY 2025

THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

WASTEWATER TREATMENT PLANT EFFLUENT UV DISINFECTION UPGRADES

APPENDIX H:
BID ADDENDA

Bidders acknowledge that they have received all the addenda issued throughout the bid process. Bidders are to complete the table provided herein.

FEBRUARY 2025

BID ADDENDA

Bidders shall complete a statement below giving the number and date of all addenda used in preparing this bid. If no addenda were issued, the words "Not Applicable" shall be entered below. Failure to complete this statement and include all addenda shall result in the bid being declared informal.

Addendum Number	Addendum Date

THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

WASTEWATER TREATMENT PLANT EFFLUENT UV DISINFECTION UPGRADES

APPENDIX I:
LIST OF PROPOSED SUB-CONTRACTORS

Bidders shall provide the name of each sub-contractor nominated to perform work under this project. Bidders are to complete the table provided herein.

FEBRUARY 2025

LIST OF PROPOSED SUB-CONTRACTORS

Bidders shall provide the name of each sub-contractor nominated to perform work under this project. No sub-contractor may be substituted without written consent of the owner. Only one name shall be shown for each Sub-Trade.

SUB-TRADE	PROPOSED SUB-CONTRACTOR

THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

WASTEWATER TREATMENT PLANT EFFLUENT UV DISINFECTION UPGRADES

APPENDIX J:
CCDC INSURANCE REQUIREMENTS

Bidders acknowledge that they will comply with CCDC 41 – CCDC Insurance Requirements

FEBRUARY 2025

SUMMARY OF WORK, SECTION 01 10 00

Part 1 - General

1.1 **SECTION INCLUDES**

.1 Documents and terminology.

.2 Associated requirements.

.3 Work expectations.

.4 Work by other parties.

.5 Premises usage.

1.2 **RELATED SECTIONS**

.1 Section 01 21 00 - Allowances.

.2 Section 01 78 10 - Closeout Submittals.

.3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 **RELATED DOCUMENTS**

.1 Section 00 73 00 - Supplementary Conditions

.2 All other Division 01 specification sections.

.3 Division 01 sections describe requirements applicable to all Sections within Divisions 02 to 49 inclusive.

1.4 **WORDS AND TERMS**

.1 Refer to and acknowledge other words, terms, and definitions in CCDC 2 Definitions. Additional words and terms are cited in Section 00 73 00 described in Supplementary Conditions.

1.5 **COMPLEMENTARY DOCUMENTS**

.1 Drawings, specifications, and schedules are complementary each to the other and what is called for by one to be binding as if called for by all. Should any discrepancy appear between documents which leave doubt as to the intent or meaning, abide by Precedence of Documents article below or obtain direction from the Consultant.

.2 Drawings indicate general location and route of conduit and wire/conductors. Install conduit or wiring/conductors and plumbing piping not shown or indicated diagrammatically in schematic or riser diagrams to provide an operational assembly or system.

.3 Install components to physically conserve headroom, to minimize furring spaces, or obstructions.

.4 Locate devices with primary regard for convenience of operation and usage.

.5 Examine all discipline drawings, specifications, and schedules and related Work to ensure that Work can be satisfactorily executed. Conflicts or additional work beyond work described to be brought to attention of Consultant.

1.6 DESCRIPTION OF THE WORK

The following describes the scope of work in general and shall not be used independently of the contract package to identify the scope.

This document shall be used in conjunction with the plans and specifications to develop the detailed scope. All Items are supply and install, unless otherwise noted.

Chamber Scope

.1 All Concrete works to support the proposed UV channel.

.2 Concrete pad for service panel.

.3 Remove and re-install handrailing.

Removals

.1 The removal of part of concrete baffles as indicated on the removal drawings.

.2 The removal of ladder rungs as indicated on the removal drawings.

.3 The removal of the chlorine system as Indicated.

.4 The removal of the gate valve.

Mechanical

.1 UV units supply and installation as per the drawings inside the contact chamber.

.2 Concrete pad next to the contact chamber.

.3 By-pass of chamber during upgrades.

Structural

.1 Concrete works to support the proposed UV channel.

.2 Concrete pad next to the contact chamber.

.3 Concrete lid of contact chamber.

Instrumentation

.1 Provide full integration and programing of UV and alarms to existing SCADA.

.2 Wire in control panel into existing PLC.

Electrical

.1 Excavate trenches for the installation of underground duct banks.

.2 Place and secure conduits to protect electrical cables, ensuring proper separation and depth as per regulations.

.3 Pull cables from the MCC #2 to the new service panel, ensuring proper cable management and support.

.4 Coordinate with Trojan for instrumentation wiring, providing power and IO connections as required.

.5 Install new panel board in designated location as indicated on the drawings, ensuring proper electrical connections and adherence to safety standards. Install new disconnects as indicated on contract drawings.

.6 Install cables as necessary for various electrical components, maintaining cable routing and securing practices.

.7 Update the breaker within MCC #2 as indicated on drawings, wire up the new MCC #2 breaker for the new service panel.

.8 Wire power distribution and IO, ensuring proper connections and adherence to manufacturers specifications. Coordinate IO connections with Trojan.

.9 Provide and install electrical services for lighting and heating in the new service panel, considering energy efficiency and user comfort.

.10 Connect the new UV units to the power distribution centers (PDC's) and wire them in a manner that optimizes performance and safety.

1.7 SEQUENCE OF WORK

.1 The following document provides notes for major construction staging activities. The Contractor shall complete a detailed work plan and submit for review.

.2 The scope of work for this Contract is complex and requires careful planning, staging and interactions between the contractor and facility operations to perform tie-ins and shutdowns in a manner that minimizes disruptions to facility operation.

.3 The Contractor is advised the Facility is a fully operational, continuously functioning facility. Maintaining this function is always the highest priority. The Owner and Operator are under a covenant agreement to protect the environment in the operation of this facility. The Contractor's activities must not impede this ability for the Owner and Operator.

.4 The Contractor is required to maintain flows through the operating facility without interruption by whatever means necessary, including but not limited to temporary piping, acceptable flow diversion methods, pumping, and staging of activities. This will require strong coordination and communication efforts by the Contractor. The Owner and Operator have sole authority over what is acceptable in this regard. The contractor is to include in their bid price, a complete by-pass system in coordination with the Operators, owner and MECP for approval to complete the work.

.5 The suggested work sequence generally describes the sequence of installation and commissioning of major structures, processes and equipment items. The Contractor is responsible for determining which ancillary permanent or temporary services (ex. Electrical, instrumentation, building enclosure, hoarding and protection, plumbing, heating, etc.) are required to be completed to permit the commissioning as described herein.

.6 The Engineer, Owner, and Operator will "assist" the Contractor in scheduling and coordinating the work in an efficient and effective manner as the project progresses Such assistance shall not relieve the Contractor of responsibility for their own schedule, directing of activities, and no basis for a claim will be considered to arise from this assistance.

.7 The "Best Practices" for the Contractor in maintaining an efficient schedule will include:

.1 Submitting and effectively updating a realistic and detailed "construction schedule"; expedient submission and management of shop drawings;

.2 submitting detailed proposed "Work Plans" in advance of activities which could impact Operations; convening focused meetings as required, etc.

.8 Any changes in facility operations required by the Contractor in order to carry out the work shall be made in writing to the Engineer and to the senior Facility Operator, at least seven (7) days in advance of the time the change is required.

1.8 CONTRACT METHOD

.1 Construct Work under single, stipulated price Contract.

.2 Relations and responsibilities are between the Contractor and the Owner.

.3 Provide the required bonds and liability insurance to ensure such specified assurances to the Owner.

.4 Assigned Subcontractors are required to provide requested bonds covering faithful performance of subcontracted work, to the Owner plus payment of related obligations.

.5 Assume responsibility for assigned contracts as Subcontracts forming part of the Work.

.6 Contract Documents were prepared by the Consultant for the Owner. Any use which a third party makes of the Contract Documents, or any reliance on or decisions to be made based on them, are the responsibility of such third parties. The Consultant and Owner accepts no responsibility for damages, suffered by any third party as a result of decisions made or actions based on the Contract Documents.

.7 For purposes of reference in these Contract Documents, the term "Contractor" shall mean the party in Contract with the Owner.

1.9 DOCUMENTS PROVIDED

.1 The Contractor may obtain additional sets of Contract Documents at the cost of printing, handling, and shipping.

.2 An electronic set of documents will be provided near the end of the Project for purposes of transferring changed information recorded on as-built documents to the electronic Record Documents.

1.10 WORK SEQUENCE

.1 Construct Work in to accommodate Owner's usage requirements during the construction period, coordinate construction schedule and operations with Consultant and Owner.

.2 Coordinate Progress Schedule and with Owner use during construction.

.3 Maintain fire access and control of fire protection equipment.

1.11 OWNER-SUPPLIED PRODUCTS

.1 Obtain the necessary Shop Drawings from the Owner and Consultant and proceed to coordinate details for installation, expedite, receive, unload, install, connect and test the specified equipment, and be responsible for warranty.

.2 Equipment specifications for pre-purchased items are included at the end of the project specification, printed for confirmation only.

.3 Receive Owner-supplied Products and equipment F.O.B. and store and process Products and equipment until installation.

.4 Owner Responsibilities:

.1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.

.2 Arrange and pay for delivery to the Place of the Work in accordance with Progress Schedule.

.3 Inspect deliveries jointly with Contractor.

.4 Submit claims for transportation damage.

.5 Arrange for replacement of damaged, defective, or missing items.

.5 Contractor Responsibilities:

.1 Designate submittals and delivery date for each Product in progress schedule.

.2 Review shop drawings, product data, samples, and other submittals. Submit to Consultant, notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.

.3 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Owner.

.4 Receive and unload Products at site.

.5 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.

.6 Handle Products at site, including uncrating and storage.

.7 Protect Products from damage, and from exposure to elements.

.8 Assemble, install, connect, adjust, and finish Products.

.9 Arrange for installation inspections required by public authorities.

.10 Repair or replace items damaged by Contractor or Subcontractor on site (under their control).

END OF SECTION

ALLOWANCES, SECTION 01 21 00

Part 1 - General

1.1 **SECTION INCLUDES**

.1 Cash allowances.

.2 Inspection and testing allowances.

.3 Contingency allowance.

1.2 **RELATED SECTIONS**

.1 Section 01 25 00 - Substitution Procedures.

.2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 **CASH ALLOWANCES**

.1 Costs Included in Cash Allowances: Cost of Product to Contractor less applicable trade discounts; delivery to site, and applicable taxes.

.2 If a Cash Allowance item described in the Allowances Schedule below indicates the inclusion of installation, include in the Cash Allowance amount, provision for Product handling at the site, including unloading, uncrating, storage, protection of Products from elements and from damage, labour for installation and finishing, insurance, labour costs, taxes, bonding if applicable, equipment rental, overhead and profit.

.3 If a Cash Allowance item described in the Allowances Schedule below indicates supply only, include in the Contract Price costs not included in Cash Allowances but included in the Contract Price: Product handling at the site including unloading, uncrating, storage, protection of Products from elements and from damage, labour for installation and finishing, insurance, labour costs, taxes, bonding if applicable, equipment rental, overhead and profit.

.4 Consultant Responsibilities:

.1 Consult with Contractor for consideration and selection of Products, suppliers, and installers.

.2 Owner and Consultant to select Products.

.3 Prepare Change Order.

.5 Contractor Responsibilities:

.1 Assist Consultant in selection of Products, suppliers and installers.

.2 Obtain proposals from suppliers and installers and offer recommendations.

.3 On notification of selection by Consultant or Owner, execute purchase agreement with designated supplier and installer.

.4 Arrange for and process shop drawings, product data, and samples. Arrange for delivery.

.5 Promptly inspect Products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

.6 Differences in costs will be adjusted by Change Order.

1.4 **CONTINGENCY ALLOWANCE**

.1 Do not include a contingency allowance in the stipulated price.

END OF SECTION

SUBSTITUTION PROCEDURES, SECTION 01 25 00

Part 1 – General

1.1 SECTION INCLUDES

.1 Substitutions.

1.2 RELATED SECTIONS

.1 Section 01 21 00 - Allowances.

.2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 SUBSTITUTIONS

.1 Instructions to Bidders specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this section.

.2 Consultant will consider requests for Substitutions only within fifteen (15) days after date of Owner-Contractor Agreement.

.3 Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

.4 Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

.5 A request constitutes a representation that the Bidder:

.1 Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.

.2 Will provide the same warranty for the Substitution as for the specified Product.

.3 Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

.4 Waives claims for additional costs or time extension which may subsequently become apparent.

.5 Will reimburse Owner and Consultant for review or redesign services associated with re-approval by authorities.

.6 Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

.7 Substitution Submittal Procedure:

.1 Submit three (3) copies of request for Substitution for consideration. Limit each request to one (1) proposed Substitution.

.2 Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence.

.3 The Consultant will notify Contractor in writing of decision to accept or reject request.

END OF SECTION

COORDINATION, SECTION 01 31 00

Part 1 General

1.1 SECTION INCLUDES

.1 Coordination Work with other contractors and work by Owner under administration of Consultant.

.2 Scheduled progress meetings.

1.2 RELATED SECTIONS

.1 Section 01 32 00 - Construction Progress Documentation.

.2 Section 01 33 00 - Submittal Procedures.

.3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 COORDINATION

.1 Perform coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities and construction Work, with progress of Work by Owner, under instructions of Consultant.

1.4 COORDINATION OF CONSTRUCTION WITH OPERATION OF EXISTING FACILITIES

.1 Give facility operations precedence over construction activities.

.2 The Iroquois Falls Wastewater treatment plant must maintain the conveyance of sewage at all times.

.3 For the facilities on the site, coordinate construction activity under this Contract with the Owner.

.4 Upon award of Contract, submit a list of services requiring shutdown, anticipated shutdown times and their maximum duration.

.5 Provide 14 days written notice to the Engineer and the Owner where a temporary bypass of any portion of existing works is required. Bypass will only be permitted for connection of the new lift station to the existing forcemain.

.6 Under no circumstances should the work impact the operation of the existing Iroquois Falls Wastewater treatment plant. In the event of conflict between construction operations and facility operations, facility operations have priority. Reschedule construction operations, if required, without change to the contract price.

.7 In the event of unpredictable circumstances and emergencies, the Owner reserves the right to cancel scheduled work that would impact the facility's capability in meeting the MECP requirements or create operational constraints.

.8 Provide written procedures for each shutdown and startup activity.

1.5 CONSTRUCTION ORGANIZATION AND START-UP

.1 Within five (5) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Senior representatives of the Owner and Consultant, Contractor, major Subcontractors, field inspectors and supervisors are to be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include following:

- .1 Appointment of official representative of participants in Work.
- .2 Schedule of Work, progress scheduling as specified in Section 01 32 00.
- .3 Schedule of submission of shop drawings, samples, colour chips as specified in Section 01 33 00.
- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences as specified in Section 01 51 00.
- .5 Delivery schedule of specified equipment as specified in Section 01 32 00.
- .6 Site safety as specified in Section 01 35 23.
- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
- .8 Owner-furnished Products.
- .9 Record drawings as specified in Section 01 78 40.
- .10 Maintenance material and data as specified in Section 01 78 40.
- .11 Take-over procedures, acceptance, and warranties as specified Section 01 78 40.
- .12 Monthly progress claims, administrative procedures, photographs, and holdbacks.
- .13 Appointment of inspection and testing agencies or firms as specified in Section 01 43 00 and 01 45 00.
- .14 Insurances and transcript of policies.

.6 Comply with Consultant's allocation of mobilization areas of site; for field offices and sheds, access, traffic, and parking facilities.

.7 During construction, coordinate use of site and facilities through Consultant's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.

.8 Comply with instructions of Consultant for use of temporary utilities and construction facilities.

.9 Coordinate field engineering and layout work with Consultant.

1.6 ON-SITE DOCUMENTS

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

.1 Contract drawings.
.2 Specifications.
.3 Addenda.
.4 Reviewed shop drawings.
.5 Change orders.
.6 Other modifications to Contract.
.7 Field test reports.
.8 Copy of approved Work schedule.
.9 Manufacturers' installation and application instructions.
.10 Labour conditions and wage schedules.
.11 Applicable current editions of municipal regulations and by-laws. Current building codes, complete with addenda bulletins applicable to the Place of the Work.

1.7 SCHEDULES

.1 Submit preliminary construction progress schedule as specified in Section 01 32 00 to Consultant coordinated with Consultant's project schedule.

.2 After review, revise and resubmit schedule to comply with revised project schedule.

.3 During progress of Work revise and resubmit as directed by Consultant.

1.8 CONSTRUCTION PROGRESS MEETINGS

.1 During course of Work and one (1) week prior to project completion, schedule progress meetings bi-weekly.

.2 Contractor, major subcontractors involved in Work, Consultant and Owner are to be in attendance.

.3 Notify parties minimum three (3) days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within two (2) days after meeting.

.5 Agenda to include following:

.1 Review, approval of minutes of previous meeting.
.2 Review of Work progress since previous meeting.
.3 Field observations, problems, conflicts.
.4 Problems which impede construction schedule.
.5 Review of off-site fabrication delivery schedules.
.6 Corrective measures and procedures to regain projected schedule.
.7 Revision to construction schedule.
.8 Progress schedule, during succeeding work period.
.9 Review submittal schedules: expedite as required.
.10 Maintenance of quality standards.
.11 Review proposed changes for affect on construction schedule and on completion date.
.12 Review site safety and security issues.
.13 Other business.

1.9 SUBMITTALS

.1 Prepare and issue submittals to Consultant for review.

.2 Submit preliminary Shop Drawings, product data and samples as specified in Section 01 33 00 for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Consultant.

.3 Submit requests for payment for review, and for transmittal to Consultant.

.4 Submit requests for interpretation of Contract Documents, and obtain instructions through Consultant.

.5 Process substitutions through Consultant.

.6 Process change orders through Consultant.

.7 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant.

1.10 COORDINATION DRAWINGS

.1 Provide information required by Consultant for preparation of coordination Drawings.

.2 Review and approve revised Drawings for submittal to Consultant.

1.11 CLOSEOUT PROCEDURES

.1 Notify Consultant when Work is considered ready for Substantial Performance.

.2 Accompany Consultant on preliminary inspection to determine items listed for completion or correction.

.3 Comply with Consultant's instructions for correction of items of Work listed in executed certificate of Substantial Performance and for access to Owner-occupied areas.

.4 Notify Consultant of instructions for completion of items of Work determined in Consultant's final inspection

Part 2 Site Conditions/Limits

2.1 EXAMINATION OF SITE

.1 Prior to commencing actual construction work:

- .1 inspect field conditions,
- .2 obtain and confirm actual site dimensions,
- .3 examine surface conditions as required, including drainage, to insure correct execution of the Work.

.2 Commencement of construction constitutes acceptance of existing conditions and means dimensions have been considered, verified and are acceptable.

.3 The Contractor should note that the surface water in the project area can vary considerably depending on snow melt and precipitation. Drainage of water away from the project site, as necessary, to ensure proper installations and progress of work is the contractor’s responsibility.

2.2 DISCREPANCIES/OMISSIONS

.1 Notify the Engineer immediately upon discovery of discrepancies or omissions in the Contract Documents or of any doubt as to the meaning or intent of any part thereof.

2.3 DOCUMENTS ON THE SITE

.1 Maintain one copy of all current Contract Documents and all shop drawings on site, in good order and available to the Engineer or their representatives.

.2 This requirement does not include the executed Contract Documents.

2.4 DEFINITION OF TRADES/JURISDICTION

.1 For convenience of reference only, the specifications are separated into titled sections (see Table of Contents). Sections are identified by title and a six digit numbering system.

.2 In the case of a dispute, the General Contractor shall decide which Subcontractor supplies and installs required materials or equipment. Extras will not be considered on the grounds of differences in interpretation of the specifications.

Part 3 Project Coordination

3.1 CONSTRUCTION ORGANIZATION AND START-UP

.1 Comply with instructions from the Engineer for use of temporary utilities and construction facilities.

.2 Coordinate field engineering and layout work with the Engineer.

3.2 COORDINATION WITH THE CORPORATION OF THE TOWN OF IROQUOIS FALLS

.1 Contractor is required and responsible to communicate in advance and coordinate work activities with the Corporation of the Town Of Iroquois Falls staff prior to performing any work which will:

.2 Cause a disruption in service at the Wastewater Treatment Plant.

.3 Cause a disruption in the wastewater collection system.

.4 Cause a disruption in the Water Treatment Plant

.5 Cause a disruption in the water distribution system.

.6 Restrict access by the Town of Iroquois Falls staff to the Wastewater Treatment Plant.

.7 Restrict access to private property adjacent to the Wastewater Treatment Plant.

Municipality Contact: Iroquois Falls
Telephone: (705) 232-5700

3.3 UTILITY AND MUNICIPAL INSTALLATIONS/CONNECTIONS/REMOVALS/TESTING

The approximate locations of utilities are shown on the Contract Drawings. It shall be the Contractor's responsibility to contact The Corporation of the Town of Iroquois Falls and the various utility companies, prior to construction, in order to verify infrastructure and utility locations on site. The Contractor shall ensure that these locations are brought to the attention of all Sub-contractors. The potential contacts are as follows:

.1 The Corporation of the Town of Iroquois Falls
253 Main Street, P.O BOX 230
Iroquois Falls, Ontario P0K 1G0
Tel: (705) 232-5700
Fax: (705) 232-4241

.2 Northern Ontario Wires Inc.
Iroquois Falls, Ontario P0K 1G0
Tel: (705) 272-6669

.3 Hydro One Networks
1918 Yonge Street

Thunder Bay, Ontario P7E 6T9
Tel: (807) 624-5160

.4 Bell Canada
P.O. Box 9000, Stn Don Mills
North York, Ontario M3C 2X7
Tel: 1-800-668-6878

3.4 CLOSE-OUT PROCEDURES

.1 Notify the Engineer when Work is considered ready for inspection for Substantial Completion.

.2 Accompany the Engineer on preliminary inspection to determine and list items for completion or correction.

.3 Comply with the Engineer's instructions for correction of items of work listed in 3.4.2.

.4 Notify the Engineer when items of work listed in 3.4.2 are corrected.

.5 Once the Engineer is satisfied, the Certificate of Completion can be executed as per **the General Conditions.**

END OF SECTION

PROJECT MEETINGS, SECTION 01 31 10

Part 1 Meetings

1.1 PRECONSTRUCTION MEETING

.1 Within fifteen (15) days after award of Contract, the Engineer shall request a pre-construction meeting to discuss and establish administrative procedures and responsibilities.

.2 Representatives of the Owner, Engineer, Contractor, Major Subcontractors, Contract Administrator and Supervisors must be in attendance.

.3 After time and location of this meeting has been established, the Engineer shall notify all parties concerned within a minimum of five (5) days before the meeting.

.4 The Contractor will chair and record discussions and decisions and circulate the minutes to all parties concerned.

.5 Agenda to include the following:

.1 Appointment of official representatives of participants in the Work

.2 Monthly progress claims, administrative procedures, photographs, holdbacks (GCs).

.3 Insurances, transcript of policies (GCs).

.6 Record mutually agreed variations to Contract Documents (Bid Revisions, refer to the GCs).

1.2 PROGRESS MEETING

.1 Schedule and administer progress meetings on a monthly basis throughout the progress of the Work as agreed upon with the Owner and Engineer.

.2 Agenda for progress meetings to include the following:

.1 Review and approval of minutes of previous meeting.

.2 Review of work progress since previous meeting.

.3 Field observations, problems, conflicts

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedule.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revisions to construction schedule.

.8 Review submittal schedules: expedite as required.

.9 Maintenance of quality standards.

.10 Pending changes and substitutions.

.11 Review proposed changes for effect on construction schedule and on completion date.

.12 Other business.

.3 The Engineer will distribute written notice of the first meeting four (4) days in advance of meeting date to required attendees and other interested parties.

.4 The Engineer will preside at progress meetings and record the minutes of progress meetings, including significant proceedings and decisions. Minutes will identify "action by" parties and date for completion of duty.

.5 Copies of minutes will be distributed within fifteen (15) working days after each meeting, to meeting participants, affected parties not in attendance and the Owner.

.6 Any amendments to the minutes shall be distributed within five (5) working days of the date of the generation of the amendment.

.7 Representatives of Contractor, Subcontractor and Suppliers attending meetings must be qualified and authorized to act on behalf of the party each represents.

END OF SECTION

CONSTRUCTION SCHEDULE, SECTION 01 32 10

Part 1 References

.1 CCDC-2 General Conditions.

Part 2 Schedule

.1 The Contractor shall prepare and submit a schedule for review to the Engineer and Owner at the preconstruction meeting.

.2 Schedule shall show dates of commencement and completion of various parts of the Work, ordering and delivery dates of Products, phasing and timing for various subcontracts and all other detailed information to the satisfaction of the Engineer.

.3 All orders for materials shall be placed in ample time for adherence to the schedule.

.4 Make special note of those times when installation could affect overall water and sewer systems operation and street access.

.5 Prepare definitive schedules for the following specific items:
.1 Schedule of material deliveries.
.2 Schedule of construction phases.

Part 3 Manpower/Overtime

.1 Should the Work fail to progress according to the approved progress schedule, the Contractor shall work such additional time (including weekends and holidays), employ additional workers, or both, as may be required to bring the Work back on schedule, at no additional cost to the Owner.

.2 Hours of Work shall be as follows: Night work will be permitted only with written permission of the Engineer and in accordance with existing municipal regulations. Provide sufficient lighting to permit night work to be performed safely and satisfactorily.

Part 4 Properties Affected by the Work

.1 Advise, in writing, all affected residents, landowners and businesses of the expected time and location of construction.

.2 Should the schedule change significantly, advise, in writing, all affected residents, landowners and businesses as to the new schedule.

.3 Written notices to affected residents, landowners and businesses shall include telephone numbers to call 24 hours per day.

Part 5 Protection of Public Traffic

.1 Restrictions on Construction Operations: The use of constructions accesses, shoulder closures, and the loading and unloading of materials and construction equipment onto and from the travelled portion of the highway shall not be carried out on days identified under the section entitled 'Holiday Restrictions', during the periods restricted by the City of Iroquois Falls Noise By-Laws, or during the following periods:

Monday or a Day Following a Holiday	Tuesday to Thursday, Except on Days Following and Preceding a Holiday	Friday or a Day Preceding a Holiday	Saturday	Sunday
0:00 Hrs to Sunrise and Sunset to 24:00 Hrs	0:00 Hrs to Sunrise and Sunset to 24:00 Hrs	0:00 Hrs to Sunrise and Sunset to 24:00 Hrs	N/A	All Day

.2 Open Excavations: The Contractor shall schedule the Work so there will be no open excavation adjacent to a lane carrying traffic overnight and on non-working days except where a traffic barrier designed to restrain errant vehicles is located between the traffic and the excavation. Any open excavation required to remain open shall be properly barricaded and comply with MOL and OH&S Act regulations.

.3 Location and Storage of Materials and Equipment: Materials and equipment shall not be stored within 2m of the travelled portion of any roadway. Notwithstanding, the foregoing, the Contractor shall, at the Contractors expense, remove any vehicle, equipment, or material that, in the opinion of the Contract Administrator, constitutes as a traffic hazard or obstruction to maintenance operations.

.4 Delivery and Trucking: The Contractor shall plan and schedule the routes of vehicles transporting all materials to, from, or within the job, so that vehicular movements are accomplished with minimum interference and interruptions to traffic in accordance with this Special Provision and the General Conditions of the Contract.

.5 Holiday Restrictions: The use of construction accesses, shoulder closures, lane closures, ramp closures, and the loading and unloading of materials and construction equipment onto and from the travelled portion of the highway shall not be carried out on *any* Canadian statutory or civic holidays.

Part 6 Liquidated Damages

6.1 FIXED COMPLETION DATE AND CHARGES

6.2 TIME

Time shall be the essence of this Contract.

6.3 PROGRESS OF THE WORK AND TIME FOR COMPLETION

The Contractor shall complete this Contract by **DECEMBER 31, 2025.**

If this time limit above specified is not sufficient to permit completion of the Work by the Contractor working a normal number of hours each day or week on a single daylight shift basis, it is expected that additional and/or augmented daylight shifts will be required throughout the life of the Contract to the extent deemed necessary by the Contractor to ensure that the Work will be completed within the time limit specified. Any additional costs occasioned by compliance with these provisions will be considered to be included in the prices bid for the various items of work and no additional compensation will be allowed.

6.4 LIQUIDATED DAMAGES

It is agreed by the parties to the Contract that in case all the Work called for under the Contract is not finished or completed within the date(s) of completion specified aforementioned or as extended in accordance with the General Conditions of Contract, a loss or damage will be sustained by the Owner. Since it is and will be impracticable and extremely difficult to ascertain and determine the actual loss or damage which the Owner will suffer in the event of and by reason of such delay, the parties hereto agree that the Contractor will pay to the Owner the sum of **$2,000.00** as liquidated damages for each and every calendar day delay in finishing the work beyond the date of completion prescribed. It is agreed that this amount is an estimate of the actual loss or damage to the Owner that will accrue during the period in excess of the prescribed date of completion.

END OF SECTION

SUBMITTAL PROCEDURES/SHOP DRAWINGS, SECTION 01 33 00

Part 1 General

1.1 SECTION INCLUDES

.1 Shop drawings and product data.

.2 Samples.

.3 Certificates and transcripts.

1.2 ADMINISTRATIVE

.1 Submit to Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Shop Drawings shall be submitted for all components of the Work, it shall be the responsibility of the Contractor to provide the Consultant with Shop Drawings. Components installed without Shop Drawings and subsequent approval will be required to be removed and replaced at the Contractor's expense.

.3 Work affected by submittal shall not proceed until review is complete.

.4 Present Shop Drawings, product data, samples and mock-ups in SI Metric units.

.5 Where items or information is not manufactured or produced in SI Metric units, converted values within the metric measurement tolerances are acceptable.

.6 Review submittals prior to submission to Consultant. 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.

.7 Submittals not stamped, signed, dated, identified as to specific project, and attesting to their being reviewed will be returned without being examined and shall be considered rejected.

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

.9 Verify field measurements and affected adjacent Work are coordinated.

.10 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.

.11 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.

.12 Keep one (1) 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 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Allow fifteen (15) working days from the acknowledged date of submission for Consultant's review of each submission.

.4 Adjustments made on Shop Drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.5 Make changes in Shop Drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.

.6 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.

.7 Submissions shall include:

- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to other parts of the Work.

.8 After Consultant's review, distribute copies.

.9 Submit an electronic copy of Shop Drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

.10 Submit an electronic copy of product data sheets or brochures for requirements requested in specification sections and as requested by Consultant where Shop Drawings will not be prepared due to standardized manufacture of product.

.11 Delete information not applicable to project.

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

.13 If upon review by Consultant, 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 re-submission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.4 RECORD DRAWINGS

.1 After award of Contract, the Engineer will provide a complete set of drawings for the purpose of maintaining record drawings. The Contractor shall accurately record significant deviations from Contract Documents caused by site conditions and changes ordered by the Engineer. Update daily.

.2 The Contractor to record locations of all elements, non-concealed and concealed, of the work.

.3 The Contractor shall keep As-Constructed records of all updated and new instrumentation and controls.

.4 Identify drawings as "Project Record Copy". Maintain in good condition and make available for inspection on site by Engineer at all times.

.5 Not less than two (2) weeks prior to application for a Certificate of Substantial Performance, the Contractor to submit record drawings and complete survey data to Engineer for review.

.6 Submission of complete and accurate data noted above shall be required for the Contractor to qualify for substantial completion.

1.5 PHOTOGRAPHS AND PUBLICITY

.1 No photographs of the site or of any portion of the Work will be permitted without prior approval of the Engineer.

.2 No press or publicity releases will be permitted without prior approval of the Engineer.

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract and prior to final payment, submit Workplace Safety and Insurance Board's status and Transcript of Insurance.

END OF SECTION

HEALTH AND SAFETY – SECTION 01 35 23

Part 1 General

1. Refer also to CCDC-2 General Conditions.

Part 2 Purpose

To ensure that Contractors:

2. Comply fully with all Health and Safety requirements in Legislation and Regulations.
3. Communicate all Health and Safety requirements to their Sub-Contractors and ensure compliance.

Part 3 Definitions

1. The Health & Safety Manager shall be the Owner's facility designate:

   The Corporation of the Town of Iroquois Falls Operators.

2. The Owner is the Corporation of the Town of Iroquois Falls.
3. The Contractor is an individual or business entity with a contract for Service with the Owner to provide goods and / or services.
4. Sub-Contractor is an individual or business entity that has contracted with the Contractor to provide goods and / or services and may not be directly contracted by the Owner.

Part 4 Responsibilities

1. Contractor shall take all reasonable precautions for the Health and Safety of their employees and the employees of their Sub-Contractors. Contractor shall comply with all relevant Health and Safety Legislation and Regulations. The Owner reserves the right to remove any Contractor or Sub-Contractor from its property for violation of Health and Safety Legislation, Regulations or the Owner's Health and Safety program, without incurring any additional charges.
2. Contractors shall provide the Owner, upon request, a copy of their Health and Safety Program and related information (e.g., certificate of insurance, WSIB clearance certificate, owner/operator clearance certificate, and/or WSIB experience rating statement). **This shall be provided prior to the commencement of Work.**
3. The Contractor shall provide the Owner with documentation to certify that all employees working on the contract have been trained on WHMIS and all other Legislative requirements that relate to the work being done.
4. The Contractor shall provide to the Owner a list of all hazardous material and controlled substances that the Contractor will be introducing into the workplace and material safety data sheets on those substances at least one week prior to the

work beginning. **Substances not on that list are not to be brought onto the Owner's property.**

5. The Contractor shall ensure that their employees are aware of the emergency evacuation procedures for the appropriate work area.

Part 5 Procedures

1. The Contractor shall comply with the Owner's Health and Safety requirements and all applicable Legislation, Regulations and Standards.

   Examples include but are not limited to:

5.1 GENERAL REQUIREMENTS

1. All Contractors shall provide proof by means of a WSIB clearance certificate or WSIB independent operator certificate of current standing according to the *Workplace Safety and Insurance Act of Ontario*. When received, these documents shall be retained with the tendering information.
2. Contractor's employees shall be restricted to work only in areas designated by the Owner.
3. Contractor's employees shall not be allowed on the Owner's property while under the influence of alcohol or incapacitating drugs or medication, nor are such substances to be brought onto the premises.
4. Contractors and their employees shall abide by the Smoking in the Workplace Policy.
5. All the Owner's regulatory signs shall be observed and adhered to, as well as specific direction(s) given by the department head and / or supervisor.
6. Tools, parts and materials shall not be left overhead at any time. Frequent thorough inspection shall be made to prevent the hazard of falling objects.
7. Suitable warning signs shall be placed, and other proper precautions taken when overhead work is being undertaken.
8. Personnel shall always be on the alert for moving equipment.
9. All equipment used shall have appropriate guarding, as per Regulation.
10. In case of fire or any emergency, contact the Department Head and / or supervisor, as well as Emergency Services, if required.
11. All electrically powered tools and equipment shall be adequately grounded, as per CSA standard.
12. All tools and equipment shall be in a good state of repair.

5.2 FIRE CONTROL

1. Contractors are to provide their own "Fire Watch" personnel during all welding and burning processes. At least two (2) 10-lbs. ABC Dry Chemical Extinguishers

and a fire blanket must be made available in the immediate area where such process is taking place. The area shall not be vacated until all sparks and/or smouldering materials have been extinguished. All combustible material must be removed from the welding or burning area or covered with fire blankets.

2. Oxygen, acetylene or other similar types of cylinders are not to be left free standing. They shall be kept in upright position and chained or secured to prevent upsetting. Caps shall be in place when cylinders are not in use. Empty cylinders shall be removed from the job site at the end of the workday.

3. Fire hydrants and hose houses shall always have a 4-foot clearance.

4. Roofing Contractors shall provide a minimum of one (1) 20-lb. dry chemical extinguisher at the tar pot location and one (1) 20-lb. Dry Chemical Extinguisher at the site of application. Tar pots shall not be located within 3 metres (10 feet) of any building or combustible material or air intakes.

5. Access to all locations on the project site shall be maintained for emergency vehicles. Fire route access shall always remain unobstructed.

5.3 ISOLATING PROCEDURES

1. Contractor shall notify the Owner of any equipment requiring isolation.

2. Before any Work is performed, all sources of energy, and/or motions (including, but not necessarily limited to, electrical, mechanical, steam, gas, air, hydraulic, etc.) shall be made safe and locked out by Contractor.

3. The standard method of isolating equipment against operation shall be a tag and padlock supplied by the Contractor to their employees and identified with the name of the worker lock owner, and that of his company, Contractor's phone number and date and time of the lock being installed.

5.4 PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING

1. Contractor shall supply their own protective breathing apparatus, where required, and ensure that their employees are trained in the use of such equipment.

2. All Contractor's employees shall wear CSA approved, (Green Patched) safety footwear and appropriate eye protection. Approved hard hat and high-visibility safety vest shall be worn according to the Work being performed.

3. When required, fall restraint systems shall be used as per the *Occupational Health and Safety Act*.

4. Proper personal protective equipment depends upon the nature of the exposure. This may range from chemical eye and face protection, gloves and safety footwear, to complete body covering. If there is the potential of exposure to a toxic substance or a lack of oxygen, appropriate fresh air breathing apparatus shall be provided and used by competent trained employees.

5.5 SERVICES

1. If it is necessary to disrupt any services for construction or installation purposes, prior notice and prior approval must be given by the Owner.

2. Qualified individuals must make connections to and disconnection of the Owner's services.

5.6 TRAFFIC

1. All vehicles shall be driven with caution and posted signs observed.
2. Trucks, cars or other vehicles shall not be permitted in the Owner's buildings, except for loading or unloading. Private cars shall be parked in the designated areas unless specific approval has been received from the Department Head.
3. Trucks and other vehicles shall not stand with engine running while in any building or near any entrance to the facility.
4. Mobile crane and hoisting operators shall be licensed as required under provincial law.
5. Anyone working on highways shall follow Provincial Regulations (ie: Book 7) and the *Highway Traffic Act*.
6. A Traffic Control Person shall be trained and qualified as per *Section 69 of Regulation 213/91.*

5.7 HOUSEKEEPING

1. Aisles, walkways, doorways and designated exits shall be kept clear at all times.
2. Contractor shall maintain working areas in a clean and tidy condition. Nails in lumber shall be removed or clinched. Material shall be piled or stacked. Sites shall be cleaned up daily. On completion of job, site shall be cleared to the satisfaction of the Owner.
3. Unless specific arrangements to the contrary are made, Contractor shall arrange for removal of their own refuse.

5.8 HAZARDOUS MATERIAL

1. All Contractors, Sub-contractors and their employees shall handle potential hazardous material in a manner so as not to cause injury or overexposure. Contractor's employees must be informed of the safe handling procedures of materials with which they will be working. Proof of this training is to be made available upon request.
2. Hazardous material shall be handled according to the appropriate Federal and Provincial Regulations and Guidelines, Federal Department of Labour and the Provincial Ministry of Environment guidelines.

NOTE: All Contractors shall comply with all provisions of the latest edition of the OHSA, Canadian Standards Association (CSA), the applicable Provincial Safety Act and all other applicable legislation. Some of the standards, listed in this document are similar to those in OHSA, but are repeated for emphasis. Others are required because of the special nature of the operations.

END OF SECTION

ENVIRONMENTAL PROTECTION, SECTION 01 35 26

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Site fires.

.2 Site drainage.

.3 Site clearing and plant protection.

.4 Work adjacent to waterways.

.5 Pollution control.

1.2 REFERENCES

.1 Environmental Protection Act, RSO 1990

.2 Fisheries Act, RSC 1985

.3 Pesticides Act. RSO 1990

.4 Ontario Water Resources Act, RSO 1990

.5 Transportation of Dangerous Goods Act, RSC 1992

.6 OPSS.PROV 180 November 2016 – General Specification for the Management of Excess Material

.7 OPSS.MUNI 506 November 2017 – Construction Specification for Dust Suppressants

.8 OPSS.PROV 501 November 2014 – Construction Specification for Compacting

1.3 DEFINITIONS

.1 Incident: means an event such as a spill, discharge, emission, release or escape of a material, pollutant, contaminant, deleterious substance or dangerous good as defined in the legislation referenced above.

(Note: Allowable emissions or escapes as specified elsewhere in the Contract, are not included in the definition of an incident.)

1.4 FIRES

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

1.5 DRAINAGE

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water

.2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.6 WORK ADJACENT TO WATERWAYS

.1 At all times, the Contractor's operations shall be controlled to prevent the entry of deleterious materials to watercourses. Controls shall include, but not be restricted to, the following:

.1 Erosion and sedimentation control and protection of environmentally sensitive areas shall be in compliance with requirements that may be specified elsewhere in the Contract.

.2 Where the Contract does not require work in watercourses or on watercourse banks, equipment shall not be operated within such areas.

.3 Waterways are not to be diverted or blocked.

.4 Do not use waterway beds for borrow material.

.5 Do not dump excavated fill, waste material or debris in waterways.

.6 Construction material, excess material, construction debris, and empty containers shall be stored away from watercourses and watercourse banks.

.7 Design and construct temporary crossings to minimize erosion to waterways.

.8 Do not skid logs or construction materials across waterways.

.9 Avoid indicated spawning beds when constructing temporary crossings of waterways.

.10 All equipment maintenance and refuelling shall be controlled so as to prevent any discharge of petroleum products. Vehicular maintenance and refuelling shall be conducted away from watercourses and watercourse banks.

If the Contract Administrator determines that controls are unacceptable, the Contractor shall cease those operations, as identified by the Contract Administrator, which are causing the entry of deleterious material to watercourses. Such operations shall remain suspended until otherwise directed by the Contract Administrator in writing. This will not require the cessation of work required for such essential operations as continuous concrete pours for structures, unless otherwise directed by the Contract Administrator.

1.7 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control unreasonable emissions from equipment.

.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.

1.8 INCIDENT MANAGEMENT UNDER LEGISLATION PROTECTING THE ENVIRONMENT AND NATURAL RESOURCES

.1 Contractor's Responsibilities:

.1 The Contractor shall be in strict compliance with the requirements of the referenced legislation regarding incidents under the control of the Contractor or that are a result of the Contractor's operations.

.2 The requirements include, but are not restricted to:

a. Immediate containment of the material, pollutant, contaminant, deleterious substance or dangerous goods.

b. Immediate notification of the incident to the proper authority; and

c. Cleanup and restoration of the environment to pre-incident conditions.

.2 The Contractor shall also be responsible for informing the Contract Administrator forthwith of:

.1 An incident when it occurs; and

.2 Any actions taken or intended to be taken by the Contractor regarding the incident.

.3 Submission Requirements:

.1 Within 48 hours of an incident, the Contractor shall provide a completed Incident Notification Form, included in this divisional specification, to the Contract Administrator.

.4 Indemnification:

.1 The Contractor shall indemnify and save the Owner harmless from any additional expense that the Owner may incur to have the Work performed as a result of the Contractor's failure to comply with the requirements of the legislation.

1.9 AREAS USED FOR THE MANAGEMENT OF EXCESS MATERIALS

It shall be the Contractor’s responsibility to dispose of all excess materials in accordance with OPSS 180. Waste materials shall be transported to disposal sites, at no additional cost to Corporation of the Town of Iroquois Falls or the Owner. The contractor is responsible for selecting suitable waste disposal sites for the management of excess material from this project.

The Iroquois Falls Landfill site may receive clean non-hazardous contaminated soils and earth spoil. The Iroquois Falls waste transfer site will accept scrap pipe. Neither site accepts waste concrete or bricks. The Contractor is responsible for coordinating the disposal of the materials within the landfill hours and for verifying the material that is accepted at the Iroquois Falls Landfill and/or Transfer sites.

The areas worked by the Contractor shall be trimmed and graded to a neat and satisfactory condition.

The Contractor shall submit, to the Contract Administrator, signed “Permission to Enter” forms for all proposed disposal sites, prior to the placement of any excess material. At the conclusion of the Work, they shall submit, to the Contract Administrator, signed “Property Owner’s Release” forms.

1.10 CONTRACTOR RESPONSIBILITY FOR DUST SUPPRESSION AND WATER FOR COMPACTION

.1 OPSS.MUNI 506 Construction Specification for Dust Suppressants (November 2017) and OPSS. PROV 501 Construction Specification for Compacting (November 2014) are modified by the following:

.1 In accordance with the General Conditions of Contract, the Contractor shall take such steps as may be necessary to prevent dust nuisance resulting from his operation either within the right-of-way or elsewhere or by public traffic where it is the Contractor's responsibility to maintain a road through the work.

.2 Where the work requires the sawing of asphalt or the sawing or grinding of concrete, blades and grinders of the wet type shall be used together with sufficient water to prevent the incidence of dust wherever dust would affect traffic or wherever dust would be a nuisance to residents of the area where the work is being carried out.

.3 Water, calcium chloride flake or calcium chloride solution may be used for dust suppression and shall conform to OPSS.MUNI 506 (November 2017).

1.11 CONSTRUCTION NOISE CONSTRAINTS

This divisional specification covers the requirements for control of construction noise produced by the Contractor's operations. Except for any exemptions from municipal noise control bylaws that may be indicated elsewhere in the Contract, these requirements do not relieve the Contractor of other obligations imposed by statute or by municipal bylaw. Noise constraints in noise sensitive areas are as follows:

Noise Sensitive Area Limits	
Contract Limits.	
Constraint	Constraint Details
Equipment Maintenance	Equipment shall be maintained in an operating condition that prevents unnecessary noise, including but not limited to non-defective muffler systems, properly secured components, and the lubrication of moving parts.
Hours of Work	Construction activities are restricted to the hours of 7:00am and 7:00pm as governed by The Corporation of the Town of Iroquois Falls

INCIDENT NOTIFICATION FORM

Highway: _____ Contract No. _____

Location of Contract:

Contractor:

Contract Administrator:

Incident Description

Date/Time of Incident: _____

Description of the Incident (what happened): _____

_____

_____

_____

Immediate Actions Taken: _____

_____

_____

_____

Notification

Date/Time of Notification: _____

Authority(ies) Notified: _____

Incident/Spill Report No. (if issued by notified Authority): _____

Remediation and Restoration

Actions taken or to be taken to remediate and restore the environment: _____

_____

_____

_____

END OF SECTION

RESTORATION PROCEDURES, SECTION 01 35 91

Part 1 General

1.1 SECTION INCLUDES

.1 Restoration procedures.

.2 Alterations.

.3 Hazardous material procedures.

1.2 DEFINITIONS

.1 Match Existing: Provide new materials to match existing, "in place" material in all aspects as closely as possible. Existing materials are those which are visible in whole or in part in the Work. New materials shall be according to the requirements of the appropriate Section or OPSS as applicable.

.2 Match Original: Provide new materials to match original material in all aspects as closely as possible. Original materials are those which were originally installed in the Work at the time of its completion, prior to previous alterations, and which may predate existing materials.

.3 Restoration: The act or process of accurately reinstating materials, surfaces, features and roadside furniture to line, level, dimensions, depth of strata, elevations, etc. to original or better condition than prior to the Work.

1.3 QUALITY ASSURANCE

.1 Restoration Procedures:

.1 Preserve original materials, finishes, and profiles.

.2 Blend new and existing original Work to provide smooth transitions and uniform appearance.

.3 Cease Work, notify The Corporation of the Town of Iroquois Falls and the Consultant, and await instructions if materials or conditions encountered at the site are not as indicated by the Contract Documents or if structure or piping is in danger of movement or collapse.

1.4 PROTECTION OF UTILITY LINES

.1 Where temporary rearranging and shielding of utility lines are detailed within the Contract Documents, such temporary rearranging and shielding is the minimum protection required. The Contractor shall remain responsible for any unauthorized disruptions of service and any damage to utilities arising out of the Contractor's work, notwithstanding such protection. The Utility Authorities will carry out the temporary rearranging and shielding of lines as detailed within the Contract Documents and more extensive rearranging and shielding if requested to do so by the Contractor. The cost of all such protective measures, together with the cost of restoring the lines to their original state and location, will be at the expense of the Contractor, and will be billed to the Contractor by the Utility authority.

.2 Notwithstanding the preceding paragraph, the Utility authorities will, subject to the Contractor's obligation under the Contract to assume responsibility for disruption of services and damage, consider alternative measures that the Contractor may suggest. Such alternative measures, if approved by the Utility authorities in writing, will be provided at the Contractor's expense and billed to the Contractor by the Utility authority.

1.5 MAINTENANCE OF HAUL ROUTES

.1 When aggregate or borrow is being hauled from a source which is not a commercial source or is not licensed under the Aggregate Resources Act by MNR, and where the haul roads are damaged, or require upgrading (ie. Widening for safe two-way traffic), due to the hauling operations, the Contractor shall, when directed by the Contract Administrator, place such material and perform such Work on the haul road as is required to provide safe passage and control traffic; and shall on completion of the hauling operations, place such material and perform such Work as ordered by the Contract Administrator to restore the haul roads.

All costs incurred by the Contractor to perform the Work outlined above will be deemed to have been included in the total price and shall include full compensation for all labour, equipment and material to do the work.

Part 2 Products

2.1 MATERIALS

.1 New Materials:

.1 Provide new materials to match original adjacent materials or original materials for closing of openings, repairs, and reconstructions.

.2 Match original materials in material, type, size, quality, color, finish, and other associated attributes.

.2 Reused Materials:

.1 Clean and prepare salvaged materials for reuse.

.2 Do not use materials with objectionable chips, cracks, splits, dents, scratches, or other defects.

.3 Repair operable items to function properly.

Part 3 Execution

3.1 PREPARATION

.1 Test materials to be used in repairs for compatibility with original materials; do not use incompatible materials.

.2 Cut, move, or remove items to provide access for alterations and restoration work. Replace and restore upon completion.

.3 Protect existing materials and surfaces from damage by construction operations.

.4 Asphalt shall be saw cut at the removal limits.

.5 Asphalt shall be keyed according to contract documents, cleaned free of debris and moisture, and tack coated prior to paving.

3.2 ALTERATIONS

.1 Coordinate alterations and renovations to expedite completion.

.2 Minimize damage to existing materials and surfaces; provide means for restoring products and finishes to their original or specified new condition.

.3 Remove debris and abandoned items from areas of Work and from concealed spaces.

.4 Refinish visible surfaces to specified condition, with neat transition to adjacent surfaces.

.5 Install products and finish surfaces as specified in individual sections, or where no specification section exists, to match existing.

.6 Rework finished surfaces to smooth plane, without breaks, steps, or bulkheads:

.7 Where new work abuts or aligns with existing, provide smooth and even transition.

.8 Where a change in plane of 6 mm or more occurs, submit recommendation to the Consultant for transition.

.9 Where alterations expose mechanical and electrical components which were previously concealed, rework to be concealed in completed work.

3.3 HAZARDOUS MATERIAL PROCEDURES

.1 If hazardous or suspected hazardous materials are encountered:

- .1 Stop work in affected area immediately.
- .2 Notify The Corporation of the Town of Iroquois Falls and the Consultant and await instructions.
- .3 Prevent damage to materials.
- .4 Prevent human contact.

END OF SECTION

REGULATORY REQUIREMENTS, SECTION 01 41 00

1.1 OPERATIONAL CONSTRAINTS/APPROVALS

.1 No Work shall be performed until an Environmental Compliance Approval for the proposed works has been obtained.

1.2 PERMITS/INSPECTIONS

.1 The Contractor shall obtain and pay for all permits, licenses, certificates, and governmental inspections required for the performance of the Work in force at the RFQ closing date.

.2 Should a utility company require an inspector (or the utility company personnel) to be present during any part or parts of construction, the Contractor shall pay any costs due for inspector's time and any related expenses.

.3 Contractor to give all required notices and comply with all local, provincial and federal laws, ordinances, rules, regulations, codes and orders relating to the Work, which are or become in force during the performance of the Work.

.4 If the Contractor knowingly performs or allows Work to be performed that is contrary to any laws, ordinances, rules, regulations or codes, the Contractor is 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. Determine detailed requirements of authorities having jurisdiction.

1.3 OCCUPATIONAL HEALTH AND SAFETY ACT COMPLIANCE

Special Provision No. 101F21	November 2014

List of Designated Substances

In accordance with the Occupational Health and Safety Act, R.S.O. 1990, c. 0.1, the Contractor is advised of the presence of the following Designated Substances:

Substance (Ontario Regulation Number)	Location
Asbestos on Construction Projects and in Buildings and Repair Operations (O. Reg. 278/05)	Suspected in concrete sanitary sewer pipes
Benzene (R.R.O. 1990, Reg. 839)	May be present
Mercury (R.R.O. 1990, Reg. 844)	Suspected as vapour in fluorescent light tubes and exterior lighting.
Vinyl Chloride (R.R.O. 1990, Reg. 846) Coke Oven Emissions (R.R.O. 1990, Reg. 840) Ethylene Oxide (R.R.O. 1990, Reg. 841) Acrylonitrile (R.R.O. 1990, Reg. 835) Isocyanates (R.R.O. 1990, Reg. 842)	n/a
Silica (R.R.O. 1990, Reg. 845)	Suspected in concrete and concrete products throughout the site See below
Arsenic (R.R.O. 1990, Reg. 836)	See below
Lead (R.R.O. 1990, Reg. 843)	See below

The Contractor is advised that a detailed designated substance and hazardous materials survey has not been performed for the site.

The Contractor is further advised that the Designated Substances silica (Ontario Regulation Number R.R.O. 1990, Reg. 845), lead (R.R.O 1990, Reg. 843) and arsenic (R.R.O. 1990, Reg. 836) are generally present throughout the Working Area, occurring naturally or as a result of vehicle emissions. Exposure to these substances may occur as a result of activities by the Contractor such as sweeping, grinding, crushing, drilling, blasting, cutting, and abrasive blasting.

1.4 IDENTIFICATION OF LOCAL REGULATORY AUTHORITIES

The following is provided for information only to facilitate contact with and notification to regulatory authorities as specified in the Contract Documents**:**

Regulatory Authority	**Notification Requirement**
MOE: Spills Action Centre (SAC) 1-800-268-6060	For notification of a spill to the environment under the Environmental Protection Act
Owner: Iroquois Falls 253 Main Street Iroquois Falls, Ontario P0K 1G0 (705) 232-5700	For notification of a spill to the environment under the Environmental Protection Act
MECP: Sault Ste. Marie Area Office 70 Foster Drive, Suite 110 Sault Ste. Marie, Ontario P6A 6V4 (705) 942-6354	For Waste Management Approval under the Environmental Protection Act
MNRF: Wawa District Office 48 Mission Road Wawa, Ontario P0S 1K0 (705) 856-2396	For notification of the release of a deleterious substance to a watercourse under the Fisheries Act
DFO: District Office, Sault Ste Marie (705) 941-3000	For notification of the release of a deleterious substance to a watercourse under the Fisheries Act
Local Police: OPP 911 1-888-310-1122	For notification of a Dangerous Occurrence involving dangerous goods under the Transportation of Dangerous Goods Act

1.5 ADMINISTRATION OF AGGREGATE SOURCES INCLUDING EARTH AND ROCK BORROW

INFORMATION TO BIDDERS REGARDING AGGREGATE SOURCES

Special Provision No. 110F14 (M)	June 2012

General

The Contractor must demonstrate the suitability of aggregate in accordance with the appropriate divisional specification(s) contained elsewhere in this contract.

For inquiries related to a specific commercial and/or private source, Contractors may visit the Aggregate Unit of the appropriate Regional Geotechnical Section by appointment to access available Mineral Aggregate Inventory Data Bank (MAIDB) information, provided they have written consent from the source owner.

Regional Geotechnical Section offices are located in:

Toronto:	Tel. (416) 235-5428 / Fax. (416) 235-3999
London:	Tel. (519) 873-4400 / Fax. (519) 873-4403
Kingston:	Tel. (613) 545-4794 / Fax. (613) 540-5106
North Bay:	Tel. (705) 497-5478 / Fax. (705) 497-5499
Thunder Bay:	Tel. (807) 473-2090 / Fax. (807) 473-2168

For enquiries related to Crown sources or sources under permit to MTO, Contractors may visit the appropriate Regional Geotechnical Section by appointment to access available MAIDB information.

Access to the information in MAIDB is provided for the convenience of the Contractor only. Since MAIDB information is dated and subject to interpretation, the information is not guaranteed. This is because of revisions to aggregate specifications and inherent source variability.

Earth Borrow, Rock Supply, Granular Base, and Conventional Hot Mix Aggregates

This contract does not include an Aggregate Sources List (ASL) for earth borrow, rock supply, granular base, and conventional hot mix aggregates. For information regarding commercial sources, Contractors may refer to the following sources of information:

i) Commercial Aggregate and Membership Directory, available through Ontario Stone, Sand & Gravel Association (OSSGA).

ii) Aggregate License/Permit List, available through the Ministry of Natural Resources (MNR); and

iii) Aggregate Resources Inventory Papers (ARIPs), available through the Ministry of Northern Development and Mines (MNDM).

1.6 APPLICABLE CODES/STANDARDS

.1 Where specified codes/standards are not dated, conform to latest issue of specified codes/standards as amended and revised to the RFQ closing date.

1.7 SAFETY

.1 Observe and enforce all construction safety measures required by applicable codes, Workplace Safety and Insurance Board of Ontario, The Ministry of Labour, General Safety Regulations and all applicable statutes.

.2 Provide signage to warn traffic, pedestrians and recreation vehicle users of the work and inherent dangers. Make every effort to ensure public safety and restrict access to the project area during construction.

.3 Confine apparatus, the storage of materials and the operations of workers to limits indicated by laws, ordinances, permits and by directions of the Engineer. Do not unreasonably encumber the premises with materials.

.4 Appoint a suitably qualified employee who has sole responsibility on site on behalf of the Contractor, for compliance with these requirements and so advise the Owner in writing with a copy to the Engineer.

.5 In the event of discrepancy between such provisions, the most stringent provision shall apply.

.6 Employ a qualified specialty Engineer for the design of all shoring and falsework for the temporary supports of all structural elements, earth banks, roads, etc.

.7 Make available four (4) "Visitor safety helmets" for authorized visitors.

.8 The burning of refuse is strictly forbidden.

.9 "NO SMOKING" regulations are in effect in areas of the Work. Ensure that all workers comply with the regulations.

.10 Ensure that all workers comply with the Owner's safety regulations where such regulations are in effect.

.11 Do not load or permit to be loaded any part of the Work with a weight, load or force that will exceed the design load and/or endanger its safety.

.12 Provide dedicated flagmen at all times when working in traffic areas to guide equipment and local vehicular and pedestrian traffic.

1.8 WORKING LIMITS/TEMPORARY EASEMENTS

.1 Confine all operations within the Owner's property limits and easements.

.2 Arrange for encroachment on areas beyond property lines separately with the property owners.

.3 Obtain written consent of adjoining property owners regarding need for any temporary easements or any other encroachments. Upon completion of Contract, make good any damage to adjacent property.

1.9 EXISTING UTILITIES

.1 Conform to Federal, Provincial and Municipal regulations during construction in proximity to utility structures.

.2 Notify appropriate utility companies and municipal departments minimum one week in advance of commencing such work:

.1 For water works, the Corporation of the Town of Iroquois Falls Public Works.
.2 For sewage works, the Corporation of the Town of Iroquois Falls Public Works.
.3 For telephone, Ontario One Call.
.4 For electrical power, Ontario One Call.
.5 For Cable TV, Ontario One Call
.6 For gas lines, Union Gas or Ontario One Call
.7 For fibre optics, Ontario One Call.

.3 Make arrangements with utility companies and municipal department for protection of pipelines, conduits, drain lines, wiring and other structures, whether underground, on the surface or overhead, and satisfy the company or department that the methods or operations and rebidding of affected utilities are effective and acceptable to the company or department that owns the utility.

.4 Where an existing utility is uncovered and/or disturbed, rebidding/reinstallation of that utility will be performed at the Contractor's expense at no additional cost to the utility owner. Excavate by hand when exposing buried utilities. Pay any inspection charges for utility company inspectors if inspection of Work is deemed necessary by utility company.

.5 Stakes or marking may disappear or be displaced. The Contract shall have the same stakes or markings replaced immediately at own expense.

.6 Indemnify and save harmless the Owners of these existing utilities from any loss or damage which may be suffered by reason of the operations of the Contractor in the performance of this Contract.

END OF SECTION

QUALITY CONTROL, SECTION 01 45 00

Part 1 General

1.1 SECTION INCLUDES

.1 Inspection and testing, administrative and enforcement requirements.

.2 Tests and Mix Designs

1.2 REFERENCES

.1 ISO/IEC 17025:2005 - General Requirements for the Competence of Testing and Calibration Laboratories.

.2 SCC (Standards Council of Canada).

1.3 INSPECTION BY AUTHORITY

.1 Allow Authorities having jurisdiction to access Work. If part of the Work is in preparation at locations other than the Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection whenever portions of the Work are designated for special tests, inspections or approvals, either when described in the Contract Documents or when required by law in the Place of the Work.

.3 If the 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.

1.4 REVIEW BY CONSULTANT

.1 The Consultant may order any part of the Work to be reviewed or inspected if the Work is suspected to be not in accordance with Contract Documents.

.2 If upon review such Work is found to not be in accordance with Contract Documents, correct such Work and pay cost of additional review and correction.

1.5 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 the Consultant or the Owner 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.

.3 If, in opinion of the Consultant, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the Owner may deduct from the Contract

Price, the difference in value between Work performed and that called for by the Contract Documents, the amount of which shall be determined by Consultant and the Owner.

1.6 INSPECTION AND TESTING OF WORK

.1 Laboratories/Agencies

.1 Independent Inspection/Testing Agencies may be engaged by the Engineer for the purpose of inspecting and/or testing portions of the Work.

.2 All equipment required for carrying out inspection and/or testing will be provided by the respective Agencies.

.3 Employment of Inspection/Testing Agencies in no way relieves the Contractor of responsibility to perform the Work in accordance with the Contract Documents.

.4 Allow the Inspection/Testing Agencies access to all portions of the Work on site and manufacturing or fabrication plants, as may be necessary. Provide facilities for such access.

.2 Design Standards, Code Requirements

.1 Inspection and/or testing will be performed in accordance with the following:

.1 Compacted fill materials to ASTM D698 for Standard Proctor Density and OPSS 501 for degree of compaction.

.2 Concrete to CSA-A23.2 and mix designs to CSA-A23.1, Part II.

.3 Welding to CSA W59.1 and ASTM E109.

.4 Bolted connections to CSA S16 or S16.1.

.5 Mechanical Work to ASME B31.3 2016.

.6 Electrical Work to ESA; and

.7 As otherwise stated in the Divisional Specifications and contract documents.

.3 Tests and Mix Design

.1 Prior to commencement of the Work, submit to the Engineer and Inspection/Testing Agency, the following:

.1 Test results and mix designs of each class of concrete

.2 Sieve analysis and standard Proctor for all granular materials to be supplied and all backfill materials as work progresses.

.3 Any other material and product submittals required in the Divisional Specifications

1.7 ELECTRICAL TESTING

.1 Electrical testing shall be in accordance with the processes and specification referenced in the electrical divisions.

1.8 MECHANICAL TESTING

.1 Mechanical testing shall be in accordance with the processes and specification referenced in the mechanical divisions.

1.9 ACCESS TO WORK

.1 Cooperate to provide reasonable access and facilities for inspection and testing of the works.

1.10 PROCEDURES

.1 Notify the Engineer well in advance of the requirements for tests in order that necessary arrangements can be made.

.2 Submit samples and/or materials required for testing with reasonable promptness so as to cause no delay in the Work.

.3 Provide facilities to allow inspection and/or testing and make available space for storage and curing of the test samples.

.4 If defects are revealed during inspection and/or testing the Engineer may issue instructions for removal or correcting defective Work and irregularities. The Contractor shall notify the Engineer within two (2) working days if such instructions are in error or at variance with the Contract Documents.

.5 Costs for re-inspection and/or testing of rejected work shall be borne by the Contractor.

1.11 REFERENCE STANDARDS

.1 Within the text of the specifications reference may be made to the following standards:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ASME	American Society of Mechanical Engineers
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CCA	Canadian Construction Association
CEC	Canadian Electrical Code (published by CSA)
CEMA	Canadian Electrical Manufacturers Association
CGSB	Canadian Government Specification Board
CISC	Canadian Institute of Steel Construction
CLA	Canadian Lumberman's Association
CPCA	Canadian Painting Contractors Association
CPCI	Canadian Prestressed Concrete Institute
CRCA	Canadian Roofing Construction Association
CSA	Canadian Standards Association
FM	Factory Mutual Engineering Corporation
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
MTO	Ontario Ministry of Transportation
NAAMM	National Association of Architectural Metal Manufacturers
NBC	National Building Code
NEMA	National Electrical Manufacturers Association
OPSS	Ontario Provincial Standard Specifications
TTMAC	Terrazzo, Tile and Marble Association of Canada

ULC Underwriters Laboratories of Canada

Conform to such standards, in whole or in part, as specified within this Contract.

.2 If there is question as to whether any product or system is in conformance with applicable standards, the Engineer reserves the right to have such products or systems tested to prove or disprove conformance. The cost for such testing will be borne by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.

.3 Where specified standards are not dated, conform to latest issue of specified standards as amended and revised to the Tender closing date.

1.12 FREQUENCY OF TESTS

.1 The Contractor, in consultation with the Engineer, will arrange and cover all costs for testing on the basis of the following:

- .1 Trench Backfill:
  - .1 Minimum of two compaction tests per 100 meters of pipe bedding.
  - .2 Minimum of two compaction tests per 100 meters of trench per 1.0 m of backfill depth.
- .2 Granular Road Base:
  - .1 Minimum of two compaction tests per 500 square meters of roadway per lift of material.
- .3 Granular Material:
  - .1 Minimum one sieve analysis per 1000 cubic meters of material delivered.
- .4 Concrete Tests:
  - .1 Minimum of three (3) sets of concrete cylinders to be cast and tested for every 75 cubic meters or less of concrete for:
    - .1 cast-in-place concrete
  - .2 One additional test cylinder shall be taken during cold weather concreting, cured on the job site under the same conditions as concrete placement.
  - .3 Slump and air content tests will be performed for each set of cylinders cast.

.2 Engineer may arrange extra tests or revise minimum test requirements where appropriate.

END OF SECTION

FIELD ENGINEERING, SECTION 01 50 00

Part 1 General

1.1 SECTION INCLUDES

.1 Inspection and testing, administrative and enforcement requirements.

Part 2 Field Engineering

2.1 QUALIFICATIONS OF SURVEYOR

.1 Qualified Construction Surveyor, acceptable to Owner. Construction Surveyor must be accepted by Owner **PRIOR** to commencing Control Survey and layout work.

2.2 ELEVATIONS AND LINES

.1 Benchmarks and reference points, to be used as a datum for all other elevations, baselines and line, will be identified by the Engineer. Establish all other required lines and grades from the Engineer's reference points. Locate, confirm and protect control points prior to starting site Work. Preserve permanent reference points during construction.

.2 One (1) set only of benchmarks and/or reference points will be established for the project.

.3 Reference points for all works and appurtenances will be established by the Contractor and approved by the Engineer.

.4 Do not disturb reference points. Pay for resetting if displaced or removed.

.5 Make all survey notes and information available to the Engineer for inspection. Keep notes clear, legible and in order. Keep copy on site at all times.

.6 Supply all stakes, batter boards, pins, templates, flagging, etc. required for the Work including those required by Engineer.

.7 Supply survey assistant(s) to the Engineer as required for checking lines and elevations and for confirming Contractor’s survey work and as-built drawing information.

.8 The Contractor shall, from baselines and benchmarks established, provide all survey required to set foundations, trenches and all other required lines and elevations. The Engineer shall undertake random compliance verification surveys only.

2.3 RECORDS

.1 The Contractor will maintain a complete, accurate and up to date log of control and survey work as it progresses. Make available to Engineer for inspection at anytime on site.

.2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles, and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines and utilities.

.4 Refer to CCDC-2 General Conditions for additional requirements.

.5 Services Record Information

.1 The Contractor shall provide all record information on the pipeline and its appurtenances including elevations of the pipeline and final grade at 20-meter intervals. The information is to be summarized and turned over to the Engineer on a weekly basis.

.2 The record information to be gathered by the Contractor shall include, but may not necessarily be limited to:

.1 The horizontal position of any installed structures and bends or fittings in all piping measured from the main to a permanent reference point.

.2 Elevations of the top of the piping, any manholes and access vaults, etc., each bend or fitting, each grade change and at 20-meter stations.

.3 Horizontal location and elevation of all other constructed parts of the work, especially items that are installed at or below the surface.

.6 Measurement and Payment

.1 No separate payment will be made for Work performed in relation to this section.

END OF SECTION

TEMPORARY UTILITIES, SECTION 01 51 00

Part 1 General

1.1 SECTION INCLUDES

.1 Temporary utilities excluding temporary water (covered under OPSS 441).

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute Work expeditiously.

.2 Remove from site all such Work after use.

.3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations free from standing water.

1.4 WATER SUPPLY

.1 Provide continuous supply of potable water for construction use.

.2 Arrange for connection with appropriate utility company and pay all costs for installation, maintenance and removal.

1.5 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

- .1 Facilitate progress of Work.
- .2 Protect Work and products against dampness and cold.
- .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Ventilating:

- .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

1.6 TEMPORARY POWER AND LIGHT

.1 Provide temporary power during construction for temporary lighting and operating of power tools.

.2 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.

.3 Provide and pay for temporary power for electric cranes and other equipment requiring temporary power in excess of above noted requirements.

.4 Provide and maintain temporary lighting throughout project.

END OF SECTION

CONSTRUCTION FACILITIES, SECTION 01 52 00

Part 1 General

1.1 SECTION INCLUDES

.1 Construction facilities.

1.2 UTILITIES

.1 Sanitary Facilities

.1 Provide and pay for sanitary facilities for workers in accordance with local health authorities. Maintain facilities in clean and tidy condition.

.2 Temporary Telephone

.1 Provide and pay for temporary telephones necessary for own use.

.3 Welding Machines and Air Compressors

.1 Welding machines and air compressors required for performance of the Work are to be the responsibility of the respective users.

.4 Gas Welding Apparatus

.1 Gas welding apparatus required for performance of the Work is to be the responsibility of the respective user.

.5 Dewatering

.1 Provide temporary drainage and pumping facilities as necessary to keep excavations and site free from water at all times.

.2 Improper handling of surface water and allowing water to accumulate in excavations will result in Engineer issuing a Stop Work order until the problem is corrected.

.3 Do not discharge drainage water into Municipal sewers or across adjacent properties without written approval.

.4 Do not discharge drainage water containing silt in suspension into sewage lines.

.6 Water Supply

.1 The Owner will provide potable water for use in flushing and testing watermains under the supervision of the Engineer and the Owners representatives.

.7 Temporary Power / Site Lighting

.1 Provide and pay for temporary site lighting, if required, for Work. Install lamps in suitable locations to obtain unobstructed light over the entire site.

.2 Perform daily inspection of temporary site lighting and replace burned out and missing lamps. Relocate promptly any lights that become obstructed by new Work.

.3 Provide and pay for temporary power required during construction, for temporary lighting and the operation of power tools. Arrange for connection with appropriate utility company, if required. Pay all costs for installation, maintenance and removal.

1.3 SERVICES

.1 Existing Services

.1 Maintain existing services and utilities in operation at all times during construction.

.2 Protect all existing services and utilities from damage. Repair services damaged by construction at no additional cost to the Owner, the owner of the service/utility or the property owner.

.3 If service interruptions are necessary, such interruptions shall be made only at times approved by the Engineer and the Owner.

.4 When breaking into, or connecting to, existing mains, services or utilities, carry out work at times directed by local governing authorities, with a minimum of disturbance to the Work and/or building occupants, end users, pedestrian and vehicular traffic. **Do not proceed with making connections to existing facilities without a Certified Operator from THE CORPORATION OF THE TOWN OF IROQUOIS FALLS, on site. Only THE CORPORATION OF THE TOWN OF IROQUOIS FALLS operation personnel, will operate valves etc. This includes new equipment once a connection is made.**

.5 Protect, relocate or maintain existing active services as required. When inactive services are encountered, cap off in a manner approved by local governing authorities having jurisdiction.

.6 Use temporary supports, connections or other provisions as necessary when working at or near overhead power, cable or telephone lines. Adhere to governing authority's requirements and regulations while performing work.

1.4 BARRIERS/PROTECTION

.1 Guard Rails and Barricades

.1 Provide guard railings, fencing and barricades, detour signs, watch persons, warning lights and/or flag persons around all excavations. Construct as recommended by local governing authorities.

1.5 CONSTRUCTION AIDS

.1 Temporary Retaining Walls

.1 Provide temporary sheeting, piling or shoring as required to protect excavations, and trenches from damage caused by rainwater, ground water and other soil and weather conditions. Erect in a manner that will not encumber the performance of the Work.

.2 Ladders, Stairs

.1 Provide and maintain adequate temporary ladders and stairs required for construction and for safe access to deep excavations.

.2 Ladders and stairs are to comply with all requirements of safety authority.

.3 Explosive Actuated Fastening Tools

.1 Provide for the use of explosive actuated fastening tools when required. When using, conform to the requirements of CAN 3Z166.1-M -"Power Actuated Tools" and local governing authorities.

.4 Scaffolding

.1 Provide and maintain scaffolding, ladders and platforms as required to access Work.

.2 Scaffolding is to be rigid, secure and constructed to ensure adequate safety for workers. Erect and remove without damage to the building or finishes.

.5 Welding Machines and Air Compressors

.1 If required for performance of the Work, these are the responsibility of the respective users.

1.6 ROADS / PARKING / TRAFFIC FLOW

.1 Access to Site

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as required for access to and on site. Conform to requirements of local governing authorities when required and when necessary, make arrangements with adjacent property owners. Locate these traffic facilities where they are least disruptive to normal street traffic and drainage.

1.7 PROTECTION OF WORK AND PROPERTY

.1 Protection for Off-Site and Public Property

.1 Protect surrounding private and public property from damage during the performance of the Work. Provide adequate protection to adjacent property and equipment during the performance of the Work. Provide necessary screens, covers, hoardings, etc. as required. Be responsible for all damages incurred due to improper or lack of protection.

.2 During excavation, provide sheeting, piling or shoring as required to protect adjacent building foundations and streets from movement.

.3 Be responsible for all damages incurred due to improper protection.

.2 Tree and Plant Protection

.1 Protect existing trees and plants on adjacent properties except as indicated otherwise on drawings or specifications.

.3 Fire Protection

.1 Provide and maintain adequate temporary fire protection equipment during performance of the Work as required by insurance companies having jurisdiction, and local and/or provincial governing codes, regulations, and bylaws.

.2 Handle gasoline and similar combustible materials with good, safe practice.

.3 Remove combustible debris from site daily. Open fires and burning of rubbish are not permitted on the site.

.4 Snow Removal

.1 Remove snow and ice from access roads, parking areas, office and storage areas.

.2 Remove snow and ice from surfaces as necessary for construction.

1.8 SECURITY

.1 If necessary, provide and pay for responsible security personnel to guard the site and contents on site after working hours, on weekends, and during holidays. Allow

security personnel access to sanitary facilities, telephone and warm weatherproof shelter.

1.9 PROJECT CLEANLINESS

.1 Maintain the Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the Owner or other Contractors.

.2 Remove waste material and debris from the site at the end of each working day.

END OF SECTION

TEMPORARY CONSTRUCTION, SECTION 01 53 00

Part 1 General

1.1 SECTION INCLUDES

.1 Protection for off-site and public property.

.2 Protection of applied finishes and surrounding Work.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such Work after use.

1.3 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 The Contractor shall be responsible for damage incurred.

1.4 PROTECTION OF APPLIED FINISHES

.1 Provide protection for finished and partially finished surfaces and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Be responsible for damage incurred due to lack of or improper protection.

1.5 PROTECTION OF SURROUNDING WORK

.1 Provide protection for finished and partially finished Work from damage.

.2 Provide necessary cover and protection.

.3 Be responsible for damage incurred due to lack of or improper or inappropriate protection.

END OF SECTION

PRODUCT REQUIREMENTS, SECTION 01 61 00

Part 1 General

1.1 SECTION INCLUDES

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 01 62 00: Product Exchange Procedures.

.3 Manufacturer's instructions.

.4 Quality of Work, coordination and fastenings.

.5 Existing facilities.

1.2 TERMINOLOGY

.1 New: Produced from new materials.

.2 Renewed: Produced or rejuvenated from an existing material to like-new condition to serve a new or existing service.

.3 Defective: A condition determined exclusively by the Consultant, Contract Administrator or Owner.

1.3 PRODUCT QUALITY

.1 Products, materials, equipment, parts or assemblies (referred to as Products) incorporated in Work: New, not damaged or defective, of best quality (compatible with specification requirements) for purpose intended. If requested, provide evidence as to type, source and quality of Products provided.

.2 Defective materials, equipment and articles whenever found may be rejected regardless of previous inspection. Inspection by the Consultant or an inspector does not relieve the Contractor of their responsibility but is merely a precaution against oversight or error. Remove and replace defective materials at own expense and be responsible for all delays and expenses caused by rejection.

.3 Should any dispute arise as to the quality or fitness of materials, equipment or articles, the decision rests strictly with the Consultant based upon the requirements of the Contract Documents.

.4 Unless otherwise indicated in specifications, maintain uniformity of manufacturer for any particular or like item throughout the project.

.5 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.

1.4 AVAILABILITY

.1 Immediately upon signing the Contract, review product requirements and anticipate foreseeable delivery delays in any items. If delays in deliveries of materials, equipment or articles are foreseeable, **propose substitutions or other remedial action in ample time to prevent delay** in performance of the Work.

.2 If such proposal is not given to the Consultant, **the Consultant reserves the right to substitute more readily available Products later in order to prevent delays** at no additional cost to the Owner.

.3 If delays in supply of Products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.4 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available Products of similar character, at no increase in Contract Price or Contract Time.

.5 To receive approval, proposed substitutes must equal or exceed the quality, finish and performance of those specified and/or shown and must not exceed the space requirements allotted on the drawings.

.6 Provide documentary proof of equality, difference in price (if any) and delivery dates in the form of certified quotations from suppliers of both specified items and proposed substitutions.

.7 Include all costs in the difference in price (if any) for any required revisions to other structures and products to accommodate such substitutions.

1.5 STORAGE AND PROTECTION

.1 Store and protect Products in accordance with manufacturers' written instructions.

.2 Store with seals and labels intact and legible.

.3 Store sensitive Products in weather tight, climate controlled, enclosures in an environment favourable to Product, or as recommended by the manufacturer.

.4 For exterior storage of fabricated Products, place on sloped supports above ground.

.5 Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.

.6 Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

.7 Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, and damage.

.8 Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.6 TRANSPORTATION AND HANDLING

.1 Transport and handle Products in accordance with manufacturer's written instructions.

.2 Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

.3 Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

.4 Pay all costs for transportation of Products required for the Work. Contractor is responsible for ensuring that all Sub-Contractors are aware of this requirement.

1.7 PRODUCT CHANGES

.1 Change in Product/Products: Submit request for substitution or alternative in accordance with Section 01 62 00.

1.8 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities.

.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.

1.9 MANUFACTURER'S WRITTEN INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect Products to manufacturer's written instructions. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.

.2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.

.3 Improper installation or erection of Products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.

1.10 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Consultant reserves right to require dismissal from site any workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant and the Owner, whose decision is final.

1.11 CONCEALMENT

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform Consultant if there is interference. Install as directed by Consultant.

1.12 REMEDIAL WORK

.1 Perform all cutting and remedial work that may be required to make the several parts of the Work come together properly. Coordinate and schedule the Work to ensure that cutting and remedial work are kept to a minimum.

.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.

.3 Should the Owner or anyone employed by them be responsible for ill-timed work necessitating cutting and/or remedial work to be performed, the cost of such work will be valued as provided in the General Conditions and added to the Contract Price.

.4 Employ specialists familiar with the materials affected in performing cutting and remedial work. Perform in a manner to neither damage nor endanger any portion of the Work.

.5 Do not cut, drill or sleeve any load-bearing members without written approval of the Consultant.

1.13 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Consultant of conflicting installation. Install as directed.

1.14 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 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.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

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

1.15 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 Type 304 or 316 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 unless specified otherwise.

1.16 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of any part of the Project.

.2 Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated, without written approval of the Consultant.

1.17 MEASUREMENT

.1 Unless otherwise noted, this Project has been designed, and is to be constructed, in the S.I. metric system of measurements.

.2 Where specified metric elements will not be available when required, submit with RFQ for alternative products in accordance with Section 01 62 00 – Product Exchange Procedures.

.3 During construction, when specified metric elements are unattainable at the time they are required to meet the Construction Schedule, the Contractor shall notify the Consultant in writing and suggest alternative substitutions. Costs due to these substitutions shall be borne by the Contractor.

END OF SECTION

PRODUCT EXCHANGE PROCEDURES, SECTION 01 62 00

Part 1 General

1.1 SECTION INCLUDES

.1 Substitutions.

1.2 SUBSTITUTIONS

.1 The Engineer will consider requests for Substitutions only within thirty (30) days after date established in Notice to Proceed.

.2 Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

.3 Substitutions may be considered when the Contractor has more experience with another Product that meets or exceeds the specifications and quality of the specified Product.

.4 Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

.5 A request constitutes a representation that the Contractor:

.1 Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.

.2 Will provide the same warranty for the Substitution as for the specified Product.

.3 Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

.4 Waives claims for additional costs or time extension which may subsequently become apparent.

.5 Will reimburse Owner for review or redesign services associated with re-approval by authorities (if required).

.6 Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

.7 Substitution Submittal Procedure:

.1 Submit a copy of request for Substitution for consideration to the Consultant. Limit each request to one (1) proposed Substitution.

.2 Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.

.3 The Consultant will notify Contractor in writing of decision to accept or reject request.

END OF SECTION

EXAMINATION AND PREPARATION, SECTION 01 70 00

Part 1 General

1.1 SECTION INCLUDES

.1 Field engineering survey services to measure and stake site.

.2 Recording of subsurface conditions found.

.3 Survey services to determine measurement inverts for the Work.

.4 Requirements and limitations for cutting and patching the Work.

1.2 REFERENCES

.1 Owner's identification of existing survey control points and property limits.

1.3 SUBMITTALS

.1 Submit name and address of surveyor to Consultant.

.2 On request of Consultant, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform with Contract Documents.

1.4 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practise in the Province of Ontario, acceptable to the Owner.

1.5 SURVEY REFERENCE POINTS

.1 Existing base horizontal and vertical control points are designated on Drawings.

.2 Locate, confirm and protect control points prior to starting site Work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to Consultant.

.4 Report to Consultant when reference point is lost, destroyed or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

1.6 SURVEY REQUIREMENTS

.1 Establish two (2) permanent benchmarks on site, referenced to established bench marks by survey control points.

.2 Record locations, with horizontal and vertical data in Project Record Documents.

.3 Establish lines and levels, locate and lay out, by instrumentation.

.4 Stake for grading, fill placement, topsoil placement, and landscaping features.

.5 Stake slopes.

.6 Establish pipe invert elevations.

.7 Stake batter boards for foundations.

.8 Establish foundation and floor elevations.

.9 Establish lines and levels for mechanical and electrical work.

1.7 SUBSURFACE CONDITIONS

.1 Promptly notify Consultant in writing if discovered surface or subsurface conditions at Place of Work differ materially from those indicated in Contract Documents.

.2 Advise the Consultant of a reasonable assumption of probable conditions when determined.

.3 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes or Change Orders set out in CCDC-2 General Conditions.

1.8 EXAMINATION

.1 Inspect existing conditions, including elements or adjacent Work subject to irregularities, damage, movement, including Work during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of the Work.

.3 Beginning of cutting or patching constitutes acceptance of existing conditions.

1.9 PREPARATION

.1 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.2 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

1.10 EXISTING SERVICES

.1 Before commencing Work, establish location and extent of all local service utility lines within the contract limits and/or area of Work and notify Consultant of findings.

.2 Remove abandoned service lines within < 2 m of structures. Grout solid lines at cut-off points as directed by Consultant.

1.11 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Consultant of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

1.12 SURVEY RECORD

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

END OF SECTION

EXECUTION, SECTION 01 73 00

Part 1 General

1.1 SECTION INCLUDES

.1 Submittal requirements associated with connecting to new and existing facilities.

.2 Execution requirements for all Work.

1.2 SUBMITTALS - ATTACHING TO EXISTING WORK

.1 Submit written request in advance of cutting or alteration which affects:

.1 Structural integrity of any element of Project.
.2 Integrity of weather-exposed or moisture-resistant elements.
.3 Efficiency, maintenance, or safety of any operational element.
.4 Visual qualities of sight-exposed elements.
.5 Work of Owner or separate contractor.

.2 Include in request:

.1 Identification of Project.
.2 Location and description of affected Work.
.3 Statement on necessity for cutting or alteration.
.4 Description of proposed Work, and products to be used.
.5 Alternatives to cutting and patching.
.6 Effect on Work of Owner or separate contractor.
.7 Written permission of affected separate contractor.
.8 Date and time Work will be executed.

1.3 TOLERANCES

.1 Monitor fabrication and installation tolerance control of Products to produce acceptable Work.

.2 Do not permit tolerances to accumulate beyond effective or practical limits.

.3 Comply with manufacturers' tolerances. In case of conflict between manufacturers' tolerances and Contract Documents, request clarification from Consultant before proceeding.

.4 Adjust Products to appropriate dimensions; position and confirm tolerance acceptability, before permanently securing Products in place.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching to complete the Work.

.2 Perform all required excavation and fill to complete the Work.

.3 Fit several parts together, to integrate with other Work.

.4 Uncover Work to install ill-timed Work.

.5 Remove and replace defective or non-conforming Work.

.6 Remove samples of installed Work for testing, if not designated in the respective Section as remaining as part of the Work.

.7 Provide openings in non-structural elements of Work for penetrations of proposed piping (exhaust or fluid), electrical and associated Work. Limit opening dimensions to minimal sizes required and performed in a neat and clean fashion.

.8 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.9 Employ competent workers to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.10 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry or concrete work without prior approval from the Consultant.

.11 Restore work with new products in accordance with requirements of Contract Documents.

.12 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.13 Re-finish surfaces to match adjacent finishes: For continuous surfaces re-finish to nearest intersection; for an assembly, re-finish entire unit.

END OF SECTION

CUTTING AND PATCHING, SECTION 01 73 30

Part 1 General

1.1 SECTION INCLUDES

.1 Requirements and limitations for cutting and patching of Work.

1.2 SUBMITTALS

.1 Submit written request in advance of cutting or alteration which affects:

- .1 Structural integrity of any element of Project.
- .2 Integrity of weather exposed or moisture resistant element.
- .3 Efficiency, maintenance, or safety of any operational element.
- .4 Visual qualities of sight exposed elements.
- .5 Work of Owner or separate contractor.

.2 Include in request:

- .1 Identification of Project.
- .2 Location and description of affected Work.
- .3 Necessity for cutting or alteration.
- .4 Description of proposed Work and Products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time Work will be executed.

Part 2 Products

2.1 MATERIALS

.1 Primary Products: Those required for original installation.

.2 Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 62 00 - Product Exchange Procedures.

Part 3 Execution

3.1 EXAMINATION

.1 Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

.2 After uncovering existing Work, assess conditions affecting performance of work.

.3 Beginning of cutting or patching constitutes acceptance of existing conditions.

3.2 PREPARATION

.1 Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

.2 Provide protection from elements for areas which may be exposed by uncovering Work.

.3 Maintain excavations free of water.

3.3 CUTTING

.1 Execute cutting and fitting to complete the Work.

.2 Uncover work to install improperly sequenced Work.

.3 Remove and replace defective or non-conforming Work.

.4 Provide openings in the Work for penetration of mechanical and electrical work.

.5 Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

.6 Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

3.4 PATCHING

.1 Execute patching to complement adjacent Work.

.2 Fit Products together to integrate with other Work.

.3 Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.

.4 Employ original installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.

.5 Restore work with new Products in accordance with requirements of Contract Documents.

.6 Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.7 Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

END OF SECTION

CLEANING AND WASTE PROCESSING, SECTION 01 74 00

Part 1 General

1.1 SECTION INCLUDES

.1 Progressive cleaning.

.2 Cleaning prior to acceptance.

Part 2 Products

2.1 CLEANING MATERIALS

.1 Cleaning Agents and Materials: Low VOC content.

Part 3 Execution

3.1 PROGRESSIVE CLEANING

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.

.3 Clear snow and ice from area of construction, bank or pile snow in designated areas only.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.6 Containers:

.1 Provide on-site steel framed, hinged lid containers for collection of waste materials and debris.

.2 Provide and use clearly marked, separate bins for recycling.

.7 Dispose of waste materials and debris at Owner designated dumping areas.

.8 Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finishing operations.

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

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

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

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

3.2 CLEANING PRIOR TO ACCEPTANCE

.1 Prior to applying for Substantial Performance of the Work, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others and leave Work clean and suitable for occupancy.

.3 Prior to final review, remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris including that caused by Owner, or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.11 Clean and polish surface finishes, as recommended by manufacturer.

.12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.14 Remove dirt and other disfiguration from exterior surfaces.

.15 Clean and sweep roofs, gutters, areaways, and sunken wells.

.16 Clean roof surfaces, down-spouts, and drainage components.

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

.18 Remove snow and ice from access to facilities.

3.3 FINAL PRODUCT CLEANING

.1 Execute final cleaning prior to final project assessment.

.2 Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces.

.3 Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

.4 Clean filters of operating equipment.

.5 Clean site: sweep paved areas, rake clean landscaped surfaces.

.6 Remove waste and surplus materials, rubbish, and construction facilities from the site.

END OF SECTION

WASTE MANAGING AND DISPOSAL, SECTION 01 74 20

Part 1 General

1.1 SECTION INCLUDES

.1 Waste goals.

.2 Waste management plan.

.3 Third party responsibilities.

.4 Waste management plan implementation.

.5 Disposal of waste.

.6 Forms for documenting program.

1.2 REFERENCES

.1 OPSS.MUNI 180 November 2021 – General Specification for the Management of Excess Material

1.3 DEFINITIONS

.1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.

.2 Construction and Demolition Waste: Solid wastes typically including but not limited to, building materials, packaging, trash, debris, and rubble resulting from construction, re-modelling, repair and demolition operations.

.3 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.

.4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including, but not limited to, ignitability, corrosiveness, toxicity, or reactivity.

.5 Non-toxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and re-manufactured into a new product for reuse by others.

.7 Recycle: To remove a waste material from the Project site to another site for re-manufacture into a new product for reuse by others.

.8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.9 Return: To give back reusable items or unused products to vendors for credit.

.10 Reuse: To reuse a construction waste material in some manner on the Project site.

.11 Salvage: To remove a waste material from the Project site to another site for resale or reuse by others.

.12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

.13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

.14 Toxic: Poisonous to humans either immediately or after a long period of exposure.

.15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

.16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:

.1 Solvents in paints and other coatings.

.2 Wood preservatives; strippers and household cleaners.

.3 Adhesives in particle board, fibreboard, and some plywood; and foam insulation.

.4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.

.17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

.18 Waste Management Plan: A Project-related plan for the collection, transportation, and disposal of the waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.4 SUBMITTAL

.1 Section 01 33 00: Submittal Procedures/Shop Drawings

.2 OPSS.MUNI 180

.3 Prepare and submit the following submittals prior to project start-up:

.1 Submit two (2) copies of completed Waste Audit.

.2 Submit two (2) copies of completed Waste Reduction Work Plan.

1.5 OWNER WASTE MANAGEMENT GOALS

.1 Owner has established this Project is to generate the least amount of waste possible. This requires that construction processes ensure as little waste as possible, either due to error, poor planning, breakage, mishandling, contamination, or other factors.

.2 Owner recognizes that waste in any project is inevitable, but indicates that as much of the waste materials as economically feasible should be reused, salvaged, or recycled as required.

.3 Minimize waste disposal to landfills.

1.6 WASTE MANAGEMENT PLAN

.1 Draft Waste Management Plan: Within ten (10) days after receipt of Notice of Award of Bid, or prior to any waste removal, whichever occurs sooner.

.2 Submit a Draft Waste Management Plan to Consultant for review.

.3 Draft Plan to contain the following:

- .1 Analysis: Proposed site waste generated, including types and quantities.
- .2 Landfill Options: Confirm that Site has been identified by THE CORPORATION OF THE TOWN OF IROQUOIS FALLS.
- .3 Landfill Accepting Hazardous Substances: Confirm the site accepts the hazardous materials and designated substances.
- .4 Proposed haul routes.
- .5 Alternatives to Landfill: According to OPSS MUNI 180
  - .1 Property available for stockpiling for re-use and disposable as fill.
  - .2 Management as disposable fill of excess material.
  - .3 Concrete.
  - .4 Identification of waterbodies and sensitive areas.
  - .5 Management of disposable fill within the Owner's property and on other property. Contact THE CORPORATION OF THE TOWN OF IROQUOIS FALLS for possible locations.
  - .6 Management by stockpiling within the Owner's property or on other property.

.4 Resources for Development of Waste Management Plan:

1. THE CORPORATION OF THE TOWN OF IROQUOIS FALLS shall be consulted regarding waste disposal policies.
2. Recycling: THE CORPORATION OF THE TOWN OF IROQUOIS FALLS shall be contacted regarding management of all recyclable materials.
3. Non-Recyclable material: THE CORPORATION OF THE TOWN OF IROQUOIS FALLS shall be contacted regarding management of all non-recyclable materials for designated disposal locations

.5 Final Waste Management Plan: Once the Owner has determined the draft Waste Management Plan is acceptable, submit, within ten (10) calendar days, a Final Waste Management Plan containing the following:

- .1 Analysis of proposed jobsite waste to be generated, including types and quantities.

.2 Landfill options: The name of landfill site where trash will be disposed of, the applicable landfill tipping fees, and the projected cost of disposing of all Project waste at the landfill.

.3 Alternatives to Landfill: A list of waste materials from Project that will be separated for reuse, salvage, or recycling.

.4 Landfill Accepting Hazardous Substances: The name of the landfill site where materials containing hazardous substances, designated substances or contaminated material not accepted elsewhere will be disposed of, the applicable landfill tipping fees, the projected cost of disposing of all waste being deposited at this landfill.

.5 Meetings: Contractor to review and comment on status of waste management plan at the project progress meetings.

.6 Materials Handling Procedures: A description of the means any waste materials identified above will be protected from contamination, and a description of the means to be employed in recycling materials consistent with requirements for acceptance by THE CORPORATION OF THE TOWN OF IROQUOIS FALLS designated facilities.

.7 Transportation: A description of the means of transportation of recyclable materials, whether materials will be site-separated and self-hauled to designated centres, or whether mixed materials will be collected by waste hauler and removed from site, and destination of materials

1.7 THIRD PARTY RESPONSIBILITY

.1 Cooperate with all parties on site to implement a Waste Reduction Plan.

1.8 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Consultant or as approved by the Owner.

.2 Hazardous materials and designated substances shall only be handled by those with the proper training and with methods in accordance with applicable regulations and standards for the substances.

.3 Hazardous materials and designated substances shall be stored in accordance with applicable regulations and standards for the substances.

.4 The Contractor shall make a reasonable effort to protect the health and safety of all workers and persons on site from designated substances, especially during removal.

.5 Unless specified otherwise, materials for removal become Contractor's property.

.6 Protect, stockpile, store and catalogue salvaged items.

.7 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.8 Support affected structures. If safety of building is endangered, cease operations and immediately notify Consultant.

.9 Protect floor drainage and utility services from damage and blockage.

.10 Protect surface drainage, storm sewers, sanitary sewers, and utility services from damage and blockage

1.9 SCHEDULING

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 PREPARATION

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations, codes and OPSS MUNI 180.

3.2 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.

.3 Provide temporary security measures as approved by Consultant.

3.3 WASTE MANAGEMENT PLAN IMPLEMENTATION

.1 Manager: Designate an on-site party responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for Project.

.2 Distribution: Distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Consultant.

.3 Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by parties at appropriate stages of Project.

.4 Separation facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

.5 Hazardous wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

3.4 DISPOSAL OF WASTE

.1 Burying and burning of rubbish and waste materials is prohibited.

.2 Disposal of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers is prohibited.

.3 Disposal of hazardous materials and designated substance must be in accordance with all applicable laws, regulations and standards.

3.5 CLEANING

.1 Remove tools and waste materials on completion of Work, 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

START-UP PROCEDURES, SECTION 01 75 16

Part 1 General

1.1 SECTION INCLUDES

.1 Starting equipment in preparation for adjusting and commissioning.

.2 To bring the facility to a fully operational state, free of deficiencies, in the most efficient and timely manner achievable.

.3 Contractor's and Owner's responsibilities during each of the following successive sub phases of facility start-up:

.1 Contractor start-up which leads to Interim Acceptance of the Work.

.2 Performance Testing which leads to Practical Completion of the Work.

1.2 SUBMISSIONS

.1 Advise the Corporation of the Town of Iroquois Falls Representative, herein after known as the Owner, of report forms required for equipment and systems.

.2 Provide a sample of manufacturer's start-up forms for equipment or systems not included.

.3 Submit a completed and verified commissioning manual to the Owner and Consultant with all data entered and signoffs, prior to Substantial Completion of the Work.

Part 2 Execution

2.1 STARTING SYSTEMS

.1 Coordinate schedule for start-up of various equipment and systems.

.2 Notify the Consultant and Owner, seven (7) days prior to start-up of each item.

.3 Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

.4 Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

.5 Verify that wiring and support components for equipment are complete and tested.

.6 Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' written instructions.

.7 Submit a written report in accordance with Section 01 33 00 that equipment or system has been properly installed and is functioning correctly.

.8 When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or

system installation prior to start-up, and to supervise placing equipment or system in operation.

2.2 START-UP REPORT

.1 Owner will provide start up report forms (check sheets) with the exception of controls.

.2 Contractor to develop, complete and provide the report forms for all control points, software and hardware

.3 Submit completed report forms to Owner for review within ninety (90) days of award of contract.

.4 Contractor will assemble completed report forms into a "commissioning manual" on the following subjects:

- .1 Each mechanical system (except for controls).
- .2 Each electrical system

.5 Refer to Owner for a sample of the commissioning report form.

.6 Include manufacturer's equipment start-up reports and test certificates as an appendix to the commissioning manual.

.7 The commissioning manual will be kept on site for use by appropriate contractors and the Owner.

- .1 Maintain this manual current.
- .2 Maintain a schedule for work of the commissioning agent in conjunction with the commissioning schedule.

.8 The report forms are divided into three parts:

- .1 Technical Data
- .2 Static Checks
- .3 Operational Checks

.9 Contractor is to complete each part prior to verification by the Owner.

.10 Contractor is responsible for completing the report forms as follows and as indicated on the attached sample:

- .1 Technical Data
  - .1 Specified: Owner
  - .2 Shop Drawing: Contractor
  - .3 Installed: Contractor
  - .4 Verified: Owner
  - .5 Date/Checked By: Contractor to sign when all Shop Drawings and installed information is completed.
- .2 Static Checks
  - .1 Confirmation of Completion: Contractor to confirm all items listed are completed prior to verification by the commissioning agent.

.2 Date/Checked By: Contractor to sign when the installation of the equipment and/or systems are complete and ready for the commissioning agent to verify.

.3 Operational Checks

.1 Operational checks will be performed by the commissioning agent using the balancing report and control's forms.

2.3 CONTRACTOR START UP

.1 Contractor to perform the following during start-up:

.1 Start equipment and systems.

.2 Test and adjust equipment and systems as per manufacturers specifications.

.3 Demonstrate equipment and systems as specified in Section 01 79 00 - Demonstration and Training.

.2 Complete and submit start-up reports including:

.1 Contractor's system and equipment start up reports.

.2 Manufacturers' equipment start-up reports.

.3 Review Contract Documents and inspect the Work to ensure completeness of the Work and compliance with requirements of Contract Documents.

.4 Correct Contract deficiencies and defects identified as a result of the foregoing and as may be identified by the owner.

.5 Execute and complete approved Change Orders.

.6 Perform other work and activities required for fulfillment of prerequisites to Interim Acceptance of the Work.

.7 Owner will perform the following during start-up:

.1 Preliminary interim inspections as necessary.

.2 Witness manufacturers’ equipment start-up coordinated and paid for by the contractor.

.3 Verify starting, testing, adjusting and balancing by Contractor.

.4 Provide start-up reports for all systems and equipment and review and approve Contractor start-up reports.

.5 Cooperate in systems and equipment demonstration and instruction.

.6 Initiate Change Orders as required.

.7 Verify correction of Contract deficiencies and defects by Contractor.

.8 Verify execution of Change Orders performed by Contractor.

.8 The following will be performed to an on-going cycle of:

.1 Owner's inspections.

.2 Documentation of results.

.3 Diagnosis of problems.

.4 Correction of Contract Deficiencies and execution of Change Orders as required.

.5 Verification of results.

2.4 PERFORMANCE TESTING

.1 Performance testing will be performed by the Owner and:

.1 Completed prior to Substantial Completion.

.2 Completed when all systems have been balanced and tested and are operating to the satisfaction of the Consultant.

.2 Contractor to perform the following during Performance Testing:

.1 Correct Contract deficiencies and defects previously outstanding and those identified during performance testing.

.2 Execute Change Orders.

.3 The following will be performed to an on-going cycle of:

.1 Performance testing.

.2 Documentation of results.

.3 Diagnosis of problems.

.4 Correction of Contract deficiencies, defects and execution of Change Orders as required.

.5 Verification of results.

2.5 SEASONAL CONSTRAINTS

.1 Notwithstanding requirements in this section, additional separate cycles of Contractor start-up, performance testing and fine tuning may be necessitated at a later time on equipment and systems whose full operation is dependent on seasonal conditions.

.2 Contractor's responsibilities with respect to later facility start-up activities are specified in this section.

2.6 PARTIAL UTILIZATION OF WORK

.1 When partial utilization of the Work is required, the applicable requirements specified in this section apply to the part(s) of the Work to be utilized.

END OF SECTION

TESTING, ADJUSTING AND BALANCING, SECTION 01 75 19

Part 1 General

1.1 SECTION INCLUDES

.1 Adjusting Products and equipment required by all specification's sections for this Project.

1.2 PURPOSE

.1 Perform testing adjusting and balancing of operating systems in contract by an agency that will be selected by the Owner and consigned to this Contract:

.2 Prior to start of balancing, ensure systems are:

.1 Piped, ducted, wired and wireless services and systems, including components and equipment forming part thereof.

.2 Manually and mechanically operated, including components and equipment forming any part.

.3 Testing, adjusting, and balancing will not be started until after all static checks have been completed for the system being balanced and signed off on the commissioning report forms.

.4 Contractor to ensure systems are operated at designated times, under conditions required for proper testing, adjusting, and balancing.

.5 Report any deficiencies or defects which may affect the balancing or noted during testing, adjusting, and balancing, which cannot be promptly corrected.

Part 2 Execution

2.1 PREPARATION

.1 Prepare each system and item of equipment for testing, adjusting, and balancing.

.2 Verify that each system and equipment installation is complete and in functional operation.

.3 Verify appropriate ambient conditions.

2.2 TESTING

.1 Tests will be conducted to confirm compliance with requirements of Contract Documents. Take corrective action as necessary.

2.3 ADJUSTING

.1 Adjust operating Products and equipment to ensure smooth and unhindered operation.

.2 Provide equipment required to ensure proper, efficient, and safe operation of all equipment including belts and sheaves.

2.4 BALANCING

.1 Cooperate with and assist the balancing agent to ensure that the various parts of system are in a proper state of equilibrium.

END OF SECTION

CLOSEOUT SUBMITTALS, SECTION 01 78 10

Part 1 General

1.1 SECTION INCLUDES

.1 Inspections and declarations.

.2 Closeout submittals

.3 Operation and maintenance manual format.

.4 Recording actual site conditions.

.5 Record documents.

.6 Warranties and bonds.

1.2 INSPECTIONS AND DECLARATIONS

.1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Consultant and Owner in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Consultant's Inspection.

.2 Consultant's Inspection: Consultant, Owner, and Contractor will perform inspection of Work to identify defects or deficiencies. Correct defective and deficient 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 are fully operational.

.4 Certificates required by authorities having jurisdiction have been submitted.

.5 Operation of systems have been demonstrated to Owner's personnel.

.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 Owner and Consultant. If Work is deemed incomplete by the Owner or Consultant, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when the Owner and Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Substantial Performance of the Work.

.6 Commencement of Warranty Periods: the date of Substantial Performance of the Work shall be the date for commencement of the warranty period.

.7 Commencement of Lien Periods: the date of publication of the certificate of Substantial Performance of the Work shall be the date for commencement of the lien period, unless required otherwise by the lien legislation applicable at the Place of the Work.

.8 Final Payment: When both the Owner and Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been completed, make application for final payment.

.9 Payment of Hold-back: After issuance of certificate of Substantial Performance of the Work, submit an application for payment of hold-back amount.

.10 Collect reviewed submittals and assemble documents executed by Subcontractors, Suppliers and Manufacturers.

.11 Submit material prior to application for Certificate of Substantial Completion. For equipment put into use with Owner's permission during construction, submit within ten (10) days after start-up. For items of Work delayed materially beyond date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.

.12 Execute transition of Performance and Labour and Materials Payment Bond to warranty period requirements.

.13 Submit a final statement of accounting giving total adjusted Contract Sum, previous payments and monies remaining due.

.14 Consultant will issue a final change order reflecting approved adjustments to Contract Sum not previously made.

1.3 CLOSEOUT SUBMITTALS

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned after final inspection with Consultant's comments.

.3 Revise content of documents as required prior to final submittal.

.4 Two (2) weeks prior to Substantial Performance of the Work, submit to the Consultant, two (2) final copies of operating and maintenance manuals in Canadian English.

.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged and free from defects, and of same quality and manufacture as products provided in Work.

.6 If requested, furnish evidence as to type, source and quality of products provided.

.7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.8 Pay costs of transportation.

1.4 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings, and within the Project Manual, provided by Consultant.

.2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.

.3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.

.4 Contract Drawings and Shop Drawings: legibly mark each item to record actual construction, including:

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

.5 Specifications: legibly mark each item to record actual construction, including:

- .1 Manufacturer, trade name, and catalogue number of each product installed, particularly optional items and substitute items.
- .2 Changes made by Addenda and change orders.

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

1.5 WARRANTIES AND BONDS

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by Subcontractors, Suppliers, and manufacturers, within ten (10) days after completion of the applicable item of work.

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

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittals.

1.6 FINAL CLEANING

.1 When the Work is Substantially Completed, remove surplus Products, tools, construction machinery and equipment not required for the performance of the remaining Work.

.2 Remove waste products and debris and leave the Work clean and suitable for occupancy by Owner.

.3 When the Work is totally completed, remove all surplus products, tools, construction machinery, equipment, waste products and debris.

.4 Leave all workplaces clean before the final inspection process commences.

.5 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.6 Sweep and wash clean manholes, access vaults/chambers, site paved areas, sidewalks, etc. Remove clay/mud/debris from gravel areas.

1.7 REMOVAL OF TEMPORARY FACILITIES

.1 Prior to application for Certificate of Substantial Completion, remove all temporary offices and furniture, hoardings, fencing, tree and plant protection and all other items used to aid the performance of the Work. Make good surfaces and features to original condition or better.

1.1 PROJECT COMMISSIONING

.1 Expedite and complete deficiencies and defects identified by the Engineer.

.2 Review cash and contingency allowances in relation to contract prices, change orders, retainages, holdbacks and other contract price adjustments.

.3 Submit required documentation such as statutory declarations, Workers' Compensation Certificates, warranties, certificates of approval or acceptance from regulating bodies.

.4 Review inspection and testing reports to verify conformance to the intent of the documents and that changes, repairs or replacements have been completed.

.5 When the Owner requires partial use of uncompleted project, coordinate Owner's uses, requirements, and access with Contractor's requirements to complete the Project.

.6 Coordinate Owner's initiating use of system with Contractor's and Subcontractor's cleaning-up and completion activities all to suit Owner's work schedule and not disrupt Owner's productivity.

.7 Provide specified camera inspections for all newly installed sanitary and storm sewers. Submit all reports and obtain approval prior to paving.

1.2 INSPECTION/TAKEOVER PROCEDURES

.1 Prior to application for Certificate of Substantial Completion, carefully inspect the Work and ensure it is complete, that major and minor construction deficiencies are complete and/or corrected and the facilities are clean and in condition for occupancy. Notify the Engineer in writing, of satisfactory completion of the Work and request an inspection.

.2 During the Substantial Completion inspection, a list of deficiencies and defects will be tabulated.

When the Engineer considers deficiencies and defects have been corrected and it appears all requirements of the Contract have been performed, make application for Certificate of Total Completion. Refer to General Conditions for specifics to application.

END OF SECTION

MAINTENANCE REQUIREMENTS, SECTION 01 78 40

Part 1 General

1.1 SECTION INCLUDES

.1 Equipment and systems.

.2 Materials and finishes.

.3 Spare parts.

.4 Maintenance manuals.

.5 Special tools.

.6 Storage, handling, and protection.

1.2 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

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

.3 Include installed colour coded wiring diagrams.

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

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

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

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

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.

.15 Additional requirements: As specified in individual divisional specification sections.

Part 2 Products

2.1 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

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

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

.4 Building Envelope: include copies of drawings of building envelope components, illustrating the interface with similar or dissimilar items to provide an effective air, vapour and thermal barrier between indoor and outdoor environments. Include an outline of requirements for regular inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.

.5 Additional Requirements: as specified in individual specifications sections.

2.2 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

.4 Obtain receipt for delivered products and submit prior to final payment.

2.3 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Obtain receipt for delivered products and submit prior to final payment.

.4 Receive and catalogue all items. Submit inventory listing to the Consultant. Include approved listings in Maintenance Manual.

2.4 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

Part 3 Execution

3.1 DELIVER TO SITE

.1 Deliver to site location as directed; place and store.

3.2 STORAGE, HANDLING AND PROTECTION

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

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

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

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

.5 Remove and replace damaged products at own expense and to satisfaction of Consultant.

END OF SECTION

DEMONSTRATION AND TRAINING, SECTION 01 79 00

Part 1 General

1.1 SECTION INCLUDES

.1 Procedures for demonstration, training and instruction of Products, equipment and systems to Owner's personnel.

.2 Seminars and demonstrations.

1.2 DESCRIPTION

.1 Demonstrate operation and maintenance of equipment, valves, pumps and all vital process components and related appurtenances.

.2 Owner will provide list of personnel to receive instructions and will coordinate their attendance at agreed-upon times.

1.3 COMPONENT DEMONSTRATION & TRAINING

.1 Manufacturer to provide authorized representative to demonstrate operation of equipment and systems.

.2 Manufacturer to provide training to operations staff and evaluate their understanding.

.3 Instruct Owner's personnel and provide written report that demonstration and instructions have been completed.

1.4 SUBMITTALS

.1 Submit schedule of time and date for demonstration of each item of equipment and each system two (2) weeks prior to designated dates, for Consultant's approval.

.2 Submit reports within one (1) week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

1.5 CONDITIONS FOR DEMONSTRATIONS

.1 Testing and adjusting have been performed in accordance with Section 01 75 19 – Testing, Adjusting, and Balancing, and equipment and systems are fully operational.

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 PREPARATION

.1 Verify that suitable conditions for demonstration and instructions are available.

.2 Verify that designated personnel are present.

.3 Prepare agendas and outlines.

.4 Explain component design and operational philosophy and strategy.

.5 Develop equipment presentations.

.6 Present system demonstrations.

.7 Accept and respond to demonstration questions with appropriate answers.

3.2 PREPARATION OF AGENDAS AND OUTLINES

.1 Prepare agendas and outlines including the following:

.1 Equipment and systems to be included in demonstration.
.2 Name of companies and representatives presenting at demonstration.
.3 Time and date of demonstration.
.4 Prepare separate agenda for each demonstration is there is more than one.

3.3 EXPLANATION OF DESIGN STRATEGY

.1 Explain design philosophy of each system. Include following information:

.1 An overview of how system is intended to operate.
.2 Description of design parameters, constraints and operational requirements.
.3 Description of system operation strategies.
.4 Information to help in identifying and troubleshooting system problems.

3.4 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment.

.2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

.3 Instruct personnel on control and maintenance of sensory equipment and operational equipment associated with maintaining energy efficiency and longevity of service.

.4 Review contents of manual in detail to explain all aspects of operation and maintenance.

.5 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

END OF SECTION

COMMISSIONING, SECTION 01 91 00

Part 1 - General

1.1 SECTION INCLUDES

.1 Commissioning, testing and documentation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 70 00 - Examination and Preparation.

.3 Section 25 30 00 – Instruments and Control Elements

.4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 DEFINITIONS

.1 Commissioning: The process for achieving, verifying, and documenting that the facility and its systems are planned, designed, installed, and tested to ensure that they meet the original project requirements established by the Owner.

.2 Commissioning Team:

.1 Owner's Representative: Representative of the Owner, as defined in the Agreement.

.2 Consultant: Consultant, as defined in the Agreement.

.3 Contractor: General Contractor, as defined in the Agreement.

.1 Operating Authority (The Town of Iroquois Falls):

.1 Operates facilities during SAT.

.2 The water operations staff will operate equipment.

.1 Contractor:

.2 Oversees the test planning and test plan execution of the Process Control System, Electrical, Mechanical, Pumps, UV, vavles equipment, and all other components that require commissioning defined in the contract.

.3 Coordinates all required manufacturers representatives for specific equipment during commissioning.

.4 Meets requirements of Section 21 05 02 – Mechanical Commissioning, Section 25 30 00 - Instruments and Control Elements for commissioning and 26 08 00 00 – Electrical Systems Commissioning.

.5 Obtains prior approval of the test plan and schedule from the Owner and Consultant.

.6 Reviews and approves test cases/scripts.

.7 Reviews test result reports/statistics and defect reports.

.8 Reviews classification of defect severity and makes necessary adjustments.

.9 Maintains Action Log.

.10 Presents change order requests for prioritization.

.11 Schedules approved change order request work.

.12 Maintains change order request Log.

.3 Contractor Representatives: Representatives of the Contractor, including any sub-contractors whose scope of work includes items requiring commissioning. Contractor responsible for coordinating between all parties for commissioning.

.4 Commissioning Documents:

.1 Commissioning Plan: A project-specific document which defines the scope and approach to commissioning of this facility.

.2 Submittal: Contract submittal, as specified in Contract Documents.

.3 Static check certificate: A document used to verify equipment data installed, prior to start-up or operation.

.4 Operating check certificate. A document used to verify equipment operation, including performance statistics.

.5 Start-up Reports: Report prepared by equipment start-up personnel, including start-up sequence, and performance statistics.

.6 Balancing Report: Report prepared by the balancing agency, indicating initial and final system performance.

.7 Maintenance Manual: A document containing detailed descriptions and technical information about start-up, operation and maintenance of equipment, to Section 01 78 40.

1.4 METHODOLOGY

.1 The Contractor shall develop a Commissioning Plan, including as a minimum the management of commissioning meetings, and the management of project-specific commissioning documents.

.2 Commissioning Plan to include:

.1 Assembly of owner's requirements, including design criteria, performance goals, budgets, and schedules.

.2 Scheduling and chairing of commissioning meetings between team members.

.3 Development of static and operating check certificates for individual equipment.

.4 Assembly of commissioning reports, including testing and balancing reports, maintenance manuals, start-up reports, and testing reports.

.5 Verification of data by testing agency.

.6 Audit procedure, to be performed in the event of dispute or failure.

.3 Execute the commissioning plan.

1.5 REGULATORY REQUIREMENTS

.1 Arrange for regulatory authorities to witness those commissioning start up procedures which are also required by regulatory authorities.

.2 Obtain certificates of approval and for compliance with regulations from Authorities Having Jurisdiction; include copies of certificates with start up reports.

1.6 **CONTRACT COMMISSIONING REQUIREMENTS**

.1 Witnessing: Allow commissioning team members to witness starting, testing, adjusting, and balancing procedures.

.2 Costs: Contractor to Pay costs associated with starting, testing, adjusting, and relevant instruments and supplies required to perform those duties.

.3 Employ experienced personnel for equipment start-up and commissioning, who are able to interpret results of readings and tests, and report the system status in a clear and concise manner.

.4 Provide all equipment required to perform testing, balancing, and commissioning of systems. Calibrate instruments used in start up as accurate; provide calibration certificates if requested by the Owner or Consultant

.5 Utilize equipment check certificates and other commissioning documents required by the Contract.

.6 Verify that equipment is installed in accordance with Contract Documents, and reviewed shop drawings. Sign and date static check certificates.

.7 Do not start up equipment unless static check sheets have been completed and submitted.

.8 Complete in detail, and sign operating check certificates.

Part 2 - Products

2.1 **NOT USED**

.1 Not Used.

Part 3 - Execution

3.1 **COMMISSION TESTING**

.1 Commission testing will include a random testing and evaluation process as determined by the Owner.

.2 System and device checks to be suitably logged, tabulated, signed, and incorporated into project Operating and Maintenance Manuals:

.1 Prior to start of testing, provide two (2) complete sets of up-to-date contract drawings and specifications including addenda to the Consultant.

.2 Provide one (1) copy of each approved notice of change and clarification.

.3 Coordinate site visits by the Consultant and the affected parties during warranty periods.

.3 The commissioning process will not:

.1 Preclude the duties and responsibilities described in the Contract Documents nor the requirements and obligations of the Contract.

.2 Circumvent any required warranties.

.3 Relieve the Contractor from warranty requirements, responsibilities, or obligations.

.4 Prior to commission testing, perform the following and provide copies to the Consultant, of component and assembly Contract Document compliance:

.1 Static test certificates.

.2 Equipment operating certificates.

.3 Three (3) copies of valve tag list.

.4 Inspection certificates from authorities having jurisdiction.

.5 Required copies of shop drawings.

.6 Manufacturer's operating and maintenance brochures of all major equipment.

.5 Ensure all systems have been started, adjusted to design criteria, and are functionally operational, ready for independent testing.

.6 Cooperate with the Consultant and Operating Authority in advance of activating operating systems.

.7 Test results that reveal failure to conform to the Contract Documents, will result in the Contractot arranging and paying to correct the Work at the Owner's discretion.

END OF SECTION

CONCRETE FORMING, SECTION 03 11 00

Part 1 General

1.1 SECTION INCLUDES

.1 Formwork for cast-in-place concrete, with shoring, bracing and anchorage.

.2 Openings in forms for other work.

.3 Form accessories.

.4 Form stripping.

1.2 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete: Supply of concrete accessories for placement by this section.

1.3 REFERENCES

.1 ACI 301-16 - Specifications for Structural Concrete for Buildings.

.2 ASME A17.1-2019/CSA-B44-19 - Handbook on Safety Code for Elevators and Escalators.

.3 CSA-S269.1-16(R2021) - Falsework and formwork.

.4 CAN/CSA-S269.2-16(R2021) - Access scaffolding for construction purposes.

.5 CSA-A23.1-19/A23.2-19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.6 CSA-O121-17 - Douglas Fir Plywood.

.7 CSA-O151-17(R2022) - Canadian Softwood Plywood.

.8 CSA-O15319 - Poplar Plywood.

.9 CSA-O437 Series-93 (R2011) - Standards on OSB and Waferboard.

.10 COFI (Council of Forest Industries of British Columbia) - Exterior Plywood for Concrete Formwork.

1.4 DESIGN REQUIREMENTS

.1 Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension as indicated on the plans.

.2 Conform to CSA-S269.1.

1.5 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Product Data: Provide data on void form materials and installation requirements.

1.6 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

.2 Installation Data: Manufacturer's special installation requirements.

.3 Shop Drawings:

.1 Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

.2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts.

.3 Comply with CSA-S269.1, for falsework Drawings and CAN/CSA-S269.3 for form work Drawings.

.4 Provide Shop Drawings stamped and signed by a Professional Engineer registered or licensed in the Province of Ontario, Canada.

1.7 QUALITY ASSURANCE

.1 Perform Work in accordance with CAN/CSA-S269.3.

.2 Formwork is to be reviewed by the site inspector prior to any placement of concrete.

1.8 REGULATORY REQUIREMENTS

.1 Conform to applicable code for design, fabrication, erection and removal of formwork.

1.9 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Deliver void forms and installation instructions in manufacturer's packaging.

.3 Store off ground in ventilated and protected manner to prevent deterioration from moisture.

Part 2 Products

2.1 WOOD FORM MATERIALS

.1 The Contractor shall have the option to select formwork materials, unless noted otherwise, however the site inspector may reject unsuitable materials.

.2 Softwood Plywood: CSA-O151, C Grade or better.

.3 Plywood: CSA-O121, Douglas Fir, COFI Exterior Plywood for Concrete Formwork CSA-O153, Poplar species; good one side grade; sound undamaged sheets with clean, true edges.

~~.4 Particle Board: CSA-O437 Series, Waferboard, OSB.~~

2.2 PREFABRICATED FORMS

.1 Preformed Steel Forms: Minimum 16 gauge matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

.2 Preformed Plastic Forms: Thermoplastic polystyrene, Thermosetting Filled, polyurethane elastomer, Polyurethane elastomer or Thermoplastic form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

.3 Glass Fibre Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.3 FORMWORK ACCESSORIES

.1 Form Release Agent:

.1 Colourless mineral oil which will not stain concrete or absorb moisture or impair natural bonding or colour characteristics of coating intended for use on concrete.

.2 Non-toxic, low VOC.

.2 Form Stripping Agent: Colourless mineral oil, non-toxic, low VOC and free of kerosene, with viscosity between 15 to 24 sq mm/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.

.3 Corners: Filleted, wood strip size; maximum possible lengths.

.4 Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 70 00 Examination and Preparation: Verify existing conditions before starting work.

.2 Verify lines, levels and centres before proceeding with formwork.

.3 Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

.1 Earth forms are not permitted.

3.3 ERECTION - FORMWORK

.1 Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of CAN/CSA-S269.1.

.2 Fabricate and erect false work in accordance with CSA-S269.1.

.3 Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

.4 Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

.5 Align joints and make watertight. Keep form joints to a minimum.

.6 Obtain approval before framing openings in structural members which are not indicated on Drawings.

.7 Provide fillet strips on external corners of columns.

.8 Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

.9 Coordinate this section with other sections of work which require attachment of components to formwork.

.10 If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Consultant.

3.4 APPLICATION - FORM RELEASE AGENT

.1 Apply form release agent on formwork in accordance with manufacturer's recommendations.

.2 Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

.3 Do not apply form release agent where concrete surfaces will receive applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

.1 Provide formed openings where required for items to be embedded in passing through concrete work.

.2 Locate and set in place items which will be cast directly into concrete.

.3 Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

.4 Install accessories in accordance with manufacturer's written instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

.5 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

.6 Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

.1 Clean forms as erection proceeds, to remove foreign matter within forms.

.2 Clean formed cavities of debris prior to placing concrete.

.3 Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.7 FORMWORK TOLERANCES

.1 Construct formwork to maintain tolerances in accordance with CSA-A23.1.

3.8 FIELD QUALITY CONTROL

.1 Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

.2 Do not reuse wood formwork more than three (3) times for concrete surfaces to be exposed to view. Do not patch formwork.

3.9 FORM REMOVAL

.1 Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

.2 Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

.3 Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION

CONCRETE REINFORCING, SECTION 03 20 00

Part 1 General

1.1 SECTION INCLUDES

.1 Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.2 RELATED SECTIONS

.1 Section 03 11 00 - Concrete Forming.

.2 Section 03 30 00 - Cast-in-place Concrete.

.3 Section 03 35 10 - Concrete Floor Finishing: Reinforcement for concrete floor toppings.

1.3 REFERENCES

.1 ASTM A1064/A1064M- Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

.2 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A184/A184M-19 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.

.4 ASTM A1064/A1064M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.5 ASTM A416/A416M-18 - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.

.6 ASTM A1064/A1064M - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.

.7 ASTM A1064/A1064M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

.8 ASTM A704/A704M-19e1 - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.

.9 ASTM A775/A775M-22 - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

.10 ASTM D3963/D3963M-21 - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.

.11 CSA-A23.1-19/A23.2-19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.12 CAN/CSA-A23.3-19 - Design of Concrete Structures.

.13 CSA-G30.18-21 - Carbon Steel Bars for Concrete Reinforcement.

.14 CSA-G40.20-13/G40.21-13 (R2018) - General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel.

.15 CAN/CSA-S806-12 (R2021) - Design and Construction of Building Components with Fibre-Reinforced Polymers.

.16 CSA-W186-21 - Welding of Reinforcing Bars in Reinforced Concrete Construction.

.17 RSIC (Reinforcing Steel Institute of Canada) – Manual of Standard Practice (2004).

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Procedures for submittals.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Procedures for submittals.

.2 Test Reports: Submit certified copies of mill test report of reinforcement materials analysis.

.3 Shop Drawings: Indicate bar sizes, spacing, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, supporting and spacing devices complete with Engineer's seal and signature.

1.6 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Perform Work in accordance with CSA-A23.1/A23.2. Maintain one (1) copy of each document on site.

.3 Provide Consultant with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.

.4 Design reinforcement under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located.

Part 2 Products

2.1 REINFORCEMENT

.1 Reinforcing Steel, Deformed: CAN/CSA-G30.18, billet steel, Grade 400R, regular bars, unfinished.

.2 Reinforcing Steel Mat, Plain: ASTM A704/A704M, 420 MPa yield grade; plain steel bars or rods.

2.2 ACCESSORIES

.1 Tie Wire: The tie wire shall be annealed ferrous wire 2.6 mm in diameter and shall be coated when used with coated reinforcing steel bar.

.2 Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapour barrier puncture.

.3 Embedded hardware, except for tie wire, within 50 mm of exposed faces shall be coated with an acceptable material or be of an acceptable non-metallic material

2.3 FABRICATION

.1 Fabricate concrete reinforcing in accordance with:

.1 CSA-A23.1/A23.2.

.2 RSIC - Reinforcing Steel Manual of Standard Practice.

.2 Weld reinforcement in accordance with CSA-W186.

.3 Locate reinforcing splices not indicated on drawings, at point of minimum stress. Review location of splices with Consultant.

Part 3 Execution

3.1 PLACEMENT

.1 Place, support and secure reinforcement against displacement to CSA-A23.1 and as indicated on reviewed placing Drawings.

.2 Do not displace or damage vapour barrier.

.3 Accommodate placement of formed openings.

.4 Maintain minimum concrete cover around reinforcing as follows (unless specified otherwise on drawings):

.1 Beams 60 mm.

.2 Supported Slabs and Joists 60 mm.

.3 Column Ties 60 mm.

.4 Walls (exposed to weather, sewage, or backfill) 75 mm.

.5 Footings and Concrete Formed Against Earth 75 mm.

.6 Slabs on Fill 75 mm.

.5 Conform to applicable code for concrete cover over reinforcement.

.6 Bond and ground all reinforcement to requirements as per Ontario Electrical Authority.

3.2 FIELD QUALITY CONTROL

.1 Section 01 45 00: Inspection.

.2 Inspect for acceptability and conformance to the contract drawings.

3.3 SCHEDULES

.1 Reinforcement for Foundation Wall Framing Members and Slab-on-Grade: Deformed bars and wire fabric, galvanized finish.

END OF SECTION

CAST-IN-PLACE CONCRETE, SECTION 03 30 00

Part 1 General

1.1 SECTION INCLUDES

.1 Cast-in-place for foundations, floor slabs, equipment pads and pipe supports.

1.2 RELATED SECTIONS

.1 Section 03 11 00 - Concrete Forming: Formwork and accessories.

.2 Section 03 35 10 - Concrete Floor Finishing: Reinforcement for concrete floor toppings.

.3 Section 03 39 00 - Concrete Curing.

1.3 REFERENCES

.1 ACI 305R-10 - Guide to Hot Weather Concreting.

.2 ACI 306R-10 - Guide to Cold Weather Concreting.

.3 ASTM A820/A820M-22 - Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.

.4 ASTM B221-21 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.5 ASTM B221M-21 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.6 ASTM C260/C260M-10a (2016) - Standard Specification for Air-Entraining Admixtures for Concrete.

.7 ASTM C330/C330M-17a - Standard Specification for Lightweight Aggregates for Structural Concrete.

.8 ASTM C494/C494M-19e1 - Standard Specification for Chemical Admixtures for Concrete.

.9 ASTM D412-16(2021) - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.

.10 ASTM D624-00(2020) - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

.11 ASTM D994/D994M-11(2022) - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

.12 ASTM D1751-18 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

.13 ASTM D1752-18 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.14 CSA-A23.1-19/A23.2-19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.15 CSA-A3000-18 - Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.16 CAN/CSA-S269.1-16(R2021) - Falsework and formwork.

.17 CAN/CSA-S474-04 (R2019) - Concrete Structures.

.18 CAN/CSA-A23.3-19 - Design of Concrete Structures.

.19 CSA-S269.2-16(R2021) - Falsework for Construction Purposes.

.20 CSA-S413-21 - Parking Structures.

.21 CSA-W59-18 - Welded Steel Construction (Metal-Arc Welding).

.22 CSA-W186-21 - Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

.2 Test Data: Minimum four (4) weeks prior to starting concrete work, Contractor to pay and submit manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:

.1 Portland cement.

.2 Blended hydraulic cement.

.3 Supplementary cementing materials.

.4 Grout.

.5 Admixtures.

.6 Aggregates.

.7 Water.

.3 Certification: Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes and will comply with CSA-A23.1/A23.2.

.4 Certification: Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1/A23.2.

.5 Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submission procedures.

.2 Record Documentation: Accurately record actual locations of embedded utilities and components.

1.7 QUALITY ASSURANCE

.1 Perform Work in accordance with CSA-A23.1/A23.2.

Part 2 Products

2.1 CONCRETE MATERIALS

.1 Cement: CSA-A3001, Type GU; Grey colour.

.2 Blended Hydraulic Cement: CSA-A3001, Type GU; Grey colour.

.3 Water: CSA-A23.1, clean and not detrimental to concrete.

.4 Grout: (Non-shrink) ASTM C1107/1107M-20, Ontario DSM List No. 9.15.35

2.2 CONCRETE MIX

.1 Mix and deliver normal density concrete in accordance with CSA-A23.1, Alternative 1, to the following criteria:

.1 Cement Type: Hydraulic.

.2 Compressive Strength (28 day): 35 MPa.

.2 Use accelerating admixtures in cold weather only when approved by Consultant. Use of admixtures will not relax cold weather placement requirements.

.3 Use calcium chloride only when approved by Consultant.

.4 Use set retarding admixtures during hot weather only when approved by Consultant.

.5 Add air entraining agent to normal weight concrete mix for work exposed to exterior.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 70 00 Examination and Preparation: Verify existing conditions before starting work.

.2 Verify all dimensions and locations required on drawings.

.3 Verify requirements for concrete cover over reinforcement.

.4 Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not impede concrete placement.

.5 Verify locations of all openings and embedments required for other mechanical electrical and architectural work.

3.2 PREPARATION

.1 Prepare previously placed concrete by mechanical roughening and applying bonding agent to manufacturer's written instructions.

.2 In locations where new concrete is dowelled to existing work, drill holes in existing concrete 5 mm larger than dowel. Install adhesive anchors and let set to manufacturer's specifications.

.3 Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

3.3 PLACING CONCRETE

.1 Place concrete in accordance with CSA-A23.1.

.2 Notify Consultant minimum 72 hours prior to commencement of operations.

.3 Ensure reinforcement, embedded parts are not disturbed during concrete placement.

.4 Water Stops.

.1 Install water stops to provide continuous watertight seal.

.2 Do not distort or pierce water stop in such a way as to hamper performance.

.3 Do not displace reinforcement when installing water stops.

.4 Use equipment to manufacturer's requirements to field splice water stops.

.5 Tie water stops rigidly in place.

.6 Use only straight heat-sealed butt joints in field.

.7 Use factory welded corners and intersections.

.5 Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

.6 Do not interrupt successive placement; do not permit cold joints to occur.

3.4 CURING AND PROTECTION

.1 Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical damage.

.2 Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

.3 Cure concrete surfaces to requirements of Section 03 39 00.

.4 Cure surfaces in accordance with CSA-A23.1.

.5 Ponding: Maintain 100 percent coverage of water over slab areas continuously for four (4) days.

.6 Spraying: Spray water over slab areas and maintain wet cure for seven (7) days.

3.5 FIELD QUALITY CONTROL

.1 Section 01 45 00: Quality Control

.2 Provide free access to Work and cooperate with appointed firm.

.3 Contractor to submit proposed mix design of each class of concrete to inspection firm for review prior to commencement of Work.

.4 Tests of cement and aggregates may be performed to ensure conformance with specified requirements, using a third party and bare costs.

.5 Contractor is to be responsible for completing Four (4) concrete test cylinders will be taken and tested for every 75 cubic meter or less, of each class of concrete placed. Contractor to provide test results to Owner and consultant for a 7-day, 14 day and 28-day breaks.

.1 Minimum one (1) test per day.

.2 One (1) test per type of component.

.6 One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

.7 Contractor to perform one slump or flow test and one air test will be taken for each set of test cylinders and witnessed by owner and/or consultant.

3.6 PATCHING

.1 Allow Consultant to inspect concrete surfaces immediately upon removal of forms.

.2 Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Consultant upon discovery.

.3 Patch imperfections in accordance with CSA-A23.1.

3.7 DEFECTIVE CONCRETE

.1 Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

.2 Repair or replacement of defective concrete will be determined by the Consultant.

.3 Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Consultant for each individual area.

END OF SECTION

CONCRETE CURING, SECTION 03 39 00

Part 1 General

1.1 SECTION INCLUDES

.1 Initial and final curing of horizontal and vertical concrete surfaces.

1.2 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-place Concrete.

1.3 REFERENCES

.1 AASHTO M182-05 (2021) - Standard Specification for Burlap Cloth made from Jute or Kenaf and Cotton Mats.

.2 ASTM C171-20 - Standard Specification for Sheet Materials for Curing Concrete.

.3 ASTM C309-19 - Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.

.4 CSA-A23.1-19/A23.2-19 - Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Product Data:

.1 Mats: Name of manufacturer, test results (AASHTO M182)

.2 Sheet materials: Name of manufacturer, type of material, batch number, film thickness, roll number, test results (ASTM C 171)

.3 Curing compound: Trade name, name of manufacturer and supplier, test certificate, MSDS.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

.2 Sustainable Design:

.1 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submission procedures.

1.7 QUALITY ASSURANCE

.1 Perform Work in accordance with CSA-A23.1/A23.2.

1.8 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Deliver curing materials in manufacturer's packaging including application instructions.

Part 2 Products

2.1 MATERIALS

.1 Liquid Membrane Curing Compound: ASTM C309, Type 2, white pigmented; Class B.

.2 Sheet Materials: ASTM C171:

.1 Polyethylene Film: Minimum 4 mil thick, clear.

.3 Burlap: AASHTO M182, Class 4.

.4 Water: Potable, not detrimental to concrete.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 70 00 Examination and Preparation: Verify existing conditions before starting work.

.2 Verify that substrate surfaces are ready to be cured.

3.2 EXECUTION

.1 Cure surfaces in accordance with CSA-A23.1/A23.2.

.2 Absorptive Mat: Spread over floor slab areas. Spray with water until mats are saturated and maintain in saturated condition for seven (7) days.

.3 Membrane Curing Compound: Apply curing compound in accordance with manufacturer's written instructions in two (2) coats, with second coat applied at right angles to first coat.

.4 Polyethylene Film: Spread over floor slab areas, lap edges and sides, seal with pressure sensitive tape; maintain in place for seven (7) days.

END OF SECTION

ALUMINUM RAILINGS, SECTION 05 52 00

Part 1 General

1.1 SECTION INCLUDES

.1 Handrails, balusters, and fittings.

1.2 REFERENCES

.1 AAMA 611-20 – Voluntary Specification for Anodized Architectural Aluminum

.2 ASTM B177/B177M-11(2021)- Standard Guide for Engineering Chromium Electroplating.

.3 ASTM B211/B211M-19- Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

.4 ASTM B221-21 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.5 ASTM B221M-21 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.6 ASTM B241/B241M-22 - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

.7 ASTM B483/B483M-21 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Tube and Pipe for General Purpose Applications.

.8 CAN/CGSB 1.181-99 - Ready-Mixed Organic Zinc-Rich Coating.

.9 CSA-W59.2-18 - Welded Aluminum Construction.

1.3 PERFORMANCE REQUIREMENTS

.1 Railing assembly, wall rails, and attachments to resist lateral force set out in the Ontario Building Code without damage or permanent set.

.2 Fabricate railing assembly, wall rails, and attachments to applicable code requirements.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submission procedures.

.2 Sustainable Design Closeout Documentation: 01 78 10

1.7 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Perform welding to CSA-W59.2.

Part 2 Products

2.1 ALUMINUM RAILING SYSTEM

.1 Contractor to re-use existing railing. If existing railing is not adequate, provide as per below.

.2 Rails: ASTM B241/B241M and ASTM B221M, ASTM B221, extruded tubing, alloy and temper; size 1-5/8 inch diameter.

.3 Posts: ASTM B241/B241M and ASTM B221M, ASTM B221, extruded tubing, aluminum alloy and temper; size 1-5/8 inch diameter.

.4 Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined aluminum.

.5 Mounting: Brackets and flanges, with aluminum brackets for embedding into masonry and with aluminum inserts for casting in concrete.

.6 Splice Connectors: As required, Welding collars; machined aluminum.

.7 Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

2.2 FABRICATION

.1 Fit and shop assemble components in largest practical sizes for delivery to site.

.2 Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

.3 Provide anchors, plates required for connecting railings to structure.

.4 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

.5 Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

.6 Interior Components: Continuously seal joined pieces by continuous welds.

.7 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

.8 Accurately form components to suit stairs and landings to each other and to building structure.

.9 Accommodate for expansion and contraction of members and building movement without damage to connections or members.

.10 Coordinate installation of handrail with other works, as required.

2.3 FINISHES

.1 Clear Anodic Coating: AAMA 611, Class I, AA-M12C22A41.

.1 Location: All Interior exposed aluminum surfaces.

2.4 EXAMINATION

.1 Section 01 70 00: Verify existing conditions before starting work.

.2 Verify that field conditions are acceptable and are ready to receive work.

2.5 PREPARATION

.1 Clean and strip aluminum where site welding is required.

2.6 INSTALLATION

.1 Install railings to manufacturer's instructions.

.2 Install components plumb and level, accurately fitted, free from distortion or defects.

.3 Anchor railings to structure with anchors, and plates.

.4 Field weld anchors. Grind welds smooth.

.5 Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

.6 Assemble with spigots and sleeves to accommodate tight joints and secure installation.

2.7 ERECTION TOLERANCES

.1 Section 01 73 00: Tolerances.

.2 Maximum Variation from Plumb: 6 mm per storey, non-cumulative.

.3 Maximum Offset from True Alignment: 6 mm.

.4 Maximum Out-of-Position: 6 mm.

2.8 SCHEDULES

.1 Aluminum pipe railings, as shown on the contract drawings.

END OF SECTION

GRATINGS, SECTION 05 53 00

Part 1 General

1.1 SECTION INCLUDES

.1 Formed floor gratings.

.2 Perimeter closure.

1.2 REFERENCES

.1 ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A510/A510M-20- Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.

.3 ASTM A653/A653M-23 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM A666-23 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar.

.5 ASTM A1011/A1011M-23 - Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength. Low-Alloy with Improved Formability, and Ultra-High Strength

.6 ASTM E84-23a - Standard Test Method for Surface Burning Characteristics of Building Materials.

.7 CAN/CGSB 1.40-97 - Anticorrosive Structural Steel Alkyd Primer.

.8 CAN/CGSB 1.181-99 - Ready-Mixed Organic Zinc-Rich Coating.

.9 CSA-W47.1-19 - Certification of Companies for Fusion Welding of Steel.

.10 CSA-W48-23 - Filler Metals and Allied Materials for Metal Arc Welding.

.11 CSA-W59-18 - Welded Steel Construction.

.12 NAAMM MBG 531-17 - Metal Bar Grating Manual.

.13 NAAMM MBG 532-19 - Heavy Duty Metal Bar Grating Manual.

.14 SSPC (The Society for Protective Coatings) - Steel Structures Painting Manual.

1.3 PERFORMANCE REQUIREMENTS

.1 Conform to applicable code for applicable loads.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Section 01 31 00: Coordination.

.2 Coordination:

.1 Coordinate with other work having a direct bearing on work of this section.

1.5 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Product Data: Provide span and deflection tables.

.3 Shop Drawings:

.1 Indicate details of ratings component supports, anchorage perimeter construction details, and tolerances.

.2 Indicate welded connections using standard welding symbols. Indicate net weld lengths.

.3 Shop drawing to be stamped by Professional Engineer in Ontario.

.4 Samples: Submit two (2) samples, 300 mm in size illustrating surface finish, colour, and texture.

1.6 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

.2 Installation Data: Manufacturer's special installation requirements, including perimeter framing.

1.7 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Closeout submission procedures.

1.8 QUALITY ASSURANCE

.1 Products of This Section: Manufactured to ISO 9000 certification requirements.

.2 Design gratings under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Ontario.

.3 Welders' Certificates: Submit to Section 01 33 00, certifying welders employed on the Work, verifying qualification within the previous 12 months to CSA-W47.1 (steel).

Part 2 Products

2.1 MATERIALS

.1 Sheet Steel: ASTM A653/A653M.

.2 Formed Steel for Welding:

.1 Bearing, connecting and cross bars to ASTM A1011, of rectangular shape.

.2 Round cross bars: ASTM A510M.

.3 Stainless Steel: ASTM A666.

.4 Welding Materials: Type required for materials being welded.

.5 Touch-Up Primer for Galvanized Surfaces: SPCC-Paint 20, Type I Inorganic, zinc rich.

2.2 ACCESSORIES

.1 Fasteners: Galvanized steel.

.2 Perimeter Closure: Of same material as grating.

2.3 FABRICATION

.1 Grating Type: NAAMM MBG 531, welded type.

.2 Fabricate grates to sizes indicated.

.3 Bolt joints of intersecting metal sections.

.4 Fabricate support framing for openings.

.5 Top Surface: Non-slip.

.6 Bearing Bar: 1 ¾ inch x 3/16 inch, size, spaced 2 inches, on centre.

.7 Cross Bar: Spaced 4 inches on centre.

.8 Removable Panels: With recessed handles.

2.4 FINISHES

.1 Prepare surfaces to be primed in accordance with SPCC SP 2.

.2 Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

.3 Galvanizing: ASTM A653/A653M to 275Z coating designation.

.4 Non-slip Surfacing: Aluminum oxide.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 70 00: Verify existing conditions before starting work.

.2 Verify that opening sizes and dimensional tolerances are acceptable.

.3 Verify that supports are correctly positioned.

3.2 INSTALLATION

.1 Install components to manufacturer's written instructions.

.2 Place frames in correct position, plumb and level.

.3 Mechanically cut galvanized finish surfaces. Do not flame cut.

.4 Anchor by bolting through saddle clips.

.5 Set perimeter closure flush with top of grating and surrounding construction.

.6 Secure to prevent movement.

3.3 ERECTION TOLERANCES

.1 Section 01 73 00: Tolerances.

.2 Conform to limits specified in NAAMM MBG 531.

.3 Maximum Space Between Adjacent Sections: 5 mm.

.4 Maximum Variation from Top Surface Plane of Adjacent Sections: 3 mm.

3.4 CLEANING

.1 Section 01 74 00: Cleaning installed work.

.2 Clean welds and damaged coatings and apply two (2) coats of touch-up galvanized coating.

END OF SECTION

ALUMINUM LADDER, SECTION 05 75 20

Part 1 General

1.1 SECTION INCLUDES

.1 Aluminum Ladder

1.2 REFERENCES

.1 ASTM B209/B209M-21a - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.2 ASTM B211/B211M-19- Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

.3 CAN/CSA-W47.2-19 - Certification of Companies for Fusion Welding of Aluminum.

.4 CAN/CSA-W48-23 - Filler Metals and Allied Materials for Metal Arc Welding.

.5 CAN/CSA W59.2-18 Welded Aluminum Construction

.6 CAN/CSA S157-17/S157.1-17 (R2022) - Strength Design in Aluminum.

1.3 SUBMITTALS FOR REVIEW

.1 Shop Drawings:

.1 Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

.2 Indicate materials, thicknesses, weld symbols, reinforcement, details and accessories.

.3 Manufacturer shall supply installation drawings and instructions.

.4 Shop drawings to be stamped by a professional engineer registered in the Province of Ontario.

1.4 SUBMITTALS FOR INFORMATION

.1 Installation Data: Manufacturer's special installation requirements.

.2 Submit shop drawings in accordance with contract documents.

.3 Indicate materials, thickness, weld symbols, reinforcement, details, and accessories.

.4 Manufacturer shall supply installation drawings and instructions.

1.5 QUALITY ASSURANCE

.1 Welding shall only be undertaken by a company Certified by the Canadian Welding Bureau to the requirements of CSA Standard W47.2, Certification of Companies for the Fusion Welding of Aluminum.

1.6 DELIVERY, STORAGE, AND PROTECTION

.1 Stack products to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

.2 Prevent contact with materials during storage which may cause discolouration, staining, or damage.

Part 2 Products

2.1 MATERIALS

.1 Aluminum Extruded Shapes: to CSA HA.5-M1980, Alloys 6061, 6063 or 6351- Temper 6.

.2 Fasteners shall be 304 stainless steel.

2.2 FABRICATION

.1 Fabricate square, true, and accurate to required size, with joints closely fitted. Remove all burrs and sharp edges.

.2 Ladder side rails shall be drilled through and rung inserted halfway. Ladder rungs shall be joined to the ladder side rail using GMAW method. Welds shall be ground and polished.

.3 Rung spacing shall be 300mm centre to centre.

.4 Attachment brackets shall be spaced at 1500mm maximum centre to centre.

.5 Aluminum shall be isolated from contact with the concrete with neoprene isolation pads.

.6 Ladders longer than 6.4m shall be joined with an external splice system.

2.3 ALUMINUM SAFTEY PLATFORMS

.1 Provide the appropriate ladders complete with all necessary attachment brackets to the dimensions on the Contract Drawings. Ensure all ladders are:

.1 Assembled using GMAW welding method,

.2 Supplied with 12 x 50mm flat bar side rails,

.3 Supplied with 19 x 22mm top fluted slip-resistant rungs,

.4 Supplied with brackets which are 12 x 50 bent flat bar welded to ladder side rail & offset from the wall face 150mm,

.5 Supplied with 16 x 150mm long 304ss wedge anchor assemblies as manufactured by Hilti, and

.6 MSU type FB.

Part 3 Execution

3.1 EXAMINATION

.1 Verify existing conditions before starting work.

.2 Verify that field conditions are acceptable and are ready to receive work.

.3 Verify dimensions, tolerances, and method of attachment with other work.

3.2 INSTALLATION

.1 Install items plumb and level, accurately fitted, free from distortion or defects.

.2 Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

.3 Obtain approval prior to site cutting or making non-scheduled adjustments.

3.3 ERECTION TOLERANCES

.1 Maximum Variation from Plumb: 6 mm per story, non-cumulative.

.2 Maximum Offset from True Alignment: 6 mm.

.3 Maximum Out-of-Position: 6 mm.

END OF SECTION

UV DISINFECTION EQUIPMENT, SECTION 11 53 00

Part 1 General

1.1 SECTION INCLUDES

1.2 RELATED SECTIONS

.1 03 30 00 – Cast In Place Concrete

.2 05 50 00 – Metal Fabrications

.3 20 05 01 Common Work Results for Mechanical

.4 20 05 02 Mechanical Commissioning

.5 26 05 00 – Common Work Results for Electrical

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Section 01 31 00: Project management and coordination procedures.

.2 Coordination:

.1 Coordinate with other work having a direct bearing on work of this section.

.2 Leave building openings of sufficient size to permit transport of equipment to final position.

.3 Pre-installation Meetings: Convene one (1) week before starting work of this section.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 Complete description in sufficient detail to permit an item comparison with the specification.

.3 Dimensions and installation requirements. Provide equipment dimensions and construction, equipment capacities, physical dimensions, utility and service requirements and locations

.4 Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances and clearances required.

.5 Descriptive information including catalogue cuts and manufacturers' specifications for major components.

.6 Electrical data, schematics and layouts.

.7 Hydraulic calculations demonstrating compliance with the required hydraulic characteristics.

.8 Independent bioassay validation and dosage calculations demonstrating compliance with the specified dose requirements.

.9 Disinfection performance guarantee

.10 Contractor to provide I/O list and rack layout for Instrumentation Design to the existing PLC.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

.2 Installation Data: Manufacturer's special installation requirements.

.3 Manufacturer's Certificate: Certify that equipment meets or exceeds MECP Guidelines.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submission procedures.

.2 Operation and Maintenance Data:

.1 Include description of equipment operation, adjusting, and testing required.

.2 Identify system maintenance requirements, servicing cycles, lubrication types required and spare part sources.

.3 Record Documentation: Record actual locations of concealed utility connections.

1.7 QUALITY ASSURANCE

.1 Certification requirements: The manufacturer of the UV system must meet ISO 9001 certification requirements.

.2 Provide documentation to demonstrate the manufacture’s previous experience with municipal UV disinfection systems in wastewater applications with variable output electronic ballasts.

.3 Provide documentation to demonstrate the manufacture is regularly engaged in the manufacture of UV systems with a proven track record of at least two hundred (200) operating installations of the proposed UV system.

1.8 REGULATORY REQUIREMENTS

.1 Conform to applicable code for UV Disinfection equipment.

.2 Conform to CSA requirements for fabrication and installation of UV Disinfection equipment.

.3 Provide certificate of compliance from authority having jurisdiction indicating approval of UV Disinfection equipment.

.4 Section 01 78 10: Closeout Submittals.

.5 Provide a five (5) year warranty to include coverage for failure to meet specified requirements.

Part 2 Products

2.1 MANUFACTURERS

.1 Product: The UV disinfection system shall be Trojan Model UV3000Plus.

.2 The UV disinfection system includes two (2) UV units, one duty and one standby, to provide 100% redundancy under peak flow condition.

.3 The physical layout of the system shown on the contract drawings and the equipment specified herein are based upon the specified equipment. If other equipment is proposed, the Contractor will demonstrate to the Engineer and the Owner that all requirements of materials, performance, and workmanship have been met or exceeded by the equipment proposed. Contractors proposing alternate manufacturers will be responsible for all costs associated with the substitution including, but not limited to, system evaluation and redesign including all electrical, mechanical, structural, hydraulic, process and civil aspects of the installation.

2.2 DESIGN CRITERA AND PERFORMANCE REQUIREMENTS

.1 Equipment shall be capable of disinfecting effluent with the following characteristics:

.1	Peak Flow:	14,280 m^3/day
.2	Total Suspended Solids:	30 mg/L (Maximum, grab sample)
.3	Effluent Temperature Range:	1 to 30°C
.4	Ultraviolet Transmittance @ 253.7 nm:	65%, minimum
.5	Design dose:	30 mJ/cm^2 (bioassay validated)
.6	Validation factors:	0.98 end of lamp life factor (Low-Pressure Amalgam Lamps) with a 0.95 fouling factor (ActiClean-WW Chemical / Mechanical Cleaning System).
.7	Effluent Standards to be Achieved:	150 E. Coli / 100ml, based on a 1 day Maximum. Grab samples will be taken in accordance with the Microbiology Sampling Techniques found in Standard Methods for the Examination of Water and Wastewater, 19th Effluent standards will be guaranteed regardless of influent count to UV system.

.2 System Configuration:

.1 The UV system configuration will be as follows:

.1	Number of Channels:	1
.2	Number of Banks per Channel:	2 (1 Duty, 1 Redundant)
.3	Number of UV Modules per Bank:	5
.4	Number of Lamps per UV Module:	8
.5	Total Number of Lamps in System:	80(Including 40 for redundancy)

.6	Maximum power draw:	20 kW – lamps only
.7	Number of System Controllers:	1
.8	Number of UV Detection Systems:	2
.9	Number of Power Distribution Centers:	2

.2 The system shall include the following equipment

.1 One (1) motorized weir gate as

.2 One (1) automatic chemical/mechanical cleaning system

.3 Two (2) Upstream Manual Isolation Gates

.4 Two (2) UV module lifting devices

.5 Support racks

.6 One (1) lot of UV Photometer Kit

.3 Performance Requirements:

.1 The ultraviolet disinfection system will produce an effluent conforming to the following discharge permit: 150 E.coli/100 ml, based on a 1 day Maximum. Grab samples will be taken in accordance with the Microbiology Sampling Techniques found in Standard Methods for the Examination of Water and Wastewater, 19th Ed

.2 The UV system will be designed to deliver a minimum UV dose of 30 mJ/cm2 at peak flow, in effluent with a UV Transmission of 60% at end of lamp life (EOLL) after reductions for quartz sleeve fouling. The basis for evaluating the UV dose delivered by the UV system will be the independent third-party bioassay, without exception. Bioassay validation methodology to follow protocols described in NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (May 2003) and/or applicable sections of the US EPA Design Manual – Municipal Wastewater Disinfection (EPA/625/1-86/021).

.3 The UV Dose will be adjusted using an end of lamp life factor of 0.98 to compensate for lamp output reduction over the time period corresponding to the manufacturer's lamp warranty. The use of a higher lamp aging factor will be considered only upon review and approval of independent third party verified data that has been collected and analysed in accordance with protocols described in NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (May 2003).

.4 The UV Dose will be adjusted using a quartz sleeve fouling factor of 0.95 when sizing the UV system in order to compensate for attenuation of the minimum dose due to sleeve fouling during operation. The use of a higher quartz sleeve fouling factor will be considered only upon review and approval of independently verified data that has been collected and analysed in accordance with protocols described in NWRI Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse (May 2003).

.5 The system will be able to continue providing disinfection while replacing UV lamps, quartz sleeves, ballasts and while cleaning the UV lamp sleeves.

.4 Equipment Design, Construction and Materials

.1 General:

.1 All module welded metal components in contact with effluent will be Type 316 stainless steel.

.2 All metal components above the effluent will be Type 304 stainless steel except for the ballast enclosure, which is constructed of anodised aluminium.

.3 All wiring exposed to UV light will be TeflonTM coated.

.4 All wires connecting the lamps to the ballasts will be enclosed inside the frame of the UV Module and not exposed to the effluent. To be considered as an alternate, wires that are exposed to the effluent will be warranted for 15 years and will be TeflonTM coated to prevent degradation under constant exposure to UV light.

.2 Lamp Array Configuration:

.1 The lamp array configuration will be the uniform array with all lamps parallel to each other and to the flow.

.2 The system will be designed for complete immersion of the UV lamps including both electrodes and the full length of the lamp tube in the effluent.

.3 UV Module:

.1 Each UV module will consist of UV lamps with an electronic ballast enclosure mounted on a Type 316 stainless steel frame. To be considered as an alternate, ballasts housed in a separate enclosure located external to the channel will be equipped with a suitable air conditioning system, supplied by the UV manufacturer, to maintain internal enclosure temperatures below 80°F (26°C). No forced air ventilation will be allowed.

.2 Each lamp will be enclosed in its individual quartz sleeve, one end of which will be closed, and the other end sealed by a lamp end seal. To be considered as an alternate, lamp quartz sleeves that are open at both ends will be supplied with twice the amount of specified spare seals and lamps.

.3 The closed end of the quartz sleeve will be held in place by means of a retaining O-ring. The quartz sleeve will not come in contact with any steel in the frame.

.4 The ends of the lamp sleeve will not protrude beyond the stainless-steel frame of the UV Module.

.5 Lamp wires will terminate in the electronic ballast enclosure located at the top of the UV Module.

.6 All lamp to ballast connections will be made by and tested by the UV Manufacturer.

.7 The electronic ballast enclosure will contain the electronic ballasts and addressable lamp status monitoring systems.

.8 Each UV Module will be connected to a receptacle on the Power Distribution Center.

.9 At the point of exit from the UV Module frame the multi conductor cable will pass through a waterproof strain relief.

.10 Each UV module will have a rating of Type 6P.

.4 UV Lamps:

.1 Lamps will be high intensity low pressure amalgam design. The lamp will be preheated to promote longevity. Lamps that are not amalgam or that are based on driving a low-pressure lamp at amperages greater than 500 milliamps will not be allowed.

.2 The filament will be of the clamped design, significantly rugged to withstand shock and vibration.

.3 Electrical connections will be at one end of the lamp and have four pins, dielectrically tested for 2,000 Vrms. Lamps that do not have 4 pins will be considered instant start. To be considered as an alternate, instant start lamp systems will supply replacement spare lamps equal to 50% of the total number of lamps in the system.

.4 Lamps will be operated by electronic ballasts with variable output settings.

.5 Lamp End Seal and Lamp Holder:

.1 The open end of the lamp sleeve will be sealed by means of a sleeve nut which threads onto a sleeve cup and compresses the sleeve O-ring.

.2 The sleeve nut will have a knurled surface to allow a handgrip for tightening. The sleeve nut will not require any tools for removal.

.3 The lamp will be held in place by means of a moulded lamp holder that will incorporate two seals. The lamp holder will incorporate a double seal against the inside of the quartz sleeve to act in series with the external O-ring seal.

.4 The second seal on the lamp holder will isolate and seal the lamp from the module frame and all other lamps in the module.

.5 In the event of a quartz sleeve fracture the two seals of the lamp holder will prevent moisture from entering the lamp module frame and the electrical connections to the other lamps in the module.

.6 The lamp holder will also incorporate a UV resistant PVC moulded stop that will prevent the lamp sleeve from touching the steel sleeve cup.

.6 UV Lamp Quartz Sleeves:

.1 Type 214 clear fused quartz circular tubing as manufactured by General Electric or equal.

.2 Lamp sleeves will be domed at one end.

.3 The nominal wall thickness will be 1.5 mm.

.7 UV Module Support Rack:

.1 The UV module support rack will be minimum Type 304 stainless steel and be mounted above the effluent in the channel allowing adjustment to the precise height of the channel.

.8 Effluent Level Controller

.1 Modulating Weir Gate shall be used as effluent level controller

.2 Modulating Weir Gates (MWGs) shall be self-contained and shall be designed and manufactured by an experienced and reputable manufacturer, based on the AWWA C561 Standard for Fabricated Stainless Steel Slide Gates and AWWA C542 Standard for Electric Motor Actuators for Valves and Slide Gates in effect as of the date of this specification.

.3 Modulating weir gates will be designed to maintain the minimum channel effluent level required to keep lamps submerged at all times

.4 MWGs shall be designed for the following performance criteria:

.1 MWG actuation speeds shall be between 10" (255 mm) and 14" (356 mm) per minute.

.2 MWG maximum design rate of change of flow shall be limited to 25% of the Peak Design Flow/Channel per minute, or alternatively, flow shall be ramped up (zero to peak) or down (peak to zero) in no less than 4 minutes.

.3 MWG actuators shall employ AWWA S4-50% duty class motors with a rated minimum 900 starts per hour capability.

.4 MWG actuators shall employ AWWA Class B solid-state Thyristor based switchgear capable of at least 5,000,000 modulating steps before overhaul; electromechanical type actuators and controls shall not be permitted.

.9 Low Water Level Sensor

.1 One low water level sensor will be provided by the UV Manufacturer for each UV channel.

.2 During manual, automatic and remote modes of system operation, the water level sensor will ensure that lamps extinguish automatically if the water level in the channel drops below an acceptable level.

.3 The low water level sensor will be powered by the Power Distribution Center.

.10 Electrical

.1 All electrical components shall be class I, Div. 1.

.2 Each UV module within a bank will be powered from the bank's dedicated Power Distribution Centre.

.3 UV manufacturer to supply all cabling and conduit between lamps and ballasts.

.4 UV manufacturer to perform all terminations between lamps and ballasts.

.5 Each electronic ballast within a UV module will operate two lamps.

.6 Power factor will not be less than 98% leading or lagging.

.7 Electrical supply to each Power Distribution Centre will be 120/208V 60Hz, 10.30 kVA.

.8 Electrical supply to the Hydraulic System Centre will be 208V 60Hz, 2.5 kVA.

.9 Electrical supply for the water level sensor will be provided by the PDC and be 12 Volt DC.

.10 Electrical supply to the System Control Centre will be 120V 60Hz, 0.15 VA.

.11 Power Distribution Center (PDC)

.1 Power distribution will be through environmentally sealed receptacles on the PDC(s) to allow for local connection of UV modules.

.2 Data concentration will be through integrated circuit boards located inside the Power Distribution Centre.

.3 PDC enclosure material will be Type 304 Stainless Steel - Type 4X (IP66).

.4 All internal components will be sealed from the environment.

.5 All Power Distribution Centres to be UL listed and UL listed to Canadian safety standards or equivalent with a rating of Type 4X.

.6 One separate sealed Power Distribution Centre will be provided per bank of lamps.

.7 To be considered as an alternative, systems that have ballasts mounted in cabinets, the UV manufacturer will provide one complete cabinet for each bank of lamps, to ensure that each bank is electrically isolated for safety during maintenance and to provide redundancy under average flow conditions.

.12 Control and Instrumentation, System Control Center (SCC)

.1 The operation of the UV3000Plus™ is managed at the SCC by a PLC based controller which continuously monitors and controls the system functions.

.2 The operator interface display screen will be menu driven with automatic fault message windows appearing upon alarm conditions. Operator Interface will be Beijer -Type 4X (7") Outdoor Rated

.3 Alarms will be provided to indicate to plant operators that maintenance attention is required or to indicate an extreme alarm condition in which the disinfection performance may be jeopardized. The alarms will include but not be limited to:

.1 Lamp Failure

.2 Multiple Lamp Failure

.3 Low UV Intensity

.4 Module Communication Alarm

.4 The 100 most recent alarms will be recorded in an alarm history register and displayed when prompted.

.5 Bank status will be capable of being placed either in Manual, Off or Auto mode.

.6 Elapsed time of each bank will be recorded and displayed on the display screen when prompted.

.7 Digital I/O modules will be provided to remotely indicate status and alarms such as:

.1 Alarm conditions (major, critical)

.2 Bank Status (one for each UV bank supplied)

.13 UV Detection System:

.1 A submersible UV sensor will continuously monitor the UV intensity produced in each bank of UV lamps.

.2 The sensor will measure only the germicidal portion of the light emitted by the UV lamps. The detection system will be factory calibrated. Detection systems that can be field calibrated will not be permitted.

.14 Dose-Pacing:

.1 A dose-pacing system will be supplied to modulate the lamp UV output in relationship to a 4-20 mA DC signal from an effluent flow meter (by Others).

.2 The system to be dose-paced such that as the flow and effluent quality change, the design UV dose is delivered while conserving power.

.3 The dose-pacing system will allow the operator to vary the design dose setting. Logic and time delays will be provided to regulate UV bank ON/OFF cycling.

.15 Hydraulic System Center (HSC):

.1 One (1) HSC will be supplied to house all components required to operate the automatic cleaning system.

.2 Enclosure material of construction will be Type 304 Stainless Steel - Type 4X (IP66).

.3 The HSC will contain a hydraulic pump complete with integral 4-way valve and fluid.

.16 Cleaning System:

.1 An automatic cleaning system will be provided to clean the quartz sleeves using both mechanical and chemical methods. Wiping sequence will be automatically initiated with capability for manual override.

.2 The cleaning system will be fully operational while UV lamps and modules are submerged in the effluent channel and energized.

.3 Cleaning cycle intervals to be field adjustable.

.4 Remote Manual and Remote Auto cleaning control options will be provided.

.5 The cleaning system will be provided with the required solutions necessary for initial equipment testing and for equipment start-up.

.6 To be considered as an alternate, systems that use only mechanical wiping must have the ability to periodically be cleaned out of channel using a chemical bath. Out of channel cleaning will include lifting slings, removable banks, cleaning tanks, agitation system and air compressors, as required. The UV

manufacturer will be responsible for supplying all equipment including any equipment not specifically listed required to perform out of channel chemical cleaning. Contactor will be responsible for installation.

.17 Module Lifting Device:

.1 Two (2) sets of Davit crane, base and lifting sling will be supplied to assist in removing individual modules from the effluent channel.

.2 Lifting device will be a crane with hand winch and will include an adjustable boom to ensure adequate reach and height.

.3 Lifting device to include a swivel handle for rotation and positioning.

.4 Crane and base will be supplied by the Manufacturer and will be installed by the Contractor.

.18 Photometer:

.1 A single beam UV photometer with front panel and 100% transmittance control adjustment will be supplied to measure the UV transmittance of effluent.

.2 The range will be 0 - 100% transmittance with a wavelength accuracy monitoring ±0.16 half band width.

.19 Spare Parts:

The following spare parts and safety equipment to be supplied:

.1 4 UV Lamps

.2 4 Quartz Sleeves

.3 2 Lamp Ballast

.4 1 Operators kit including face shield, gloves and cleaning solution.

.5 GUARANTEE

.1 Equipment: The equipment furnished under this section will be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of 12 months from date of start-up or 18 months after shipment, which ever comes first.

.2 UV lamps purchased are warranted for 12,000 hours of operation or 3 years from shipment, whichever comes first. The warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.

.3 Ballasts to be warranted for 5 years, prorated after 1 year.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 70 00: Verify existing conditions before starting work.

.2 Verify that rough-in frames, anchors and supports are accurately placed.

3.2 PREPARATION

.1 Provide rough-in frame and anchors for placement by Section 03 11 00.

3.3 INSTALLATION

.1 Contractor shall install all equipment specified in this section in accordance with contract drawings, manufacturers' shop drawings, instructions, and installation checklist.

.2 Contractor shall prepare Installation Checklist and return to Consultant at least two (2) weeks prior to date requested for commissioning.

.3 Contractor shall provide all labor, materials and test apparatus necessary for completing the installation.

.4 Contractor shall calibrate all instruments included in the present section.

.5 Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

3.4 COMMISSIONING

.1 Contractor shall perform commissioning of the UV system per Section 21 05 02 Mechanical Commissioning

END OF SECTION

Part 1 - General

1.1 RELATED REQUIREMENTS

.1 This section describes requirements applicable to all Sections within Divisions 21, 22, 23 and 25.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures and Shop Drawings.

.1 Drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.2 Drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.3 By-pass plan for gate valve and UV system.

- .1 By-pass plan shall include everything contractor deems necessary to complete the work; such as temporary pumps, generators, temporary diversion walls, piping and valves.
- .2 Proper disinfection and dichlorination using an approved neutralizer is required during by-passing.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for Consultant before final inspection

.1 Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.

.2 Operation data to include:

- .1 Control schematics for systems including environmental controls.
- .2 Description of systems and their controls.
- .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
- .4 Operation instruction for systems and component.
- .5 Description of actions to be taken in event of equipment failure.
- .6 Valves schedule and flow diagram.
- .7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation, and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.5 Approvals:

.1 Submit two (2) copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed Consultant.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Engineer will provide one set of mechanical drawings. Mark changes as work progresses and as changes occur.

.2 Transfer information to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-Built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right-hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting, and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.4 **MAINTENANCE**

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers.

.4 Furnish one commercial quality grease gun, grease, and adapters to suit different types of grease and grease fittings.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with the manufacturer's instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Replace defective or damaged materials with new.

1.6 RELATED WORK

.1 It is the intent of these specifications to ensure that all materials and equipment as hereinafter specified, and/or as shown on the drawings, are installed in such a manner as to leave each o the systems of the mechanical trades complete and in satisfactory condition.

.2 Where used, the words "Section" and "Division" shall also include other Sub-Contractors engaged on site to perform work to make buildings and site complete in all respects.

.3 Where used, the word "supply" shall mean furnishing to site in location required or directed complete with accessory parts.

.4 Where used, the word "install" shall mean secured in place and connected for operation as noted or directed.

.5 Where used, the word "provide" shall mean supply and install as each is described above.

.6 Where used, the word "authorities", shall mean any agency that enforces the applicable laws, ordinances, rules, regulations, or code of the place of the work.

.7 Where used, the word "work" shall mean all equipment, permits materials and labour to provide a complete mechanical installation as required and detailed Drawings and Specifications.

.8 Where used, the word "Consultant" shall mean the Project Engineer.

.9 Where used, the words "Drawings" and "Specifications" shall mean the "Contract Documents".

.10 Where used, the words "Mechanical Contractor" shall mean the supervisory Mechanical Contractor of all Mechanical Sub-Contractors.

.11 The terms "instructions" or "as instructed" or "where instructed" mean as instructed by the Consultant, including supplementary instruction notices; job site instructions by a field representative/ inspector appointed by the Consultant and including all comments made regarding submittal of shop drawings and samples for review.

.12 The term "exposed" means within the line of sight of any person standing or sitting in the occupied space, unless defined otherwise in the following sections.

.13 The term "concealed" means not exposed.

.14 The term "listed" mean, that the materials or equipment are tested in accordance with applicable standards and are approved and listed for their intended use by a testing company approved by the Authorities having jurisdiction.

.15 The term "approved", "approvals", etc., means approved by Authorities having jurisdiction as conforming to the requirements of the Contract Documents.

.16 The term "acceptable" or "acceptance", etc., means acceptable to the Consultant as conforming to the requirements of the Contract Document.

.17 The term "submit for review" or "submit notice" etc., means submit to the Consultant.

.18 The term "subject for review" means, work or materials laid out for review by the Consultant. Obtain instruction from the Consultant before proceeding with the work. Submit further information, sop drawings, samples, etc., as specified and/or as may be reasonably requested by the Consultant.

.19 The term "accessible" used alone means readily accessible by a person using tools as required without cutting or breaking out materials.

.20 The term "noted" means notes on the drawings, the detail drawings and on the Schedules.

1.7 DISCREPANCIES AND OMISSIONS

.1 The specifications are to be considered as an integral part of the plans which accompany them; neither the plans nor the specifications shall be used alone. Any item or subject omitted from one, but which is mentioned or reasonably implied in the other, shall be considered as properly and sufficiently specified, and must therefore, be provided. Notify the Consultant in writing of any discrepancy between the drawings and the Specifications. Misinterpretations of either the plans or the specifications shall not relieve the Contractor and his Subcontractors of responsibility.

1.8 INSPECTION OF PREMISES AND SITE

.1 Visit the site of the building and become thoroughly familiar with all the conditions to be met in carrying out the work covered by these specifications. No extras will be allowed for failure to properly evaluate conditions which affect the scope of the work included in Divisions 21, and 22.

1.9 INTERPRETATION OF DRAWINGS

.1 The drawings upon which this contract is based show the arrangements, general design, and extent of the piping, and other systems. These systems are suitably outlined on the drawings with regard to sizes, locations, general arrangement and installation details. The mains and connections thereto are shown more or less in diagram, except where in certain cases, the drawings may include details giving the exact locations and arrangements required. All piping shall be concealed unless shown otherwise. The Mechanical Contract Drawings do not intend to show Architectural or Structural details.

.2 Where any parts of the system and/or pieces of equipment are located by dimensions on the drawings, said dimensions shall be checked and verified in the field. Each division shall make without additional charge or expense to the Owner, any necessary changes, additions or offsets to the runs to accommodate structural conditions. The Consultant shall be notified immediately, and his authority secured in writing for such revisions before proceeding with the work.

.3 As the work progresses, and before installing fixtures and other fittings and equipment which may interfere with the work of other trades, each Contractor shall consult with the Consultant and obtain detail drawings or instructions for the exact location of such equipment.

1.10 RECORD DRAWINGS

.1 The Consultant will provide an extra set of whiteprints to be marked up by his division as the job progresses, showing all changes and deviations from the plans, so that on completion of the job, the Consultant will have a record of the exact location of all the piping and equipment. These drawings shall be available during construction at all times and will be reviewed monthly by the consultant.

.2 Record drawings shall locate all concealed shut-off valves, dampers, control valves and concealed air vents.

.3 The Consultant will provide to the Mechanical Contractor the AutoCAD disk for a fee. The Mechanical Contractor will be required to sign “Transfer of Files on Electronic Media” Form and pay the fee in order to receive the files.

1.11 INTERFERENCE DRAWINGS

.1 Before shop fabrication begins or undertaking installation work inside the building, prepare an integrated set of mechanical interference sketches, where indicated on the drawings.

.2 These sketches shall be prepared by the Mechanical Contractor with the co-operation of the other trades and shall show the location or space allocated for the work of each trade.

.3 Submit two (2) copies of detailed interference sketches, showing structural members, electrical conduits, devices, and all Mechanical elements to the Consultant for review and general approval before proceeding with the work.

.4 Copies of these reviewed interference drawings shall be submitted to all trades, the General Contractor, the Architect, and the Consultant, and general approval shall be obtained before the space allotment and installation.

.5 As a minimum, interference drawings shall be made for all areas of mechanical equipment rooms, duct shafts and corridor ceiling spaces.

.6 Work that has been installed before review of interference drawings and has been determined that it is in conflict with the building, shall be removed from the site at no extra cost to the Owner. The work, approved by the Consultant, shall be installed at no extra cost to the Owner.

1.12 STANDARDS OF MATERIAL AND EQUIPMENT

.1 Material and equipment are specifically described and named in this specification as "design based on" and "acceptable products".

.2 Where the term "**acceptable products"** is used, the bid may be based on any of the acceptable products.

1.13 MATERIALS & EQUIPMENT - ACCEPTABLE PRODUCTS, BASE BID, ALTERNATE PRODUCTS, UNSOLICITED ALTERNATES

.1 Provide materials and equipment in accordance with Division 01.

.2 Equipment and material to be CSA certified and manufactured to standards specified herein.

.3 Factory assemble control panels and component assemblies.

.4 The Specification indicates Acceptable Product manufacturers (or Acceptable Manufacturers) for various products, materials and systems which make up the mechanical work. The Tender Price shall be based on any of the "Acceptable Products".

.5 The Specifications may also indicate Base Bid and Approved Alternate (or Alternate Products) manufacturers for various products, materials, and systems. For such cases, the Tender Price MUST be based on the "Base Bid" manufacturer/ system. The net dollar addition or deduction to/from the Tender Price for each "Approved Alternate" shall be indicated on the Bid Form or letter attached to the Bid Form for consideration by the Consultant.

.6 Unsolicited Alternate manufacturer/systems which do not appear in the Tender Documents may also be proposed, provided the following conditions are met:

.1 They appear separately in an accompanying letter attached to the Bid Form.

.2 The net dollar deduction from the Tender Price if the alternate is accepted. This value shall reflect all costs associated with the incorporation of the alternate into the work, including any required changes in Architectural, Structural, Electrical, and other Mechanical Sections and the Consultants costs of revising the design to suit.

.7 The Owner reserves the right to accept or reject any or all "Approved Alternates" or "Unsolicited Alternate" manufacturers/systems."

1.14 MANUFACTURERS, SHOP DRAWINGS AND SUBMITTALS

.1 Before fabrication of any materials and/or equipment, submit shop drawings and data sheets covering all items of equipment listed as requiring shop drawings. Shop drawings to be submitted are listed in each section under **SUBMITTALS.** These will be reviewed and returned to the Contractor. Materials shall not be ordered until "accepted" review has been given.

.2 The Mechanical Contractor is to consult with the Consultant on the manner in which drawings will be handled. Supply metric information for metric projects.

.3 Equipment requiring electrical wiring by Division 26 will have the electrical wiring diagrams submitted with the shop drawings. Shop drawings will not be reviewed unless wiring diagrams accompany the equipment drawings.

.4 For whiteprint-type shop drawings, eight (8) copies as required. For 8-1/2" x 11" fixture cuts, submit eight (8) copies of booklets as required.

.5 **The Mechanical Contactor is to keep track of the shop drawings and the subsequent equipment delivery.**

.6 The shop drawings must apply to the equipment under consideration. Advertising literature and comprehensive data sheets are not acceptable.

.7 The shop drawings must contain the following information: job name, equipment tag, actual dimensions of unit and dimensioned location and size of all field connections, model, performance curves, capacity, HP, voltage, and all accessories listed in the specifications and/or being provided, and the operating points of the proposed equipment. Room schedules are to be provide for multiple units.

.8 The shop drawings submitted for review must be carefully checked by the Mechanical Contractor and bear the Contractor's identification review stamp or signature. Drawings will not be considered otherwise.

.9 Shop drawing review is for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the contract documents. Contractor is responsible for the dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of the construction; coordination of his or her work with that of all other trades; and the satisfactory performance of his or her work.

.10 Shop drawings will be returned "No Exception Taken", "Revise & Resubmit", "Make Corrections Noted, Resubmission Not Required" or "Rejected, Submit Compliant Product/System".

.1 "**No Exception Taken"** Drawings shall be considered as conforming with the design concept.

.2 **"Make Corrections Noted, Resubmission Not Required"** Drawings shall be considered as conforming with the design concept once corrections have been made as noted on the drawings. This notation shall not hold up manufacture. These drawings shall be corrected for final submission with project Maintenance/Operation manuals.

.11 All shop drawings must be submitted promptly.

1.15 MAINTENANCE AND MAINTENANCE MANUALS

.1 During the one (1) year guarantee period, commencing after Substantial Completion Letter has been issued by the Consultant's Office, maintain all equipment installed as part of this Division. This is to include lubrication of bearings, cleaning of strainers, etc., except the replacement of air filters and water treatment. This agreement shall be part of the written guarantee. This work shall be carried out in the presence of the owner's representative and a letter shall be sent to the Consultant stating that this work was carried out. Three (3) maintenance inspections must be carried out by the Mechanical Contractor during this one (1) year period, evenly spaced over the time frame (after Substantial Completion Letter issued by the Consultant). Submit written report to Owner and Consultant after each inspection.

.2 This maintenance shall continue up to the date of instruction of the Owner's designated representatives, at which time each piece of equipment is to be lubricated and checked in the presence of the Owner's representative(s).

.3 Not later than three (3) weeks prior to application for inspection by Consultant for Substantial Performance, submit records and maintenance manuals to Consultant.

.4 Prepare two (2) sets of "letter" sized, hard-cover, three-ring, black, maintenance manuals, containing dimensioned certified prints of each piece of mechanical equipment and Manufacturer's recommended maintenance instructions, air balancing reports, and wiring diagrams. Tabulated at the front of this binder is to be a maintenance schedule for each piece of equipment, and lubricant to be used, and a tabulation of things to be checked at each piece of equipment.

.5 Maintenance Manuals will be requested by the Consultant shortly after the final submission of all shop drawings. Maintenance manuals must be submitted and reviewed before training of the Owner's personnel and before a final inspection will be carried out.

1.16 ELECTRICAL WIRING AND WIRING DIAGRAMS

.1 All motors for equipment under this Division will be by this Division. All starters, switches and power wiring will be provided by Division 26, as noted. Where electrical requirements for equipment exceed the provisions described in electrical specifications, this Contractor shall provide labour and material as required to complete the installation. All motors, switches and equipment shall be of Canadian manufacture: Westinghouse Canada, Canadian General Electric, Allen-Bradley, Square 'D', Robins & Meyers, Lincoln, Tamper.

.2 Provide with shop drawings, a comprehensive wiring diagram for all mechanical equipment requiring review. Shop drawings will not be reviewed unless accompanied by the wiring diagrams.

1.17 ACCESS PANELS AND DOORS

.1 For Non-Fire-Rated Separation (Drywall Ceilings & Walls):

.1 Supply for finished drywall ceilings and walls, APS (Bauco-Plus II) recessed access door of a suitable size to provide access to plumbing cleanouts and for servicing dampers, valves and equipment which will be concealed.

.2 Access door to be designed for flush installation in drywall surfaces. Access door is recessed 1" to receive drywall. The flange of the door is a textured galvanized steel taping bend with pre-punched holes. Drywall compound is applied over the beading at the same time as the drywall joints are finished.

.3 Door to be 16 gauge prime-coated steel with 14-gauge steel frame and screwdriver operated can latch.

.4 Prime Mechanical Contractor shall include for the installation of all access doors supplied by Division 21, 22, 23 and 25. Engage and pay the respective General Trade on site to install same.

.2 For Non-Fire-Rated Separation (Not Drywall Ceilings & Walls):

.1 Supply for finished ceiling or wall surfaces that are not of drywall construction, Smillie, McAdams Summerlin Limited, Le Hage (Ancon Industries Incorporated) access doors of a suitable size to provide access to plumbing cleanouts and for servicing dampers, valves and equipment which will be concealed. Minimum size for reach-in access to be 12" x 12" (300 mm x 300 mm) and 18" x 18" (450 mm x 450 mm) for man access.

.2 Door and frame to be 16 gauge prime-coated steel with concealed hinges and positive locking and self-opening screwdriver lock.

.3 Prime Mechanical Contractor shall include for the installation of all access doors supplied by Divisions 21, 22, 23, 25. Engage and pay the respective General Trade on site to install same.

.3 Fire-Rated Separations:

.1 Supply access doors in fire-rated ceiling assemblies, walls, and shafts. Access doors shall be Smillie, McAdams Summerlin Limited, Le Hage (Ancon Industries Incorporated), ULC listed, manufactured, and installed in accordance with NFPA-80.

.2 Door to be complete with 16-gauge steel frame with concealed continuous hinge and key-operated lock and self closer, double wall 20 gauge prime-coated steel door with 2" (50 mm) thick insulation.

.3 ULC rating 1-1/2 hours, temperature rise maximum 250°F (120°C) in thirty (30) minutes.

.4 Prime Mechanical Contractor shall include for the installation of all access doors supplied by Divisions 21, 22, 23, 25. Engage and pay the respective General Trade on site to install same.

.4 Size access panel doors to provide adequate access and correspond with the type of structural and architectural finish.

.5 Ensure proper fire resistance rating of doors/panels in fire separations.

.6 Provide the following:

.1 Type RW recessed for "SG" board in wet areas.

.2 Type TM flush mount for tile and masonry.

.3 Type WB flush for wall board.

.7 Materials & Finish:

.1 Galvanized bonderized steel, phosphate-dipped with baked-on rust inhibitive grey prime finish.

.2 Stainless steel with No. 4 finish in Shower, Wet Washrooms and Drying Areas.

.8 Acceptable Products:

.1 Le Hage

.2 Milcor

.3 Acudor

.4 Nystrom

.5 Access Panel Solutions Inc. (Bauco - Plus II) for Drywall

1.18 CONCRETE WORK AND SUPPORTS

.1 Installation of concrete bases for all mechanical equipment shall be by this division.

.2 Mechanical Contractor shall construct the bases. Provide accurate templates for the concrete trade to pour the bases.

.3 For equipment suspended from the building structure, provide all structural members, platforms, brace, and hanger rods as required. Method of attachment to be reviewed with the Structural Consultant before proceeding with the installation.

.4 For pre-cast slabs, Mechanical Contractor shall co-ordinate all openings for pipes with the Precast Concrete Erector. The Precast Concrete Erector shall be responsible for drilling or cutting all holes through precast slabs. Holes through the structural slabs shall be sleeked as specified herein.

1.19 FLASHING

.1 The Mechanical Contractor shall provide flashings for the work of this Division. If not specified, a description is to be supplied for approval.

.2 Generally, all pipes passing through the roof shall be flashed with an 18-gauge steel sleeve soldered watertight and fastened to the roof deck before the roofing is applied with a minimum of 8” (200 mm) overlap along the roof deck and extending 8” (200 mm) up the pipe, sealed with a weather skirt.

.3 Vent stacks may be flashed with patented flashing cones provided with the equipment.

.4 Where large ducts pass though roofs, curbs and flashing shall be by this Division where shown on the roofing plan. If not shown, all curbs, flashing and counter flashing are by this Division.

1.20 CUTTING AND PATCHING

.1 It is the responsibility of the Mechanical Contractor to install sleeves for piping, and provide frames for opening for grilles, louvres, fans and similar equipment to be built into the existing building. All structural components must have the location, size and proposed method of cutting approved before proceeding.

.2 Should damage occur to the work of other trades and Divisions, remedial work will be done by the trade who originally installed the work, at the expense of the sub-contractor who caused the damage.

.3 Where pipes and ducts pass through walls in the existing building, the cutting and patching is by the Mechanical Contractor.

1.21 SLEEVES

.1 Provide pipe sleeves at points where pipes (plumbing, heating, sprinkler, gas, etc.) pass through masonry of minimum 22-gauge thickness galvanized sheet steel with lock seam joints. Where ducts pass through masonry walls, provide suitable 18-gauge galvanized steel sleeves. Size sleeves on insulated piping or ducts to permit insulation to continue through. Where piping or ducts pass through concrete or frame construction, provide 1/8" (3mm) thick galvanized iron sleeves. On copper pipe provide copper pipe sleeves.

.2 Use cast iron or steel pipe sleeves with annular fin continuously welded at midpoint, through foundation walls and where sleeve extends above finished floor.

.3 Provide 1/8" (3mm) clearance all around, between sleeve and pipes or between sleeve and insulation and where piping passes below footings, provide minimum clearance of 2" (50mm) between sleeve and pipe. Backfill up to underside of footing with concrete of same strength as footing.

.4 Terminate sleeves flush with surface of concrete and masonry and 2" (50mm) above floors. Not applicable to concrete floors on grade.

.5 For pipes passing through roofs, use cast iron sleeves with caulking recess and flashing clamp device. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make watertight durable joint.

.6 Fill voids around pipes

.1 Where sleeves pass through walls or floors, caulk space between insulation and sleeve or between pipe and sleeve with waterproof, fire-retardant, non-hardening mastic. Seal space at each end of sleeve with waterproof, fire-retardant, non-hardening mastic.

.2 Ensure no contact between copper pipe and ferrous sleeve.

.7 Where pipes and ducts pass through fire separations (walls, floor and partitions) pack space with ULC listed and/or approved fire stopping mineral fibre insulation and seal with approved fire-retardant sealing compounding. Sealing compound to be installed to Manufacturer's specifications and detail. Fire stopping shall comply with the Ontario Building Code and approved by local Building Department. Obtain written approval from Local Building Department before commencing with work.

1.22 ESCUTCHEONS AND PLATES

.1 Provide on exposed pipes passing through finished walls, partitions, floor and ceilings.

.2 Use chrome or nickel-plated brass, solid type with set screws for ceiling or wall mounting.

.3 Inside diameter shall fit around finished pipe. Outside diameter shall cover sleeve.

.4 Where sleeve extends above finished floor, escutcheons or plates shall clear sleeve extension.

.5 Secure to pipe or finished surface.

1.23 HANGERS AND INSERTS

.1 All inserts shall be approved by the Consultant and shall be firmly secured to the framework before concrete is poured. Supply and install these inserts and be responsible for their correct locations. There shall be no flame cutting of structure unless approval is received from the Consultant.

.2 Any additional supports required from concrete floors or walls for piping or ducts shall be provided by drilling same and using steel anchor shield and bolt or toggle or expansion bolt.

.3 Hangers shall be secured to concrete block by, steel anchor shield and bolt or toggle or expansion bolt.

.4 Hangers shall be secured to steel structures by:

.1 Punching flanges for bolt

.2 Friction lug or flange

.3 “C” clamp or beam clamp

.4 Tack welding as conditions require

.5 Steel and/or wood deck shall not be used to support ducts, pipes, fixtures and equipment except on written permission of the Structural Consultant.

.6 Take special care to avoid introduction of undue reaction forces into structure of building, to flanges of pumps and equipment, to expansion joints and to piping.

.7 Ensure that load on building structure does not exceed maximum mechanical loading per square foot (metre) shown on Structural drawings or as directed by the Architect. Take special care to avoid introduction of undue reaction forces into structure of building, to flanges of pumps and equipment, to expansion joints and to piping.

1.24 TESING AND ADJUSTING

.1 Testing all piping systems for leaks providing gauges materials and labour as required. Equipment furnished as part of the permanent installation shall not be used for testing purposes. Before testing, remove all equipment which is not designed to withstand the test pressures. All piping is to be tested before covering is applied, and before backfilling or concealing.

.2 Hydrostatic Tests: All pressure pipe is to be tested as described in each Section. Test pressure shall be maintained for the times noted, during which time the pressure test shall remain constant without pumping.

.3 Gravity Piping: All gravity drainage piping within the buildings shall undergo a ball test and a water test, which must be supervised and inspected by the Consultant.

.4 All testing shall be done to the satisfaction and approval of the Consultant.

.5 Before final payment, test the operation of each system and all equipment installed, make all necessary adjustments and replacements, and demonstrate to the satisfaction of the Consultant that all equipment is operating as intended and without undue noise and vibration.

.6 All tests must be witnessed by the Owner's Authorized Representative. Failure to do so will result in a retest.

.7 If system pumps are used during the system flushing, Mechanical Contractor shall supply and install replacement pump seals in each pump, once flushing is complete and tests results accepted.

1.25 OPERATE AND ADJUST SYSTEMS

.1 Operate all systems to full capacity and verify proper, safe, efficient operation of all parts and each complete system. Oil motors and grease bearings before operating equipment.

.2 When work is complete, and systems are in operation, adjust valves, belt drives, controls, and thermostats so that there is an even distribution of cooling and heating throughout. Turn over to owner necessary keys, handles and operating devices for each system.

1.26 COMPLETION

.1 Keep the premises in a clean and orderly condition during construction. All waste and unusable materials shall be promptly removed from the site.

.2 Upon completion of this work, go over the entire installation, clean and polish all fixtures and equipment, and remove all surplus materials and rubbish of every description incidental to this work, leaving the installation neat and orderly.

.3 Before final payment is made, the following items must be completed:

.1 Present to the Consultant "Maintenance Manuals" complete with air and water balancing reports, wiring diagrams and certified equipment prints.

.2 Present to the Consultant an as-built record set of drawings and CAD disk.

.3 Instruction of Owner's personnel in the maintenance and operation of all new equipment.

.4 Present to the Consultant completed Equipment Start-up and Acceptance Checklist for all Mechanical Equipment.

.5 Present to the Consultant completed Equipment Test Certificates and Results.

.6 Present to the Consultant Valve Tag Charts.

.7 Spare filters and frames, labelled and located where directed by the Owner.

.8 Present to the Consultant start-up report for fan coil units.

.9 Present to the Consultant complete controls commissioning report.

.10 Maintain a set of approved drawings on site available for review by authorities.

.11 Advise the Consultant at least 48 hours in advance of any scheduled authorities' inspections.

.13 Perform the above work in a timely manner so as not to interfere with the progress of the project.

1.27 **PROTECTION**

.1 Protect work from damage. Securely plug or cap open ends of conduits, pipes, ducts or equipment to prevent entry of dirt, dust, debris, water, snow or ice. Cover all items cast into concrete floors/walls such as floor drains, cleanouts, etc., prior to pour, with heavy plastic tape or duct tape. Clean all piping, ducting, conduits, and equipment inside and outside before testing.

.2 Material stored on site shall protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts. Protect all bearings and motors from damage due to moisture and dust. Equipment not yet in operation shall be turned over at least at monthly intervals to prevent bearing deterioration.

1.28 **TEMPORARY OR TRIAL USAGE**

.1 Do not use any permanent Mechanical Systems during construction unless specific written approval is obtained from the Consultant.

.2 Temporary or trial usage of any mechanical device, machinery, apparatus, equipment, or materials shall not be constructed as evidence of acceptance of same and no claim for damage shall be made for injury to or breaking of any part of such work which may so be used.

.3 Where the Owner permits the use of a system the Mechanical Contractor shall be in charge of and maintain all equipment in accordance with manufacturers instruction at all times the systems are in operation.

.4 The use of permanent systems shall not invalidate the guarantee or warranty.

.5 Prior to final acceptance, return all equipment to a new condition and provide supplier certification of same.

1.29 **LIABILITY**

.1 Each Section and Trade shall:

.1 Assume full responsibility for laying out his work and for any damage caused to other Sections or Owner by improper location or carrying out of same.

.2 Be responsible for prompt installation of work in advance of concrete pouring, ceiling installation or similar work.

.3 Protect finished and unfinished work of this Division and work of other Sections from damage due to work of this Division.

.4 Be responsible for condition of material and equipment supplied. Be responsible for protection and maintenance of work completed until termination and acceptance.

1.30 **DIELECTRIC COUPLINGS**

.1 Provide wherever pipes of dissimilar metals are joined.

.2 Provide insulation unions for pipe sixes 2" diameter (50 mm) and smaller, and flanges for pipe sizes 2-1/2" (65 mm) and larger. Brass adaptors and bronze valves will not be accepted.

.3 Provide an isolating separation wherever piping may touch dissimilar metal studs, joists, concrete, etc.

1.31 **PERMITS AND FEES**

.1 Pay all permit and inspection fees in order to complete the work contained in Divisions 21, 22, and 23.

1.32 **RIGGING OF EQUIPMENT**

.1 Provide all rigging, hoisting, and handling of equipment as necessary in order to place he equipment in the designated area in the building.

.2 Direct this work by qualified people normally engaged in rigging, hoisting and handling of equipment.

1.33 **RIGHTS RESERVED**

.1 Rights are reserved to furnish any additional detail drawings which, in the judgement of the Consultant, may be necessary to clarify the Work and such drawings shall form a part of the Contract.

1.34 **SUPERINTENDENCE**

.1 Maintain at this job site, at all times, qualified personnel and supporting staff with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.

1.35 **SPECIAL CLEANING**

.1 Vacuum clean and remove debris from the inside of fans, ducts, coils, terminal units, etc.

.2 Comb all bent fins to proper configuration on all coils in air handling units, fan coils units, etc., on finned radiation elements.

1.36 **CO-ORDINATION**

.1 Section 00 73 03 – Supplementary General Conditions

.2 The Mechanical Contractor is responsible for co-ordinating the mechanical work herein to suit Project Phasing Schedule.

.3 Co-ordinate all Mechanical Work with the work of any other Divisions to avoid conflicts. Be responsible for modifying the work of this Division to accommodate space conflicts.

.4 Failure to co-ordinate will result in installed work being removed and new work put in place without cost to the owner.

1.37 **FIRE STOPPING**

.1 The Prime Mechanical Contractor is responsible for all fire stopping related to the work of Division 21, 22 and 23 including, but not limited to, the ductwork, piping, and control wiring.

1.38 **PROJECT CO-ORDINATION**

.1 Section 00 73 03 – Supplementary General Conditions

.2 The Mechanical Contractor shall refer to the Contract Drawings and Specifications for co-ordination requirements and completion dates various portions of the Project.

1.39 **MOVING, HOISTING AND SCAFFOLDING**

.1 The Mechanical Contractor is responsible for moving, hoisting and demurrage for all equipment and materials to be furnished and installed under this Division. Include the cost of dismantling and reassembling equipment, where required, to the manufacturer's approval.

1.40 **TIME FOR COMPLETION**

.1 Review the general contract requirement for completion dates. Identify at the time of tender any items which may affect the time for completion.

.1 Advise the Consultant if materials and equipment involve longer delivery times than indicated in the schedule.

.2 Monitor and expedite delivery of equipment and materials. If necessary, inspect at source of manufacture.

.3 Be responsible for failure of, or delay in, the delivery of specified equipment.

1.41 **TENDERING INSTRUCTIONS**

.1 Section 00 21 13 – Instruction to Bidders.

.2 Refer to the General Conditions and Section 00 73 03 – Supplementary General Conditions

.3 The Mechanical Contractor agrees to employ those subcontractors proposed in the Form of Tender and accepted by the Owner at the signing of the Contract.

.4 The Owner may, for reasonable cause, object to the use of a proposed subcontractor and consequently may require the Mechanical Contractor to employ one of the other subcontractor bidders.

.5 In the event that the Owner requires a change from a proposed subcontractor originally proposed by the Mechanical Contractor, the Contract Price shall be adjusted by the difference in cost.

.6 The Mechanical Contractor shall not be required to employ as a subcontractor a firm to whom he may reasonably object.

.7 Work of subcontractors named at the time of Tender or substitutions authorized by the Owner will be recognized as being in accordance with the Contract Documents and any payments will be approved by the Owner only to such subcontractors.

1.42 **IMPELLER, SHEAVE AND BELT CHANGES**

.1 The Mechanical Contractor to carry the costs for pump impeller, fan sheave and belt changes.

Part 2 - Products

2.1 **MATERIALS**

.1 Not used

Part 3 - Execution

3.1 **DEMONSTRATION**

.1 Contractor will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Supply tools, equipment, and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio-visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

3.2 **PAINTING REPAIRS AND RESTORATION**

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.3 **CLEANING**

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and waste processing.

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

3.4 **PROTECTION**

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Conform to the General Conditions of Division 01.

.2 Refer to Section 01 91 00 – Commissioning for commissioning team and duties of the contractor.

.3 Conform to the Mechanical General Requirements Section 21 05 01 - Common Work Results for Mechanical.

.4 Provide labour and mechanical to conduct the commissioning process as outlined in this specification section.

.5 The commissioning process for the Mechanical Systems shall include:

- .1 Verification that the installation meets the requirements of the contract documents.
- .2 Verification that the systems performance meets the design intent.
- .3 Submission of Form EWS-001, as attached after this specification.
- .4 Provision of building operator training.
- .5 Provision of as-built documentation, operating and maintenance manuals (3 hard copies each), and systems operating manuals (3 hard copies each).
- .6 Shop drawings.
- .7 Commissioning schedule.

.6 The Contractor, shall provide the services to complete the process. The execution portion of this Section defines the areas of responsibility.

1.2 DEFINITIONS

.1 Commissioning: A systematic process confirming that building systems have been installed, properly started, and consistently operated in strict accordance with the Contract Documents, that all systems are complete and functioning in accordance with the Contract Documents at Substantial Completion, and that Contractor has provided Owner adequate system documentation and training. Commissioning includes deferred and/or seasonal tests as approved by Owner.

.2 Commissioning Plan: Document prepared by Contractor and approved by Consultant that provides the structure, schedule, and coordination plan for the Commissioning process from the construction phase through the warranty period. The Commissioning Plan must satisfy the Owner's test requirements.

.3 Commissioning Team: Working group made up of representative(s) from the Engineer, Contractor, and Owner. Contractor will provide ad-hoc representation of Subcontractors on the Commissioning Team as required for implementation of the Commissioning Plan. Refer to section 01 91 00 – Commissioning for team definition.

.4 Deferred Tests: Functional Performance or Integrated System Tests performed after Substantial Completion due to partial occupancy, partial equipment acceptance, seasonal requirements, design, or other Site conditions that prohibit the test from being performed prior to Substantial Completion.

.5 Deficiency: Condition of a component, piece of equipment or system that is not in compliance with Contract Documents.

.6 Factory Testing: Testing of equipment at the factory, by factory personnel with an Owner's representative present if deemed necessary by Owner.

Part 2 Products

2.1 INSTRUMENTATION

.1 The Mechanical Contractor and manufacturers shall provide all instrumentation and equipment necessary to conduct the tests specified. The Mechanical Contractor shall advise the Consultant of instrumentation to be used and the dates the instruments were calibrated.

Part 3 Execution

3.1 THE COMMISSIONING PROCESS

.1 This Section describes the commissioning process to be performed by the Contractor. The process shall provide a high level of quality control during the construction.

.2 The commissioning process consists of:

- .1 Drawings and Record Drawings
- .2 Submission of “Equipment Data Sheet Commissioning Form”.
- .3 Installation inspection and equipment verification
- .4 Testing of equipment and systems
- .5 Commissioning:
  - .1 Coordination with the Manufacturer’s Representative
  - .2 Manufacturer’s Representative performance testing
  - .3 Commissioning meetings
  - .4 Operating and maintenance manuals
  - .5 Training
  - .6 Systems Demonstration and turnover
  - .7 Testing forms
  - .8 Warranties

3.2 SHOP DRAWINGS AND RECORD DRAWINGS

.1 Conform to Section 21 05 01 - Common Work Results for Mechanical and Section 01 33 00 - Submittal Procedures/Shop Drawings, for requirements for shop drawings and record drawings.

.2 The Contractor shall provide the Commissioning Agent with one (1) copy of shop drawings that have been reviewed by the Consultant.

3.3 INSTALLATION INSPECTION AND EQUIPMENT VERIFICATION

.1 The Mechanical Contractor shall coordinate with the Consultant who will inspect the mechanical installation.

.2 The Mechanical Contractor shall complete the Corporation of the Town of Iroquois Falls Form Equipment Data Sheet Preinstallation, Pre-commissioning, and commissioning report equipment for each piece of equipment. The forms shall be included in each copy of the operating and maintenance manual. The equipment data shall include:

.1 Manufacturers name, address and telephone number

.2 Distributors name, address and telephone number

.3 Make, model number and serial number

.4 Pumps - RPM, impeller sizes, rated flow

.5 Fans - belt type and size, shive type and size

.6 Electrical - volts, amps, fuse size, overload size

.7 Any other special characteristics.

3.4 TEST FORMS AND VERIFICATION FORMS

.1 The Contractor will prepare a test form manual, which will contain a form for every test identified in the Specification. A copy of this manual will be given to the Consultant and Owner.

.2 The Contractor shall notify the Engineer and the Owner when systems are available for testing. The Contractor shall document all tests performed. The forms shall be forwarded to the Consultant.

3.5 THE CONTRACTOR'S TESTING OF PIPING SYSTEMS

.1 Test all piping systems in accordance with ASME B31.3-2016 and Sections within Divisions 21 and 23.

.2 All tests for the systems shall be performed in the presence of the Consultant or Commissioning Consultant. Complete the testing forms and forward to the Engineer

3.6 TESTING OF EQUIPMENT AND SYSTEMS

.1 General

.1 The Mechanical Contractor shall hire the services of the manufacturer’s technicians to test the equipment and associated systems. The technician shall record the results of the tests on the testing forms. The tests shall be witnessed by the Consultant or the Commissioning Consultant. When the tests have been completed satisfactorily, the technician and witnessing authority shall sign the forms. A copy of the forms shall be forwarded to the Engineer. The original shall be inserted into the operating and maintenance manual.

.2 Should equipment or systems fail a test, the test shall be repeated after repairs or adjustments have been made. The additional test shall be witnessed.

.3 Tests which have not been witnessed shall not be accepted and shall be repeated.

.4 The equipment and systems to be tested shall include:

.1 UV system as a whole

.2 Valves

.3 Pumps
.4 Submersible Pumps
.5 Pressure relief values
.6 Pressure Reducing Valves
.7 Flow Meters
.8 Air Release Valves
.9 All other Process Equipment

3.7 COMMISSIONING MEETINGS AND REPORTING

.1 The Mechanical Contractor shall include the schedule for all test and equipment start-up tests in the construction schedule.

.2 The commissioning meetings shall occur during the regular construction meetings. The testing schedules and results of all tests shall be reviewed.

.3 All testing forms and reports associated with the mechanical systems shall be directed to the Consultant and Commissioning Consultant.

.4 The forms and reports to be issued shall include:

.1 Shop drawings, issued and accepted
.2 Equipment verification forms
.3 Testing forms
.4 Reports resulting from tests
.5 Testing schedule
.6 Minutes of commissioning meetings
.7 Equipment Start-up Forms
.8 The Corporation of the Town of Englehart From EWS-001 – Equipment Data Sheet Pre-Installation, Pre-Commissioning, and Commissioning Report.

3.8 OPERATING AND MAINTENANCE MANUAL

.1 Conform to Section 21 05 01 - Common Work Results for Mechanical, for requirements for the O&M Manuals.

.2 Submit Operating and Maintenance Manuals to Commissioning Agent for review.

.1 Once reviewed, submit three (3) hard copies of each Operation and Maintenance manual, with revisions from review to the Corporation.

3.9 OPERATOR TRAINING

.1 Conform to Section 21 05 01 - Common Work Results for Mechanical, for requirements for Instruction to Operating Staff.

.2 Training shall not begin until three (3) copies of the operating and maintenance manuals have been delivered to The Owner and approved by the Consultant.

.3 Each training session shall be structured to cover:

.1 The operating and maintenance manual
.2 Operating procedures

.3 Maintenance procedures

.4 Trouble-shooting procedures

.5 Spare parts required

.6 Submit a course outline to the Mechanical Consultant before training commences.

.7 Provide course documentation for up to eight people.

.4 The training sessions shall be scheduled and co-ordinated by the Commissioning Consultant. The Commissioning Consultant shall video tape the sessions.

.5 Training shall be provided for the following systems:

	System	Minimum Training Times
.1	The Mechanical System	8 hours

.6 The training requirement for the mechanical system shall include a walk-through of the building by the Mechanical Contractor. During the walk through the Mechanical Contractor shall:

.1 Identify equipment

.2 Identify starters associated with equipment

.3 Identify valves and balancing dampers

.4 Identify access doors

.5 Review general maintenance of equipment

.6 Review drain points in pipework systems

.7 Identify maintenance items

.7 When each training session has been completed, notify the Owner or the Commissioning Consultant.

3.10 MECHANICAL SYSTEM DEMONSTRATION AND TURNOVER

.1 Refer to Section 21 05 01 - Common Work Results for Mechanical.

.2 The system demonstration and turnover to the Owner shall occur when:

.1 The installation is complete.

.2 The acceptance test conducted by the Mechanical Contractor has been completed successfully.

.3 The system performance testing has been completed successfully.

.4 Training has been completed.

.5 Operating and Maintenance Manuals have been accepted.

.6 Shop-drawings have been updated.

.7 As-built drawings have been completed.

.3 The systems demonstration shall be conducted by the Mechanical Contractor and the manufacturers. The demonstration shall cover a demonstration of equipment installation and operation.

3.11 TESTING FORMS

.1 The Mechanical Contractor and manufacturers shall fill out the forms listed in this section or provide other forms. The forms must be approved by the Engineer and the Owner before they are used.

3.12 WARRANTIES

.1 Equipment and system warranties shall not begin until the system demonstration and turnover has been conducted successfully and accepted by the Owner.

.2 The Mechanical Contractor shall fill out the warranty form listing the equipment and systems and the start and finishing dates for warranty.

.3 Refer to the general conditions specification section for the requirements during the warranty period.

END OF SECTION

EQUIPMENT DATA SHEET PRE-INSTALLATION, PRE-COMMISSIONING, AND COMMISSIONING REPORT

A. GENERAL

Project Name: _____ Project No.: _____

Sub-Contractor: _____ Contract No.: _____

Equipment Supplier: _____ Order No.: _____

B. EQUIPMENT SUMMARY

Identification Name: _____

1. Equipment Purpose _____ Tag No.: _____

2. Make: _____ Model: _____

3. Capacity Serial No.: _____

   a) Minimum _____ Rating HP/kW _____ Supply Volts _____

   b) Maximum _____ RPM _____ Amps _____

   c) Design Summary _____ Phase _____ Wire _____

4. Insulation Design _____ Ins. Class _____ Temp. Rise _____

5. Enclosure ☐ DP ☐ TEFC ☐ TENV ☐ Exp. Pf CEMA ☐ 1 ☐ 2 ☐ 3

6. Approvals – CSA, NEMA, CEMA As Specified ☐ Yes ☐ No

7. Addendum No.: _____ Change Order No.: _____ Date: _____

8. Date Received: _____ Date Started: _____

9. Warranty Expiry Date _____ Initials: _____ Date: _____

LEGEND

(A) Inspected and found acceptable.
(B) Inspected, found at fault and corrected.
(C) Inspected, found at fault and NOT corrected.
(D) Not inspected

EQUIPMENT DATA SHEET PRE-INSTALLATION, PRE-COMMISSIONING, AND COMMISSIONING REPORT

C. PRE-INSTALLATION CHECKS
(Refer to Manufacturer's Manual for all checks)

		A	B	C	D
1	Handling				
2	General Cleanliness				
3	Moisture, Dampness				
4	Covering				
5	Paint/Finishes				
6	Shop Drawing Match				
7	Special Protection /Storage Req'ments				

	Others (Specify)	A	B	C	D
8					
9					
10					
11					
12					
13					
14					

Contractor's/Manufacturer's Representative ☐ Yes ☐ No

Date: _____ Print Name: _____ Signature: _____

General Contractor: _____

Approved by Consultant

Date: _____ Print Name: _____ Signature: _____

D. PRE-COMMISSIONING/INSTALLATION CHECKS

		A	B	C	D
1	Foundation or Base				
2	Mounting Bolts				
3	Couplings, Belts, Chains				
4	Gaskets				
5	Stresses				

		A	B	C	D
6	Mounting Alignment				
7	Grounding				
8	Numbering, Lettering				
9	Paint/Finishes				
10	Special Protection / Storage Req'ments				

Manufacturer's Representative in Attendance ☐ Yes ☐ No

Date: _____ Print Name: _____ Signature: _____

Approved for Incorporation into Work ☐ Yes ☐ No

Date: _____ Print Name: _____ Signature: _____

EQUIPMENT DATA SHEET PRE-INSTALLATION, PRE-COMMISSIONING, AND COMMISSIONING REPORT

D. PRE-COMMISSIONING/ELECTRICAL CHECKS

		A	B	C	D
1	Rotation				
2	Breaker				
3	Starter				
4	Overloads				

	Others (Specify)	A	B	C	D
5					
6					
7					
8					

Manufacturer's Representative in Attendance ☐ Yes ☐ No

Date: _____ Print Name: _____ Signature: _____

Approved for Incorporation into Work ☐ Yes ☐ No

Date: _____ Print Name: _____ Signature: _____

F. COMMISSIONING CHECKS
(Refer to Manufacturer's Manual and List All Checks)

		A	B	C	D
1	General Condition				
2	Bearing Temp.				
3	Seals, Packing				
4	Valves, Check Valve				
5	Lubricants				
6	Couplings				
7	Seal Lubricants				
8	Safety Hazards				

	Others (Specify)	A	B	C	D
9	Ins. Res. Tested				
10	Painting				
11	Deflection Vibration				
12	Hydro Inspected				
13					
14					
15					
16					

Contractor's/Manufacturer's Representative ☐ Yes ☐ No

Date: _____ Print Name: _____ Signature: _____

General Contractor: _____

Approved for Operation

Date: _____ Print Name: _____ Signature: _____

Hand/Auto

Alarm Settings: High: _____ Low: _____ Failure: _____

Range: _____

EQUIPMENT DATA SHEET PRE-INSTALLATION, PRE-COMMISSIONING, AND COMMISSIONING REPORT

Span: _____

Electrical Settings: Breaker Size _____

Overload _____

Starter Size _____

Mechanical Settings: _____

G. SETTINGS

H. ROUTINE MAINTENANCE REQUIREMENTS

1 Calibration Frequency _____
2 Recommended Spare _____
3 Parts _____
4 Lubrication _____
5 _____
6 _____
7 _____
8

EQUIPMENT DATA SHEET PRE-INSTALLATION, PRE-COMMISSIONING, AND COMMISSIONING REPORT

I. REASON FOR NON-APPROVAL

Consultants Comments: _____

_____

_____

_____

_____

Additional Comments: _____

_____

_____

I. TRAINING COMPLETED

Consultant _____

Owner _____

INSTRUMENTATION & CONTROL ELEMENTS, SECTION 25 30 00

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 26 03 02 – SCADA Instrumentation & Control Wiring

1.2 REFERENCES

.1 CSA Standard C22.1:24 Canadian electrical code, Part I (26th edition), safety standard for electrical installations.

.2 CSA C22.2 NO. 5:16 Molded-case circuit breakers, molded-case switches and circuit-breaker enclosures (Trinational standard with UL 489 and NMX-J-266-ANCE-2016).

.3 CAN/CSA C22.2 NO. 94-M91 Special purpose enclosures.

.4 CSA (Canadian Standards Association).

.5 UL (Underwriters Laboratories Inc.).

1.3 SCOPE OF WORK

.1 Contractor is responsible for all instrumentation wiring required for I/O of UV system.

.2 The control panel chassis shall be powered by UPS. The discrete inputs shall be powered by UPS. All field instruments and network equipment shall be powered by UPS.

.3 All panel-mounted equipment shall be complete with labelling as indicated in Section 26 05 00 – Common Work Results for Electrical.

.4 All equipment and assemblies of equipment shall be CSA approved. Permanently attached CSA labels shall be attached to each assembly and all equipment supplied.

.5 The control panel shall be designed to be accessed without the need for Arc Flash training or equipment.

.6 All spare I/O points must be wired to terminal blocks or spare interposing relays.

.7 I/O Terminal Blocks shall be grouped per card.

.8 I/O Terminal Block groups shall be organized within the panel so that similar inputs are grouped together.

.9 I/O Terminal block groups shall be organized in logical sequential order. The order shall be Digital Inputs, Digital Outputs, Analog Inputs, and Analog Outputs.

.10 Spare I/O terminal blocks shall be added at the end of each row of I/O and clearly marked spare.

.11 Spare field wires shall be minimized and labeled clearly at both ends and at any point where the wire breaks. When spare field wires have been installed, they should be landed on terminal blocks within the panel and clearly marked as spare.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: Provide for all manufactured components.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 10 – Closeout Submittals.

.2 Operation Data: Include instructions for operating equipment.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wiring devices from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 GENERAL

.1 Supply and install equipment mounting brackets as required.

.2 Supply, install and commission all hubs, switches, routers, transceivers, patch panels or any other communication equipment identified on the contract drawings unless otherwise noted.

.3 Install, test, and commission power supplies, PLC modules, PLC racks and vendor supplied controllers with all required cables to provide a full integration of UV system.

2.2 PLC EQUIPMENT

.1 The contractor is to supply, install, test, and commissioning the following PLC components for the proposed upgrades.

.2 Provide all interconnecting cables between controllers and other networking components as required for a complete system as identified in the contract and on the drawings.

.3 Provide all Ethernet cabling, Ethernet Work Area Outlets as required for a complete network.

Part 3 Execution

3.1 INSTALLATION

.1 Install to manufacturer's written instructions.

.2 Coordinate installation with work by others.

.3 Provide all hardware and standard software for a fully operational system, complete in all respects. Provide software drivers, interconnecting cables, terminators, etc. Provide interconnecting cables of proper lengths.

3.2 EXAMINATION

.1 Verify that systems are ready to receive work.

.2 Sequence work to ensure installation of components is complementary to installation of components by others.

.3 Ensure installation components are complementary to installation of components installed by others.

3.3 TESTING AND COMMISSIONING

.1 Pre-Operational Inspection:

.1 Inspect all electrical connections for compliance with installation standards.

.2 Verify correct operation of displays, and alarms.

.2 Documentation:

.1 Provide all testing and commissioning reports, as-built documentation, operation manuals, and maintenance instructions.

.2 Include wiring diagrams and programming instructions for future reference.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Processing.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Provide temporary dust covers or plastic sheeting over the equipment during construction to prevent contamination from dust, paint, concrete, or debris.

.3 Repair damage to adjacent materials cause by automatic transfer switch installation.

END OF SECTION

SECTION 25 60 00, FIELD WIRING

PART 1 GENERAL

1.1 Field Wiring

.1 Field Wiring is the wiring that connects the field equipment (instruments, control stations, control panels, MCC) to the Main Process Control Unit. Use only CSA approved and labelled cables and conductors.

Part 2 PRODUCTS

2.1 Analog Signals

.1 Definition: Analog signals are 4-20 mA inputs received from field instruments.

.2 Single Pair Cable: For individual instrument circuits use single-pair, two inch lay, twisted, foil 100% shielded with bare #18 AWG copper drain wire, #16 AWG, 19 X 29 strand copper conductors CSA labelled tray cable at 600 volts.

.3 Multi-Pair cables: For multiple instrument circuits, use multi-pair cables made up of individual single pair, two inch lay, twisted, foil 100% shielded with suitable drain wire, #16 AWG, 19 X 29 strand copper conductors CSA labelled tray cable at 600 volts.

.4 Shields: Signal shields should have one ground point located at the power source unless otherwise recommended by the instrument/equipment manufacturer. Shields should be continuous through cabinets, panels, and junction boxes.

.5 Colour Coding: Positive: White, Negative: Black

.6 The power supply connection for each individual field device circuit shall be wired through a fuse to ensure that a wiring fault of one field device does not adversely affect the operation of other devices sharing the same power supply.

2.2 DC Digital Signals

.1 DC digital signals are at 24 Vdc originating from contact inputs.

.2 Single Pair Cable: For individual contact closure circuits use single pair, two inch lay, twisted #16 AWG, 19 X 29 strand copper conductors CSA labelled tray cable at 600 volts with RW90 insulation with PVC jacket.

.3 Multi-pair Cable: For multiple contact closure circuits use multi-pair cables made up of individual single pair two inch lay, twisted, #16 AWG, 19 X 29 strand copper conductors CSA labelled tray cable at 600 volts with RW90 insulation with PVC jacket.

.4 Colour Coding – Field: Dark Blue (+), Light Blue (Common)

.5 Colour Coding – Panel: Brown (+), Yellow (Common

2.3 AC Digital Signals

.1 AC digital signals are 120 VAC and less than 20 amperes and received from contact outputs used for controlling 120-volt devices such as motor starters, push-buttons, pilot lights, and the like.

.2 Single Conductor: For single circuit use single conductor #14 AWG, 19 strand copper conductor at 600 V with RW90 insulation with PVC jacket.

.3 Multi-Conductor: For multiple circuits use multiple conductor #14 AWG, 19 strand copper conductor at 600 V with RW90 insulation with PVC jacket.

.4 Colour Coding: Control: Red, Neutral: White, Hot: Black, Ground: Green.

.5 The conductor designation is that green conductors are always at ground.

2.4 Ethernet Patch Cables

.1 Ethernet cables shall conform to IEC 1158-2. Shielded, twisted-pair.

.2 Also check with the manufacturer's recommendation for special application.

2.5 DeviceNet Cables

.1 Thick cable according to DeviceNet specifications, with metal armour and heavy-duty PVC outer jacket.

.2 Terminating connectors as required.

2.6 Access Closet Power Supply

.1 Provide, where required, 120 VAC power supply in a rigid steel conduit to designated Access Closets from Uninterruptible Power Supplies located in the Control Panels. The Access Closets will be within 20 metres of the nearest RPU Control Panel supplying 120 VAC and will be supplied and installed under another Contract.

.2 The required power in the Access Closet from the UPS is 120 VAC at 800 VA. The UPS and power supply wires shall be sized accordingly.

Part 3 INSTALLATION

3.1 General

.1 Avoid running cables inside or under power cable trays. Where field wiring is in power cable trays, insulation must be equal to or greater than the highest voltage in the cable tray.

.2 Where power or signal cables must cross, make them cross at an angle of 90 degrees.

.3 Communication cables will not be mixed with power or signal cables.

3.2 Signal Separation

.1 Analog and 24 VDC Discrete Signals: Analog 4-20 mA signals and 24 Vdc discrete signals should normally be in separate conduits. An exception to this standard may be made in cases where it would cause parallel conduit runs to the same device and combining signals would eliminate one conduit. In cases where the exception is used, both the analog and discrete signals should be twisted shielded pairs as described for analog signals previously. This exception will be limited to 3 meters only.

.2 AC Digital and Control: AC digital signals and AC control wiring may occupy the same conduit, but all instrument power circuits should be isolated by a separate conduit from all AC digital and control circuits.

.3 All conduits for signal cables shall be rigid metallic conduit with the last meter flexible connecting to the field instrument unless otherwise noted.

3.3 Miscellaneous

.1 Thermocouple Extension Wire: Thermocouple extension circuits should be solid conductors and same gauge as the T/C of the same material as the associated thermocouple. Thermocouple signal lines should be continuous from the thermocouple connection head to the final termination point.

.2 Spare Conductors: Spare conductors in each conduit should be equal to 15% of the number required for both present and (defined) future conditions, but in no case less than two spare wires or one pair, should be installed. Each cable should have 10% spare conductors but not less than two conductors. Spare conductors should be terminated on a marked terminal strip or connector pin at each end.

.3 Termination: Wire at both ends of the cable should be terminated with pre-insulated solder less spade or ring lugs for maximum physical strength and electrical conduction. Wires should not be terminated on adjacent terminal points if accidental short-circuiting could cause tripping or closing of a breaker.

END OF SECTION

COMMON WORK RESULTS FOR ELECTRICAL, SECTION 26 05 00

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CSA-C22.1-06, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.
- .2 CSA-C22.2 No. 0-10 (R2015).
- .3 CAN/CSA-C22.3 No. 1-01(Update March 2005), Overhead Systems.
- .4 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .5 Emergency Electrical Power Supply for Buildings - CAN/CSA-C282-09.
- .6 Local Fire Code Requirements.
- .7 Local Electrical and other low voltage systems Utility Requirements

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC).

- .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

- .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

- .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit for review single line electrical diagrams under plexiglass and locate as indicated.

- .1 Electrical distribution system in main electrical room.
- .2 Electrical power generation and distribution systems in power plant rooms.

.2 Submit for review fire alarm riser diagram, plan and zoning of building under plexiglass at fire alarm control panel and annunciator.

.3 Shop drawings:

.1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.4 Submit required number of copies of 600 x 600 mm minimum size drawings and product data to authority having jurisdiction.

.5 If changes are required, notify Consultant of these changes before they are made.

.6 Short Circuit and Protective Device, Co-ordination Analysis and Arc Flash Study Report for the entire electrical distribution system downstream of the pole mounted transformer. This report shall be submitted to the Consultant for review prior to submitting electrical distribution system Shop Drawings. The Report shall be stamped by a licensed professional engineer.

.4 Quality Control: in accordance with Section 01 45 00 - Quality Control. Provide CSA certified equipment and material.

.1 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction and the Consultant for special approval before delivery to site.

.1 Submit test results of installed electrical systems and instrumentation.

.2 Permits and fees: in accordance with General Conditions of contract.

.3 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.

.2 Manufacturer's Field Reports: submit to Consultant manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.2 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 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.

.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.

.3 Site Meetings:

.1 In accordance with Section 01 32 10 - Construction Schedule.

.2 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, in appropriate NMS Section, schedule site visits, to review Work, at stages listed.

.1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.

.2 Twice during progress of Work at 30% and 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 00 73 13 - Health and Safety.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide the Owner's Project Manager with schedule within time frame, as agreed, after award of Contract.

1.4 SYSTEM START-UP

.1 Refer to Section 26 08 00 - Electrical Systems Commissioning in addition to requirements listed below.

.2 Instruct Owner's operating personnel in operation, care and maintenance of systems, system equipment and components.

.3 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.4 Provide these services for such period, and for as many visits as necessary to put equipment in operation and ensure that operating personnel are conversant will aspects of its care and operation.

1.5 OPERATING INSTRUCTIONS

.1 Refer to Section 26 08 00 - Electrical Systems Commissioning in addition to requirements listed below.

.2 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.3 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.4 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.5 Post instructions where directed.

.6 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.7 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 61 00 - Product Requirements.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment is are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

.3 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 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction.

.2 Decal 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.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core.

.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Consultant prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 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 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

System	Primary Colour	Secondary Colour
Fire Alarm	Red	
Low Voltage	Yellow	
Emergency Low Voltage	Yellow/Red	
UPS Low Voltage	Yellow/Blue	
High Voltage	Black	
Ground	Green	
BMS	Gray	
Information Technology	Orange	
VSAT	Orange/Black	
Internet	Orange/Yellow	
Security	Blue	
IDACS	Blue	
CSAS	Blue/Black	
CCTV	Blue/Green	

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

2.9 FIRE STOPPING

.1 Related Work

.1 Coordinate work of this section with other sections as required to properly execute the work and as necessary maintain satisfactory progress of the work of other sections.

.2 References

.1 Codes and standards referenced in this section refers to the latest edition thereof.

.1 Underwriter's Laboratories of Canada (ULC)

.2 CANS115, Standard Methods of Fire Tests of Firestop Systems.

.3 UL1479, Fire Tests of Through-Penetration Firestops

.4 National Building Code of Canada, Section 3.1.9

.5 CAN/ULC-S101-M Standard Methods of Fire Endurance Tests of Building Construction and Materials.

.3 Samples

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit duplicate 300 x 300 mm samples showing actual firestop material proposed for project.

.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

.3 Submit manufacturer's engineering judgement identification number and drawing details when no ULC or cUL system is available. Engineering judgement must include both project name and contractor's name who will install firestop system as described in drawing.

.5 Product Data

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

.2 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation. Include manufacturer's specifications, training letter, and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used.

.6 Manufacturer's Representative

.1 A manufacturer's representative is to be on site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures and at commissioning stage to certify acceptance completed installation. Training will be done as per manufacturer's written recommendations published in their literature and drawing details.

.2 Materials

.1 Use only firestop products that have been ULC or cUL tested for specific fire rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements and fire rating involved for each separate instance.

.2 Fire stopping and smoke seal systems: in accordance with CANS115.

.1 Asbestos free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CANS115 and not to exceed opening sizes for which they are intended.

.2 Firestop system rating: as indicated on drawings.

.3 Service penetration assemblies: certified and tested by ULC or cUL in accordance with CANS115.

.4 Service penetration firestop components: certified and tested by ULC or cUL in accordance with CANS115.

.5 Fire resistance rating of installed fire stopping assembly in accordance with national Building Code of Canada.

.6 Non-curing, re-penetrable intumescent sealants, caulking or putty material for use with flexible cables or cable bundles.

.7 Fire stopping and smoke seals at openings around penetrations for electrical ducts, conduits, cable trays and other electrical items requiring sound and vibration control: elastomeric seal. Consult with Engineer/Architect and manufacturer prior to installation of ULC or cUL firestop systems that might hamper the performance of electrical materials.

.8 Intumescent sealants or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe. No silicone-based firestop is allowed to be applied on PVC pipes.

.9 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.10 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.11 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.12 Sealants for vertical joints: non-sagging.

.3 Preparation

.1 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.2 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

.4 Installation

.1 Install fire stopping and smoke seal material and components in accordance with ULC certification or UL Products Certified for Canada (CUL) and manufacturer's instructions.

.2 Seal holes or voids made by through penetrations, poke through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to a neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

.5 Inspection

.1 Notify Engineer/Architect when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

.6 Schedule

.1 Firestop and smoke seal at:

.1 Penetrations through fire resistance rated masonry, concrete, and gypsum board partitions and walls.

.2 Edge of floor slabs at curtain wall and precast concrete panels.

.3 Top of fire resistance rated masonry and gypsum board partitions.

.4 Intersection of fire resistance rated masonry and gypsum board partitions.

.5 Control and sway joints in fire resistance rated masonry and gypsum board partitions and walls.

.6 Penetrations through fire resistance rated floor slabs, ceilings and roofs.

.7 Openings and sleeves installed for future use through fire separations.

.8 Around electrical assemblies penetrating fire separations.

.9 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

.7 Clean Up

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

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 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe plastic sheet metal, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1200 mm.

.2 Wall receptacles:

.1 General: 450 mm.

.2 Above top of continuous baseboard heater: 200 mm.

.3 Above top of counters or counter splash backs: 175 mm.

.4 In mechanical rooms: 1000 mm.

.3 Panelboards: as required by Code or as indicated.

.4 Telephone and interphone outlets: 450 mm.

.5 Wall mounted telephone and interphone outlets: 1500 mm.

.6 Fire alarm stations: 1200 mm.

.7 Fire alarm bells: 2100 mm.

.8 Television outlets: 450 mm.

.9 Wall mounted speakers: 2100 mm.

.10 Clocks: 2100 mm.

.11 Doorbell pushbuttons: 1500 mm.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

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

.2 See Submittal Requirements for protective device, coordination and arc-flash study reports, in Item 1.5.

3.7 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.

.1 Power generation and distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.5 Systems: fire alarm system, communications.

.6 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.4 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.8 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

WIRE AND BOX CONNECTORS (0-1000V), SECTION 26 05 20

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 CSA International CAN/CSA-C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.

.1 CAN/CSA-C22.2 No. 65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 10 - Closeout.

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors, as required.

.2 Fixture type splicing connectors to: CAN/CSA-C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

- .1 Connector body and stud clamp for stranded copper conductors.
- .2 Clamp for stranded copper conductors.
- .3 Clamp for stranded aluminum ACSR conductors round aluminum bar.
- .4 Stud clamp bolts.
- .5 Bolts for copper bar.
- .6 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable, TECK cable aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No. 18.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables 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 CAN/CSA-C22.2 No. 65.
- .2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No. 65. Replace insulating cap.
- .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Processing.

END OF SECTION

WIRES AND CABLES (0-1000 V), SECTION 26 05 21

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements & Workmanship.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600V or 1000V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, RWU90 XLPE, Jacketed Non-Jacketed.

.3 Copper conductors: size as indicated, with thermoplastic insulation type T90 Nylon rated at 600 V or 1000V.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Cross-linked polyethylene XLPE.

.2 Rating: 600V or 1000V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride.

.7 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two-hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 900 mm centers.

.3 Threaded rods: 6 mm diameter to support suspended channels.

.8 Connectors:

.1 Watertight, approved for TECK cable.

.2 Explosion proof, Class 1 Division 1 and/or 2, approved for TECK cable.

2.3 MINERAL-INSULATED CABLES

.1 Conductors: solid bare soft-annealed copper, size as indicated.

.2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.

.3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V or 1000V, 250 degrees C.

.4 Overall jacket: none.

.5 Two-hour fire rating.

.6 Connectors: watertight, field installed approved for MI cable.

.7 Termination kits: field installed approved for MI cable

2.4 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from galvanized steel aluminum strip.

.4 Connectors: anti short connectors.

2.5 ALUMINUM SHEATHED CABLE

.1 Conductors: copper, size as indicated.

.2 Insulation: cross linked polyethylene type RA90 rated 600Vor 1000V.

.3 Sheath: aluminum applied to form continuous corrugated sheath.

.4 Outer jacket: thermoplastic applied over sheath and to be compliant to applicable Building Code classification for this project, wet locations.

.5 Fastenings for aluminum sheathed cable:

.1 One-hole aluminum straps to secure surface cables 25 mm and smaller. Two-hole steel straps for cables larger than 25 mm. Use aluminum strap only with single conductor cable.

.2 Channel type supports for two or more cables at 450 mm centers.

.3 Threaded rods: 6 mm diameter to support suspended channels.

2.6 CONTROL CABLES

.1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath: thermoplastic jacket, and armour of closely wound aluminum wire.

.2 Type: low energy 300 V control cable: solid annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: PVC or approved equal

.2 Shielding: tape coated with paramagnetic material over each group.

.3 Overall covering: PVC jackets.

.3 Type: 600 V flexible stranded annealed copper conductors, sizes as indicated:

.1 Insulation: cross-linked polyethylene type

.2 Shielding: non-magnetic tape over conductors.

.3 Overall covering: thermoplastic jacket.

2.7 NON-METALLIC SHEATHED CABLE

.1 Non-metallic sheathed copper cable type: NMD90XLPE, size as indicated.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform megger tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Install cable in trenches in accordance with Section 33 71 73.02 - Underground Electrical Service.

.2 Lay cable in cable trays in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.

.3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.4 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.5 Conductor length for parallel feeders to be identical.

.6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.7 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.8 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.9 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 In underground ducts in accordance with Section 33 65 73.

.3 In surface and lighting fixture raceways in accordance with Section 26 05 33.01.

.4 In wireways and auxiliary gutters in accordance with Section 26 05 37.

.5 Overhead service conductors in accordance with Section 26 05 14.

3.4 INSTALLATION OF TECK 90 CABLE (0 -1000 V)

.1 All cable Installations to follow requirements of latest edition of Ontario Electrical Safety Code. The following are to be used as a simplified guideline only.

.2 Group cables wherever possible on channels.

.3 Install cable concealed, securely supported by hangers or straps.

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

.1 Install cable concealed, securely supported by hangers.

.2 Support 2-hour fire rated cables at 1 m intervals.

.3 Make cable terminations by using factory-made kits.

.4 Cable terminations: use thermoplastic sleeving over bare conductors.

.5 Where cables are buried in cast concrete or masonry, sleeve for entry exit of cables.

.6 Do not splice cables unless indicated.

3.6 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.7 INSTALLATION OF ALUMINUM SHEATHED CABLE

.1 Group cables wherever possible on channels.

3.8 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit, cable troughs.

.2 Ground control cable shield.

3.9 INSTALLATION OF NON-METALLIC SHEATHED CABLE

.1 Install cables.

.2 Install straps and box connectors to cables as required.

END OF SECTION

GROUNDING - PRIMARY, SECTION 26 05 27

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 Utility Standards

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837- [02], Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 Products

2.1 MATERIALS

.1 All materials shall be supplied by Hydro One Networks Inc.

Part 3 Execution

3.1 INSTALLATION

.1 Entire primary grounding system shall be supplied and installed by Hydro One Networks Inc. This contractor shall co-ordinate installation, submit test results and as-built drawings.

.2 Primary grounding system shall be at least 2 metres away from any other grounding system.

END OF SECTION

GROUNDING - SECONDARY, SECTION 26 05 28

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 26 05 27 - Grounding Primary.

1.2 REFERENCES

.1 Ontario Electrical Safety Code, Section 10 - Grounding & Bonding.

.2 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 10 - Closeout.

.2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect grounding equipment from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 EQUIPMENT

.1 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as required.

.2 Rod electrodes: copper clad steel 19 mm diameter by minimum 3 m long.

.3 Plate electrodes: galvanized, surface area 0.2 m^2, minimum 1.6 mm thick.

.4 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.5 Insulated grounding conductors: green, copper conductors, size as indicated.

.6 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.7 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

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

3.2 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at one end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install separate ground conductor to outdoor lighting standards.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.12 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end and load end.

3.3 ELECTRODES

.1 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.

.2 Install rod, plate electrodes and make grounding connections as indicated.

.3 Bond separate, multiple electrodes together.

.4 Use size 4/0 AWG copper conductors for connections to electrodes.

.5 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.4 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary 120/208V, 3 phase system.

3.5 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting, cable trays.

3.6 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.

.2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0 AWG.

3.7 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, security systems, intercommunication systems as follows:

.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

.2 Sound, fire alarm, security systems, intercommunication systems as indicated.

3.8 GROUNDING RESISTANCE

.1 Intent of the following instructions is to achieve a low impedance (5 ohm or less) ground grid system. Contractor shall verify the above impedance by Fall of Potential tests and submit documentation per Item 1.4 above.

.2 Bond non-current carrying metal parts together with size 6 AWG copper equipotential conductor. Run conductor from separate lug or service neutral bar to, but not necessarily limited to, following indoor systems and equipment:

.1 Hot water heating system.

.2 Main water pipe.

.3 Main building drain.

.4 Oil line.

.5 Telephone, radio/TV, emergency and fire alarm lead-in or service conduits, near panels.

.6 Make connections to pipes on building side of main valves and tanks. Connect jumpers across boilers to supply and return hot water heating pipes.

.3 Drive three -19 mm diameter x 3 m copper clad ground rods at least 1.8 m apart in original undisturbed ground. If rods will not penetrate ground, drive at angle not more than 60 degrees from vertical, and in same direction. Rods must be driven, not trenched.

.4 Install ground wire from service neutral bar to rods and where buried use bare copper not smaller than size 1 AWG strand or size 4 AWG solid, and at least 640 mm below ground. Bond ground conductor, or short tap from it to outside metal sheathing of building close to power service conduit. Use lug or cast clamp, with bronze or plated bolt, nut and washers (not sheet metal screw or wood screw). Remove paint from sheathing for good contact. Conduit is required only on outside wall of building. Indoors, run bare and fasten as specified for equipotential bonding wire.

.5 Install electrode interconnections where metal parts, circuits or grounding conductors and/or electrodes are in proximity to lightning rod conductors.

3.9 BONDING LIGHTNING PROTECTION SYSTEM TO THE BUILDING GROUND

.1 Use #6 bare copper conductors to bond lightning protection ground systems to the building ground system. Do not use grounding electrode for a lightning protection system as the building grounding electrode.

.2 Metal raceways enclosures frames and other metal parts of electrical equipment require bonding or spacing from the lightning protection conductors. Separation from lightning protection conductors shall be 6 feet through the air, or 3 feet through dense materials, such as concrete, brick or wood.

3.10 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

3.11 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Processing.

END OF SECTION

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS, SECTION 26 05 29

Part 1 General

1.1 RELATED SECTIONS

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

Part 2 Products

2.1 SUPPORT CHANNELS

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

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

.1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole steel straps to secure surface conduits and cables 50mm and smaller.

.2 Two-hole steel straps for conduits and cables larger than 50mm.

.3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Processing.

.1 Leave work area clean at end of day.

END OF SECTION

SPLITTERS, JUNCTION, PULL BOXES AND CABINETS, SECTION 26 05 31

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA-C22.1-06, Canadian Electrical Code, Part 1, 20th Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures. Provide manufacturer's shop drawings.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect low voltage switchgear from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: main and branch lugs, connection blocks to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat covers.

2.3 CABINETS

.1 Construction: welded sheet steel, aluminum or as indicated

Part 3 Execution

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

END OF SECTION

OUTLET BOXES, CONDUIT BOXES AND FITTINGS, SECTION 26 05 32

Part 1 General

1.1 RELATED SECTIONS

.1 26 05 00- Common Work Results for Electrical

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-06, Canadian Electrical Code, Part 1, 20th Edition.

1.3 SUBMITTALS

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

.2 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect low voltage switchgear from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 600V outlet boxes for 347 V switching devices

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

.2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 FLOOR BOXES

.1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass or brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex or single receptacles. Minimum depth: 73 mm for receptacles and communication outlets.

.2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16, 21 and 50mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

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

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

.1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.8 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

END OF SECTION

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS SECTION 26 05 33

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for raceway and boxes and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 10 - Closeout.

.2 Operation and Maintenance Data: submit operation and maintenance data for raceway and boxes for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect low voltage switchgear from nicks, scratches, and blemishes.

.4 Replace defective or damaged materials with new.

Part 2 Products

2.1 SPLICE BOXES

.1 Feeder cable splices are allowed only where existing underground cables are damaged and need to be repaired. No splices shall be carried out for feeder cables without prior approval from Consultants.

.2 Splice boxes cast iron enclosures 6 mm thick painted with chromate primer and gray enamel to provide mechanical protection and moisture seal for direct buried cable splices rated 0.6 kV and consisting of: Two halves, split along cable axis, finely ground matching surfaces, fastened with silicon bronze or galvanized steel bolts, top half with large filling holes with gasketted plugs for medium hard asphalt base compound, bottom half with screws on inside for bonding lead sheath, armour and box end openings sealed by:

.1 Wrapping cables with anhydrous tape and clamping to make snug fit, for 2-way splices.

.2 Fitting boxes with cable entrance fittings suitable for steel tape armour interlocking armour sheaths, for 2-way splices.

2.2 JUNCTION BOXES SUBWAY LEVEL

.1 Subway level junction boxes shall be installed only if they are shown on drawings. Approval shall be obtained prior to installation.

.2 Cast iron octagonal box with joints ground smooth and sealed with gasket, painted with chromate primer and gray enamel fitted with contacts mounted on porcelain supports to which conductors are fastened by soldered-on lugs, air filled, suitable for 3 phase, 5 kV non-shielded cable up to 500 MCM, 2, 3 ways, for direct burial.

.3 Welded steel rectangular boxes, gasketted steel plate lid, fastened with silicon-bronze bolts, copper buses mounted on insulating supports, wiring sleeve entrances, cable conductor lugs detachable from bus contacts at no voltage, rated 500 MCM maximum at 3 pole, 5 kV, 2-way, designed for wall mounting in manhole or tunnel.

.4 Welded steel rectangular boxes, painted with chromate primer and gray enamel, steel plate lids, galvanized forged steel C clamps, silicon-bronze screws, oil resistant gaskets, lined and phases partitioned with Bakelite, copper strap buses plastic insulation enclosed mounted on porcelain supports, disconnecting links, insulated switch stick operated at no voltage, interchangeable unit cable heads compound filled, equipped with air valve, designed to operate at 14 kPa air pressure, rated 3 phase, 15 kV, 250 A with number of ways and sets of disconnecting links, for wall mounting in manholes or tunnels.

2.3 JUNCTION BOXES DISTRIBUTION LEVEL

.1 Distribution level junction boxes shall be installed only if they are shown on drawings. Approval shall be obtained prior to installation.

.2 Welded steel rectangular boxes 6 mm thick minimum painted with chromate primer and gray enamel with removable plate on front side, designed for through run of main cable and porcelain enclosed disconnecting branches of 2 or 3 single conductor cables, using pothead plug and socket disconnectors enclosed in porcelain tubes and caps, standard deep overlapping for submersion designed for no voltage disconnecting, and for wall mounting in manholes tunnels, branch cables rated 100 250 A, 5 kV, filled with medium hard asphalt base compound.

2.4 JUNCTION BOXES POWER LEVEL

.1 Power level junction boxes shall be installed only if they are shown on drawings. Approval shall be obtained prior to installation.

.2 Cast iron octagonal box painted with chromate primer and gray enamel with joints ground smooth and fitted with gasket, contacts mounted on porcelain supports to which conductors are fastened by soldered-on lugs, medium hard asphalt compound filled, suitable for 3 phase, 15 kV cable, 250 MCM maximum cable size, with wiping sleeve entrance.

.3 Welded steel rectangular boxes, oil resistant gasketted steel plate lids fastened with silicon-bronze bolts, shot blasted and painted with chromate primer and gray enamel, cable heads medium hard asphalt compound filled cap nut sealed potheads with wiping sleeve entrances, air filled, disconnecting links insulated switch stick operated at no voltage rated 500 A at 15,000 V, 3 or 4-way for wall mounting in manholes.

Part 3 Execution

3.1 INSTALLATION

.1 Install splice boxes at cable joint, on floor of trench. Tighten armour clamps and fill with compound.

.1 Ground splice boxes as required.

.2 Install submarine splice boxes at cable joints, tighten clamps and fill with compound before lowering cable to seabed.

.3 Install junction boxes on trench floor around cable splice to CSA C22.2 No. 40. Connect cable terminals to box contacts.

.1 Ground junction boxes as required.

.2 Fasten lid securely and check for air leaks before trench is backfilled.

.4 Install subway level steel boxes on wall of manholes or tunnels. Connect cables to bus, install links, fasten lid and test for air leaks.

.1 Ground steel boxes as required.

.5 Install distribution level steel boxes on walls of manholes tunnels. Splice main cable in box and connect branch feeder. Fasten cover and fill with compound.

.1 Ground steel boxes as required. Install power level boxes as follows:

.2 Cast iron type: on trench floor, connect cable terminals to box contacts, fasten lid and fill with compound before trench is backfilled.

.3 Steel type: mount on wall of manhole or tunnel; connect cables to box terminals; install disconnect links, fasten lid securely check for air leaks.

.4 Ground power level boxes as required.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Processing.

END OF SECTION

CONDUITS, CONDUIT FASTENINGS AND CONDUIT FITTINGS, SECTION 26 05 34

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

- .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

.2 Electrical Safety Authority

- .1 Ontario Electrical Safety Code.

1.3 SUBMITTALS

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

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

- .1 Submit cable manufacturing data.

.3 Quality assurance submittals:

- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

Part 2 Products

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.

- .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

.4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

.2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings and with expanded ends.

.4 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.5 Flexible metal conduit: to CSA C22.2 No. 56, steel liquid-tight flexible metal.

.6 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller.

.1 Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1 m on centre.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas. See drawing notes for specific locations.

.3 Use rigid galvanized steel threaded conduit below 2.4 m subject to mechanical injury.

.4 Use epoxy coated conduit underground and in corrosive areas.

.5 Use electrical metallic tubing (EMT) except in cast concrete above 2.4 m not subject to mechanical injury.

.6 Use rigid PVC conduit underground and in corrosive areas.

.7 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without prewired outlet box, connection to surface or recessed fluorescent fixtures, work in movable metal partitions.

.8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.9 Use explosion proof flexible connection for connection to explosion proof motors.

.10 Install conduit sealing fittings in hazardous areas.

.1 Fill with compound.

.11 Minimum conduit size for lighting and power circuits: 19 mm.

.12 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.13 Mechanically bend steel conduit over 19 mm diameter.

.14 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.15 Install fish cord in empty conduits.

.16 Run 2-NPS 1 (25 mm) spare conduits up to ceiling space and 2- 1" (25 mm) spare conduits down to ceiling space from each flush panel.

.1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete or surface type box.

.17 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.18 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel.

.1 Install in centre one third of slab.

.2 Protect conduits from damage where they stub out of concrete.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.

.1 Use cold mastic between sleeve and conduit.

.5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.

.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope.

.2 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Processing.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

WIREWAYS AND AUXILIARY GUTTERS, SECTION 26 05 37

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wireways and auxiliary gutters and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 10 - Closeout.

.2 Operation and Maintenance Data: submit operation and maintenance data for wireways and auxiliary gutters for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect low voltage switchgear from nicks, scratches, and blemishes.

.4 Replace defective or damaged materials with new.

Part 2 Products

2.1 WIREWAYS

.1 Wireways and fittings: to CSA C22.2 No. 26.

.2 Sheet steel with bolted cover to give uninterrupted access.

.3 Finish: baked grey enamel in accordance with Section 26 05 00 - Common Work Results for Electrical.

.4 Elbows, tees, couplings and hanger fittings manufactured as accessories to wireway supplied.

Part 3 Execution

3.1 INSTALLATION

.1 Install wireways and auxiliary gutters in accordance with manufacturer's written recommendations.

.2 Keep number of elbows, offsets, connections to minimum.

.3 Install supports, elbows, tees, connectors, fittings.

.4 Install barriers where required.

.5 Install gutter to full length of equipment.

.6 Ground metallic wireways and gutters as required.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with 01 74 00 - Cleaning and Waste Processing.

END OF SECTION

INSTALLATION OF CABLES IN TRENCHES AND IN DUCTS, SECTION 26 05 43.01

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 CSA International

.1 CAN/CSA-Z809-08, Sustainable Forest Management.

.2 Forest Stewardship Council (FSC)

.1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.3 Insulated Cable Engineers Association, Inc. (ICEA)

.4 Sustainable Forestry Initiative (SFI)

.1 SFI-2010-2014 Standard.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for cables and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect low voltage switchgear from nicks, scratches, and blemishes.

.4 Replace defective or damaged materials with new.

Part 2 Products

2.1 CABLE PROTECTION

.1 38 x 140 mm planks pressure treated with clear or copper napthenate or 5% pentachlorophenol solution, water repellent preservative.

2.2 MARKERS

.1 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs.

.2 Cedar post type markers: to CAN/CSA-Z809 or FSC or SFI 89 x 89 mm, 1.5 m long, pressure treated with clear or copper napthenate or 5% pentachlorophenol solution, water repellent preservative, with nameplate fastened near post top, on side facing cable or conduit to indicate depth and direction of duct and cable runs.

.1 Nameplate: aluminum anodized 89 x 125 mm, 1.5 mm thick mounted on cedar post with mylar label 0.125 mm thick with words Cable, Joint or Conduit with arrows to indicate change in direction.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for cable installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 DIRECT BURIAL OF CABLES

.1 Follow instructions below only if no specific details are provided on drawings.

.2 After sand bed in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable.

.1 Do not pull cable into trench.

.3 Include offsets for thermal action and minor earth movements.

.1 Offset cables 150 mm minimum for each 60 m run, maintaining minimum cable separation and bending radius requirements.

.4 Make termination and splice only as indicated leaving 0.6 m minimum of surplus cable in each direction.

.1 Make splices and terminations in accordance with manufacturer's written recommendations using approved splicing kits.

.5 Underground cable splices not acceptable for new installations.

.6 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable or in accordance with manufacturer's written recommendations; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

.7 Cable separation:

.1 Maintain 75 mm minimum separation between cables of different circuits.

.2 Maintain 300 mm minimum horizontal separation between low and high voltage cables.

.3 When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position.

.4 At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables.

.5 Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position.

.6 Install treated planks on lower cables 0.6 m minimum in each direction at crossings.

.8 After sand protective cover specified in Section 31 23 33.01 - Excavating, Trenching and Backfilling, is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run.

3.3 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.4 MARKERS

.1 Mark cable every 150 m along cable duct runs and changes in direction.

.2 Mark underground splices.

.3 Where markers are removed to permit installation of additional cables, reinstall existing markers.

.4 Install concrete cable markers within 180 m from each side of runway centreline; 45 m from each side of taxi way centreline; 50 m from edge of taxi ramps or aprons.

.5 Install cedar post type markers.

.6 Lay concrete markers flat and centred over cable with top flush with finish grade.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using qualified personnel.

.1 Include necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds.

.1 Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests:

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests:

.1 Carry out acceptable test per Specification Section - 26 08 00.

.7 Provide Departmental Representative DCC Representative Consultant with list of test results showing location at which each test was made, circuit tested and result of each test.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Processing.

3.7 PROTECTION

.1 Repair damage to adjacent materials caused by cables installation.

END OF SECTION

ELECTRICAL SYSTEMS COMMISSIONING, SECTION 26 08 00

Part 1 General

1.1 RELATED DOCUMENTS

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

.2 Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

.3 Refer to Appendices A and B for Tests and Test Values as repeated from ANCI/NETA, ATS-2009.

1.2 REFERENCE

.1 National Electrical Installation Standards (NIES) NECA 90-2004, Recommended Practice for Commissioning Building Electrical Systems.

.2 Standard for Acceptance Testing Specification for Electrical Power Equipment and Systems, 2009, ANCI/NETA ATS-2009

1.3 SUMMARY

.1 The purpose of this Section is to define Contractor responsibilities in the commissioning process, which are being directed by the Contractor. Other electrical system testing is required under other Division 26 Specification Sections.

.2 Commissioning requires the participation of the Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. General Commissioning requirements and coordination are detailed in Division 01. Division 26 shall be familiar with all parts of Division 01 and the Commissioning Plan issued by the Contractor and shall execute all Commissioning responsibilities assigned to them in the Contract Documents and include the cost of Commissioning in the Contract price.

.3 Electrical systems to be commissioned include, but are not limited to, the following:

.1 Secondary Service Electrical Systems (transformers, feeders and branch circuits)
.2 Emergency battery units and lighting systems
.3 Distribution and Branch Circuit Panelboards.
.4 Lighting Fixtures and Controls.
.5 Power factor correction equipment.
.6 Fire Alarm Equipment/Fire Alarm Equipment Monitoring System.
.7 AC Motors.
.8 Grounding Systems.
.9 Emergency Generators, automatic transfer switches and Distribution System.
.10 Uninterruptible Power Systems.

1.4 REFERENCE STANDARDS

.1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

.2 All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

.3 All materials, installation and workmanship shall comply with the applicable requirements and standards.

1.5 DEFINITIONS

.1 Commissioning: A systematic process confirming that building systems have been installed, properly started, and consistently operated in strict accordance with the Contract Documents, that all systems are complete and functioning in accordance with the Contract Documents at Substantial Completion, and that Contractor has provided Owner adequate system documentation and training. Commissioning includes deferred and/or seasonal tests as approved by Owner.

.2 Commissioning Plan: Document prepared by Contractor and approved by Architect/ Engineer that provides the structure, schedule, and coordination plan for the Commissioning process from the construction phase through the warranty period. The Commissioning Plan must satisfy the Owner's test requirements.

.3 Commissioning Team: Working group made up of representative(s) from the Architect/Engineer (A/E), Contractor, Owner's Test, Adjust, and Balance (TAB) Firm, Building Automation System (BAS) provider, specialty manufacturers and suppliers, and Owner. Contractor will provide ad-hoc representation of Subcontractors on the Commissioning Team as required for implementation of the Commissioning Plan.

.4 Deferred Tests: Functional Performance or Integrated System Tests performed after Substantial Completion due to partial occupancy, partial equipment acceptance, seasonal requirements, design, or other Site conditions that prohibit the test from being performed prior to Substantial Completion.

.5 Deficiency: Condition of a component, piece of equipment or system that is not in compliance with Contract Documents.

.6 Factory Testing: Testing of equipment at the factory, by factory personnel with an Owner's representative present if deemed necessary by Owner.

.7 Functional Performance Test Procedures: Commissioning protocols and detailed test procedures and instructions in tabular and script-type format that fully describe system configuration and steps required to determine if the system is performing and functioning properly. Contractor prepares these procedures to document Functional Performance Tests.

.8 Functional Performance Test (FPT): Test of dynamic function and operation of equipment and systems executed by Contractor. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, life safety conditions, power failure, etc. Systems are run through all specified sequences of operation. Components are verified to be responding in accordance with Contract Documents. Functional Performance Tests are executed after start-ups and Pre-functional Checklists are complete.

.9 Integrated System Test: Test of dynamic function and operation of multiple systems. Integrated System Tests are tested under various modes, such as fire alarm and emergency situations, life safety conditions, power failure, etc. Systems are integrally operated through all specified sequences of operation. Components are verified to be responding in accordance with Contract Documents. Integrated System Tests are executed after Functional Performance Tests are complete and prior to Substantial Completion. Integrated System Tests provide verification that the integrated systems will properly function according to the Contract Documents.

.10 Integrated System Test Procedures: Commissioning protocols and detailed test procedures and instructions in tabular and script-type format that fully describe system configurations and steps required to determine if the interacting systems are performing and functioning properly. Contractor prepares these procedures to document Integrated System Tests.

.11 Pre-functional Checklist: A list of static inspections and material or component tests that verify proper installation of equipment (e.g., belt tension, oil levels, labels affixed, gages in place, sensors calibrated, etc.). The word pre-functional refers to before Functional tests. Pre-functional Checklists must include the manufacturer's Start-up checklist(s). Contractor shall sign Pre-functional Checklists as complete and submit with the Request for Start-up/Functional Performance Test Form.

.12 Start-up: The activities where equipment is initially energized, tested, and operated. Start-up is completed prior to Functional Performance Tests.

.13 Test Requirements: Requirements specifying what systems, modes and functions, etc. must be tested. Test requirements are not detailed test procedures. Test requirements and acceptance criteria are specified in the Contract Documents.

1.6 SUBMITTALS

.1 Contractor shall prepare Pre-functional Checklists and Functional Performance Test (FPT) procedures and execute and document results. All Pre-functional Checklists and tests must be documented using specific, procedural forms in Microsoft Word or Excel software developed for that purpose. Prior to testing, Contractor shall submit those forms to the Architect/Engineer for review and approval.

.2 Contractor shall provide Owner with documentation required for Commissioning work. At minimum, documentation shall include: Detailed Start-up procedures, Full sequences of operation, Operating and Maintenance data, Performance data, Functional Performance Test Procedures, Control Drawings, and details of Owner-Contracted tests.

.3 Contractor shall submit to Owner installation and checkout materials actually shipped inside equipment and actual field checkout sheet forms used by factory or field technicians.

.4 Contractor shall review and approve other relative documentation for impact on FPT's of the systems:

.1 Shop Drawings and product submittal data related to systems or equipment to be commissioned. The Subcontractor responsible for the FPT shall review and incorporate comments from the Owner and A/E via the Contractor.

.2 Incorporate manufacturer's Start-up procedures with Pre-functional checklists.

.3 Draft Electrical Testing Agency (ETA) Reports: Review and provide comments to Architect/Engineer.

.4 Factory Performance Test Reports: Review and compile all factory performance data to assure that the data is complete prior to executing the FPT's.

.5 Completed equipment Start-up certification forms along with the manufacturer's field or factory performance and Start-up test documentation: Subcontractor performing the test will review the documentation prior to commencing with the scheduled FPT's.

.6 Final ETA Reports: Subcontractor performing the test will review the documentation prior to commencing with the scheduled FPT's.

.7 Operating and Maintenance (O&M) information per requirements of the Technical Specifications and Division 01 requirements: To validate adequacy and completeness of the FPT, the Contractor shall ensure that the O&M manual content, marked-up record Drawings and Specifications, component submittal drawings, and other pertinent documents are available at the Project Site for review.

Part 2 Products

2.1 GENERAL

.1 All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 TEST EQUIPMENT

.1 Provide all specialized tools, test equipment and instruments required to execute Start-up, checkout, and testing of equipment.

.2 All specialized tools, test equipment, and instruments required to execute Start-up, checkout, and testing of equipment shall be of sufficient quality and accuracy to test and/or measure system performance within specified tolerances. A testing laboratory must have calibrated test equipment within the previous twelve (12) months. Contractor must calibrate test equipment and instruments according to manufacturer's recommended intervals and whenever the test equipment is dropped or damaged. Calibration tags must be affixed to the test equipment or certificates readily available.

.3 Infrared Thermographic Scanner:

.1 Infrared scanning equipment shall be an AGA (or approved equal) thermovision set capable of viewing an entire bus or equipment assembly at one time and have a sensitivity of 0.2 degrees C with a liquid nitrogen reference.

.2 All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified.

Part 3 Execution

3.1 PREPARATION

.1 Construction Phase:

.1 In each purchase order or subcontract that is written for changes in scope, include the following requirements for submittal data, commissioning documentation, testing assistance, Operating and Maintenance (O&M) data, and training, as a minimum.

.2 Attend Pre-Commissioning Meeting(s), Pre-Installation Meeting(s), and other Project meetings scheduled by the Contractor to facilitate the Commissioning process.

.3 Provide manufacturer's data sheets and shop drawing submittals of equipment.

.4 Provide additional requested documentation to the Contractor, prior to O&M manual submittals, for development of Pre-functional Checklist and Functional Performance Tests procedures.

.1 Typically, this will include detailed manufacturer's installation and Start-up, operating, troubleshooting and maintenance procedures, full details of any Owner-contracted tests, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified.

.2 In addition, the installation, Start-up, and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Contractor.

.3 This information and data request may be made prior to normal submittals.

.5 With input from the BAS Provider and A/E, Clarify the operation and control of commissioned equipment in areas where the Specifications, BAS control drawings, or equipment documentation are not sufficient for writing detailed test procedures.

.6 Prepare the specific Functional Performance Test procedures.

.7 Develop the Commissioning Plan using manufacturer's Start-up procedures and the Pre-functional Checklists. Submit manufacturer's detailed Start-up procedures and the Commissioning Plan and procedures and other requested equipment documentation to Owner for review.

.8 During the Start-up and initial checkout process, execute and document related portions of the Pre-functional Checklists for all commissioned equipment.

.9 Perform and clearly document all completed Pre-functional Checklists and Start-up procedures. Provide a copy to the Architect/Engineer prior to the Functional Performance Test.

.10 Address current Architect/Engineer and Owner punch list items before Functional Performance Tests. Air and water test, adjust and balance shall be completed with discrepancies and problems remedied before Functional Performance Tests of the respective air or water related systems are executed.

.11 Provide skilled technicians to execute starting of equipment and to assist in execution of Functional Performance Tests. Ensure that they are available and present during the agreed-upon schedules and for a sufficient duration to complete the necessary tests, adjustments, and problem solving.

.12 Correct deficiencies (differences between specified and observed performance) as interpreted by the Owner's Project Manager and Architect/Engineer and retest the system and equipment.

.13 Compile all Commissioning records and documentation to be included in a Commissioning and Closeout Manual.

.14 Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

.15 During construction, maintain as-built marked-up Drawings and Specifications of all Contract Documents and Contractor-generated coordination Drawings. Update after completion of Commissioning activities (include deferred tests). The as-built drawings and specifications shall be delivered to the Owner both in electronic format and hard copies as required by the Owner.

.16 Provide training of the Owner's operating personnel as specified.

.17 Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

.2 Warranty Phase:

.1 Execute seasonal or deferred tests, witnessed by the Owner, according to the Specifications.

.2 Complete deferred tests as part of this Contract during the Warranty Period. Schedule this activity with Owner. Perform tests and document and correct deficiencies. Owner may observe the tests and review and approve test documentation and deficiency corrections.

.3 If any check or test cannot be completed prior to Substantial Completion due to the building structure, required occupancy condition, or other condition, execution of such test may be delayed to later in the Warranty Period, upon approval of the Owner. Contractor shall reschedule and conduct these unforeseen deferred tests in the same manner as deferred tests.

.4 Correct deficiencies and make necessary adjustments to O&M manuals, Commissioning documentation, and as-built drawings for applicable issues identified in any seasonal testing.

.3 Electrical Testing Agency (ETA):

.1 The Contractor shall retain an independent Electrical Testing Agency (ETA). Their specific testing responsibilities include checking and testing of the electrical power distribution equipment per National Electrical Testing Association (NETA).

.2 Attend Pre-Commissioning Meeting(s), Pre-Installation Meeting(s), and other Project meetings scheduled by the Contractor to facilitate the Commissioning process.

.3 Obtain all required manufacturer's data to facilitate tests.

.4 Provide assistance to the Contractor in preparation of the specific Pre-functional Checklist and Functional Performance Test procedures. Generally ETA shall provide their standard forms to document the NETA tests to be incorporated into the Pre-functional Checklist and Functional Performance Tests record.

.5 During related tests, execute and document the tests in the approved forms and/or test record.

.6 Perform and clearly document all completed Start-up and system operational checkout procedures, providing a copy to the Contractor.

.7 Clearly indicate any deficiencies identified during testing and add to an action list for resolution and tracking. The field technicians shall keep a running log of events and issues. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, Contract interpretation requests and lists of completed tests to the Contractor at least twice a week and provide technical assistance in the resolution of deficiencies.

.8 Provide skilled technicians to execute testing. Ensure that they are available and present during the agreed-upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem solving.

.9 Warranty Phase: Perform thermographic imaging of loaded panel at time designated by Electrical Subcontractor or Contractor.

3.2 INSTALLATION

.1 Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

.2 All installation shall be in accordance with manufacturer's published recommendations.

3.3 TESTING

.1 Acceptance tests:

.1 Follow the Acceptance Test procedures specified in this Section.

.2 Pre-functional Checklists and Start-up:

.1 Follow the Start-up and initial checkout procedures specified by Manufacturer for specific equipment. Start-up and complete systems and sub-systems so they are fully functional, meeting the requirements of the Contract Documents.

.2 Pre-functional Checklists shall be complete prior to commencement of a Functional Performance test.

.3 Functional Performance Tests:

.1 Functional Performance Tests are conducted after system Start-up and checkout is satisfactorily completed.

.2 Refer to specifications for specific details on the required Functional Performance Tests.

.4 Coordination Between Testing Parties:

.1 Factory Start-ups: Factory Start-ups are specified for certain equipment. Factory Start-ups generally are Start-up related activities that will be reviewed and checked prior to Functional Performance Tests. All costs associated with factory Start-ups shall be included with the contract price unless otherwise noted. Notify the Commissioning Team of the factory Start-up schedule and coordinate these factory Start-ups with witnessing parties. The Commissioning Team members may witness these Start-ups at their discretion.

.2 Independent Testing Agencies: For systems that specify testing by an independent testing agency, the cost of the test shall be included in the Contract price unless otherwise noted. Testing performed by independent agencies may cover aspects required in the Pre-functional Checklists, Start-ups, and Functional Performance Tests. Coordinate with the independent testing agency so that Owner and/or A/E can witness the test to ensure that applicable aspects of the test meet requirements.

3.4 TRAINING

.1 Submit a written training plan to the Owner and Architect/Engineer for review and approval. Contractor's training plan shall cover the following elements:

.1 Equipment included in training.

.2 Intended audience.

.3 Location of training.

.4 Objectives.

.5 Subjects covered.

.6 Duration of training on each subject.

.7 Instructor for each subject.

.8 Methods (classroom lecture, video, Site walk-through, actual operational demonstrations, written handouts, etc.).

.9 Instructors and qualifications.

.2 Contractor shall have the following training responsibilities:

.1 Provide a training plan ten (10) calendar days prior to the scheduled training, in accordance with Division 01.

.2 Provide Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned mechanical equipment or system.

.3 Training shall start with classroom sessions, if necessary, followed by hands-on training on each piece of equipment, which shall illustrate the various modes of operation, including Start-up, shutdown, fire/smoke alarm, power failure, etc.

.4 During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

.5 The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This representative may be the Start-up technician for the piece of equipment, the installing contractor, or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.

.6 The training sessions shall follow the outline in the Table of Contents of the O&M manual and illustrate whenever possible the use of the O&M manuals for reference.

.7 Training shall include:

.1 Usage of the printed installation, operation and maintenance instruction material included in the O&M manuals.

.2 Review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include Start-up, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.

.3 Discussion of relevant health and safety issues and concerns.

.4 Discussion of warranties and guarantees.

.5 Common troubleshooting problems and solutions.

.6 Explanation of information included in the O&M manuals and the location of all plans and manuals in the facility.

.7 Discussion of any peculiarities of equipment installation or operation.

.8 Hands-on training shall include Start-up, operation in all modes possible, including manual, shutdown, and any emergency procedures and maintenance of all pieces of equipment

.9 Training shall occur after Functional Performance Tests are complete and shall be scheduled with the Owner's Project Manager.

.3 Provide training on each system/piece of equipment according to the following schedule:

Hours	System
8 hours minimum	Normal Power & Distribution Systems
2 hours minimum	Lighting
3 hours minimum	Fire Alarm System
4 hours minimum	Lighting Controls
3 hours minimum	Emergency Generator and Emergency Power System
2 hours minimum	Uninterruptible Power System (UPS)
2 hours minimum	Telecommunications and Data
3 hours minimum	Miscellaneous Systems

END OF SECTION

PANELBOARDS BREAKER TYPE, SECTION 26 24 16.01

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No. 29-11, Panelboards and Enclosed Panelboards.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit manufacturer shop drawings.

.2 Include on drawings:

.1 Electrical detail of panel, branch breaker type, quantity, ampacity, interrupting ratings, bus type, enclosure type and size.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 10 - Closeout.

.2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect panelboards from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No. 29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250 and 600 V panelboards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity or as indicated on drawings, whichever is highest.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Minimum of 2 flush locks for each panel board.

.6 Two keys for each panelboard and key panelboards alike.

.7 Copper bus with neutral of same ampere rating of mains.

.8 Mains: suitable for bolt-on breakers.

.9 Trim with concealed front bolts and hinges.

.10 Trim and door finish: baked enamel.

.11 Isolated ground bus.

.12 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers or as shown on drawings.

.5 Lock-on devices for fire alarm, emergency, exit circuits.

2.3 EQUIPMENT IDENTIFICATION

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

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.

2.4 MANUFACTURERS

.1 Design is based on Eaton Cutler Hammer Canada

.2 Acceptable Products:

.1 Eaton Cutler Hammer Canada
.2 Schneider Electric Canada
.3 Siemens Canada
.4 General Electric Canada

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Mount panelboards to height specified in Section 26 05 00 - Common Work Results for Electrical or as indicated.

.3 Connect loads to circuits.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with 01 74 00 - Cleaning and Waste Processing.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by panelboards installation.

END OF SECTION

PANELBOARDS SWITCH AND FUSE TYPE, SECTION 26 24 16.02

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA C22.2 No. 29-M1989 (R2000), Panelboards and Enclosed Panelboards.

.2 Department of Justice Canada (Jus).

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

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.4 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit shop drawings and include electrical detail and dimensions of panel, branch switch type, fuse types, ampacity and quantity.

1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 00 73 13 - KAP Health and Safety.

Part 2 Products

2.1 PLANT ASSEMBLY

.1 Assemble panelboard interior before shipment. Ship fuses loose for on site installation.

.2 In addition to CSA requirements, manufacturer's nameplates must show fault current that panelboard has been built to withstand.

2.2 CONSTRUCTION FEATURES

.1 Fuse and switch type panelboards: to CSA C22.2 No. 29.

.2 Panelboards: product of one manufacturer.

.3 Sequence phase bussing with odd numbered sections on left and even on right, with each section identified by permanent number identification as to circuit number and phase.

.4 Panelboards with mains, number of circuits, and number and size of branch sections as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Copper bus with neutral of same ampere rating as mains.

.7 Suitable for plug-in fusible sections.

.8 Trim and door finish: baked grey enamel.

.9 Fusible pull-outs or door-operated type switches not acceptable.

.10 Fuse clips: suitable for type of fuses specified for each unit.

.11 Fuses: in accordance with Section 26 28 13.01 - Fuses - Low Voltage, sizes as indicated.

2.3 CUSTOM BUILT PANELBOARD ASSEMBLIES

.1 Double stack panels as indicated.

.2 Contactors in mains as indicated.

.3 Feed through lugs as indicated.

2.4 EQUIPMENT IDENTIFICATION

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

.2 Nameplate for each panel size 4 engraved "Panel (Name)".

.3 Nameplate for each circuit in distribution panels size 2 engraved "name of load" as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit. Install circuit directory under plastic protective cover on front of panel.

2.5 MANUFACTURERS

.1 Design is based on Eaton Cutler Hammer Canada Acceptable Products:

.1 Eaton Cutler Hammer Canada
.2 Schneider Electric Canada
.3 Siemens Canada
.4 General Electric Canada

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Locate panelboards as indicated and mount securely, plumb, and square, to adjoining surfaces.

.2 Mount panels to height specified in Section 26 05 00 - Common Work Results - Electrical or as indicated.

.3 Connect loads to circuits.

.4 Connect neutral conductors to common neutral bus.

END OF SECTION

WIRING DEVICES, SECTION 26 27 26

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No. 42-10, General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CAN/CSA C22.2 No. 42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.3 CSA C22.2 No. 55-M1986(R2008), Special Use Switches.

.4 CSA C22.2 No. 111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 10 - Closeout.

.2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wiring devices from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SWITCHES

.1 15 or 20A, 120V, single pole, double pole, three-way, four-way switches to: CSA C22.2 No. 55 and CSA C22.2 No. 111.

.2 Decora style: All areas except mechanical, electrical and outdoor areas.

.3 Manually-operated general purpose AC switches with following features:

- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine moulding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 Ivory toggle.

.4 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads and heating loads.

.5 Switches of one manufacturer throughout project.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125V, 15A, U ground, to: CSA C22.2 No. 42 with following features:

- .1 Decora style: All areas except mechanical, electrical rooms and outdoor areas.
- .2 Ivory urea moulded housing.
- .3 Suitable for No. 10 AWG for back and side wiring.
- .4 Break-off links for use as split receptacles.
- .5 Eight back wired entrances, four side wiring screws.
- .6 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125V, 15A, U ground with following features:

- .1 Ivory urea moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.
- .3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles fed from Central UPS to be red colour.

.5 Receptacles of one manufacturer throughout project.

2.3 SPECIAL WIRING DEVICES

.1 Special wiring devices:

- .1 Clock hanger outlets, 15A, 125V, 3 wire, grounding type, suitable for No. 10 AWG for installation in flush outlet box.

.2 Electric shaver outlets, 15A, 125V, AC with 20 VA isolating transformer with chrome plated cover plate marked RAZOR ONLY.

.3 Pilot lights as indicated, with neon type 0.04 W, 125 V lamp and red plastic jewel lense flush type.

2.4 WIRING DEVICES FOR COMPUTER ROOMS

.1 Duplex receptacles, CSA type 5-15 R, 125V, 15A, U ground, to: CSA C22.2 No. 42 with following features:

.1 Decora style: All areas except mechanical, electrical rooms and outdoor areas.

.2 Orange urea moulded housing.

.3 Suitable for No. 10 AWG for back and side wiring.

.4 Break-off links for use as split receptacles.

.5 Eight back wired entrances, four side wiring screws.

.6 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125V, 15A, U ground with following features:

.1 Orange urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.5 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No. 42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Stainless steel, vertically brushed, 1 mm thick cover plates plastic ivory brown cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.4 Sheet metal Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.6 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

2.7 MANUFACTURERS

.1 Acceptable Products:

.1 Legrand Canada
.2 Leviton Canada
.3 Hubbell Canada
.4 Or approved equivalent

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.
.2 Install switches in gang type outlet box when more than one switch is required in one location.
.3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical as indicated.
.4 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
.5 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical as indicated.
.6 Where split receptacle has one portion switched, mount vertically and switch upper portion.
.7 Install GFI type receptacles as indicated.

.2 Cover plates:

.1 Install suitable common cover plates where wiring devices are grouped.
.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Processing.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

FUSES - LOW VOLTAGE, SECTION 26 28 13.01

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 26 28 23 - Disconnect Switches - Fused and Non-Fused

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide fuse performance data characteristics for each fuse type and size above 100 A. Performance data to include: average melting time-current characteristics.

.3 Shop Drawings:

.1 Provide shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Store fuses in original containers in storage cabinet moisture free location.

1.4 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 10 - Closeout.

.2 Three spare fuses of each type and size installed above 600 A.

.3 Six spare fuses of each type and size installed up to and including 600 A.

Part 2 Products

2.1 FUSES - GENERAL

.1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.

.2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

.1 Class L fuses.

.1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Type L2, fast acting. Class J fuses.

.3 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.4 Type J2, fast acting.

.2 Class R -R fuses.

.1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.

.2 Type R2, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.

.3 Class C fuses.

2.3 FUSE STORAGE CABINET

.1 Fuse storage cabinet, manufactured from 2.0 mm thick aluminum 750 mm high, 600 mm wide, 300 mm deep, hinged, lockable front access door finished in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.4 MANUFACTURERS

.1 Acceptable Products:

.1 Ferraz Shawmut (Mersen)

.2 Cooper Bussman

Part 3 Execution

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit. Ensure correct fuses fitted to physically matched mounting devices.

.1 Install rejection clips for Class R fuses.

.2 Ensure correct fuses fitted to assigned electrical circuit.

.3 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.

.4 Install spare fuses in fuse storage cabinet.

END OF SECTION

MOULDED CASE CIRCUIT BREAKERS, SECTION 26 28 16.02

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 26 24 13 - Switchboards.

.3 Section 26 24 16.01 - Panelboards Breaker Type.

.4 Section 26 24 16.02 - Panelboards Switch and Fuse Type.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Include time-current characteristic curves for breakers with ampacity of 100 A and over or with interrupting capacity of 10,000 A symmetrical (RMS) and over at system voltage.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters, Fused circuit breakers, and Accessory high-fault protectors: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.4 Common-trip breakers: with single handle for multi-pole applications.

.5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.6 Circuit breakers with interchangeable trips as indicated.

.7 Circuit breakers to have minimum symmetrical RMS interrupting capacity rating as shown on electrical panel schedules.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS DESIGN B

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 CURRENT LIMITING AND SERIES RATED THERMAL MAGNETIC BREAKERS DESIGN C

.1 Thermal magnetic breakers with current limiters.

.1 Time current limiting characteristics of fuses limiters coordinated with time current tripping characteristics of circuit breaker.

.2 Co-ordination to result in interruption by breaker of fault-level currents up to interrupting capacity of breaker.

.2 Series rated breakers to be manufacturer tested and listed. Breakers to be applied following manufacturer's guidelines and accepted best practice.

.1 Breakers applied following manufacturer's guidelines and accepted best practice.

2.5 SOLID STATE TRIP BREAKERS DESIGN D

.1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time short time instantaneous tripping for phase ground fault short circuit protection.

2.6 OPTIONAL FEATURES

.1 Include:

.1 Shunt trip.

.2 Auxiliary switch.

.3 Motor-operated mechanism complete with time delay unit.

.4 Under-voltage release.

.5 On-off locking device.

.6 Handle mechanism.

2.7 ENCLOSURE

.1 Refer to electrical panel schedules.

2.8 MANUFACTURERS

.1 Design is based on Eaton Cutler Hammer Canada

.2 Acceptable Products:

.1 Eaton Cutler Hammer Canada
.2 Schneider Electric Canada
.3 Siemens Canada
.4 General Electric Canada

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

GROUND FAULT CIRCUIT INTERRUPTERS - CLASS 'A', SECTION 26 28 20

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 PAYMENT

.1 Payment for field testing of ground fault equipment performed by Contractor or equipment manufacturer in accordance with Section 01 29 83 - Payment Procedures: Testing Laboratory Services.

1.3 REFERENCES

.1 CSA International

.1 CAN/CSA C22.2 No. 144-M91(R2006), Ground Fault Circuit Interrupters.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA PG 2.2-1999(R2009), Application Guide for Ground Fault Protection Devices for Equipment.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for ground fault circuit interrupters and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit manufacturer's drawings.

.4 Test and Evaluation Reports: submit test report for field testing of ground fault equipment to Consultant and certificate that system as installed meets criteria specified.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 10 - Closeout.

.2 Operation and Maintenance Data: submit operation and maintenance data for ground fault circuit interrupters for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect ground fault circuit interrupters from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA C22.2 No. 144 NEMA PG 2.2.

.2 Components comprising ground fault protective system to be of same manufacturer.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Single or Two pole ground fault circuit interrupter for 15A, 120V or 208V, 1 phase circuit c/w test and reset facilities.

2.3 GROUND FAULT LIFE PROTECTOR

.1 2 pole circuit breaker to supply power to mains of a single-phase panel and complete with:

.1 Automatic shunt trip breaker.

.2 Zero sequence current sensor.

.3 Facilities for testing and reset.

.4 CSA Enclosure, as shown in Panel Schedules.

.5 Ground fault trip indicator light.

2.4 GROUND FAULT PROTECTOR UNIT

.1 Self-contained with 15 A, 120 V circuit interrupter and duplex receptacle complete with:

.1 Solid state ground sensing device.

.2 Facility for testing and reset.

.3 CSA Enclosure 1, surface or flush mounted with stainless steel painted face plate.

2.5 MANUFACTURERS

.1 Design is based on Eaton Cutler Hammer Canada

.2 Acceptable Products:

.1 Eaton Cutler Hammer Canada

.2 Schneider Electric Canada

.3 Siemens Canada

.4 General Electric Canada

Part 3 Execution

3.1 INSTALLATION

.1 Do not ground neutral on load side of ground fault relay. Pass phase conductors including neutral through zero sequence transformers.

.2 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and co-ordinate with Section 01 45 00 - Quality Control, if required.

.2 Arrange for field testing of ground fault equipment by ground fault equipment manufacturer before commissioning service.

.3 Demonstrate simulated ground fault tests.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Processing.

END OF SECTION

DISCONNECT SWITCHES - FUSED AND NON-FUSED, SECTION 26 28 23

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No. 4-M89 (R2000), Enclosed Switches.

.2 CSA C22.2 No. 39-M89 (R2003), Fuseholder Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 00 73 13 - KAP Health and Safety.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Fusible, non-fusible, horsepower rated disconnect switches in CSA Enclosures, to CAN/CSA C22.2 No. 4, size as indicated.

.2 Provision for padlocking in Off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.

.5 Fuseholders: to CSA C22.2 No. 39 relocatable and suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

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

.2 Indicate name of load controlled on size 4 nameplate.

2.3 MANUFACTURERS

.1 Design is based on Eaton Cutler Hammer Canada

.2 Acceptable Products:

.1 Eaton Cutler Hammer Canada
.2 Schneider Electric Canada
.3 Siemens Canada
.4 General Electric Canada

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

CONTACTORS, SECTION 26 29 01

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No. 14-10, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 2-2000 (R2005), Controllers, Contactors and Overload Relays Rated 600 V.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for contactors and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 10 - Closeout.

.2 Operation and Maintenance Data: submit operation and maintenance data for contactors for incorporation into manual.

.3 Include operating information required for start-up, synchronizing and shutdown of generating units.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect contactors from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CONTACTORS

.1 Contactors: to CSA C22.2 No. 14.

.2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.

.3 Breaker or fused switch combination contactor as indicated.

.4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.

.5 Mount in CSA NEMA Enclosure as shown on drawings.

.6 Include following options in cover (if shown on drawings):

- .1 Red Green indicating lamp.
- .2 Stop-Start pushbutton.
- .3 Hand-Off-Auto selector switch.
- .4 On-Off selector switch.

.7 Control transformer: in accordance with Section 26 29 03 - Control Devices, factory wired and installed in contactor enclosure.

2.2 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Size 4 nameplate indicating name of load controlled as indicated.

2.3 MANUFACTURERS

.1 Design is based on Eaton Cutler Hammer Canada

.2 Acceptable Products:

- .1 Eaton Cutler Hammer Canada
- .2 Schneider Electric Canada
- .3 Siemens Canada
- .4 General Electric Canada

Part 3 Execution

3.1 INSTALLATION

.1 Install contactors and connect power wires and auxiliary control devices.

.2 Identify contactors with nameplates or labels indicating panel and circuit number.

.3 Test contactors in accordance with 26 05 00 - Common Work Results for Electrical.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with 01 74 00 - Cleaning and Waste Processing.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by contactor installation.

END OF SECTION

MOTOR STARTERS TO 600 V, SECTION 26 29 10

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 NEMA/EEMAC Rated Starters:

.1 NEMA/EEMAC Rated Starters, CSA C22.2, NO 14, EEMAC 14-1

.2 International Electrotechnical Commission (IEC)

.1 IEC 947-4-1-2002, Part 4: Electromechanical contactors and motor-starters.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Provide shop drawings for each type of starter to indicate:

.1 Mounting method and dimensions.

.2 Starter size and type.

.3 Layout and components.

.4 Enclosure types.

.5 Wiring diagram.

.6 Interconnection diagrams.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 10 - Closeout.

.2 Submit operation and maintenance data for each type and style of motor starter for incorporation into maintenance manual.

.3 Extra Materials:

.1 Provide listed spare parts for each different size and type of starter.

.1 3 contacts, stationary.

.2 3 contacts, movable.

.3 1 contacts, auxiliary.

.4 1 control transformer.

.5 1 operating coil.

.6 2 fuses.

.7 10% indicating lamp bulbs used.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00 - Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 MATERIALS

.1 Starters: to IEC 947-4 with AC4 utilization category.

2.2 MANUAL MOTOR STARTERS

.1 Single or Three phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:

.1 Switching mechanism, quick make and break.

.2 One or Three overload heaters, manual reset, trip indicating handle.

.2 Accessories:

.1 Toggle Key switch or pushbutton: heavy duty, oil tight labelled as indicated.

.2 Indicating light: heavy duty, oil tight type and colour as indicated.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Wiring and schematic diagram inside starter enclosure in visible location.

.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include fused disconnect switch, motor circuit interrupter or circuit breaker with operating lever on outside of enclosure to control disconnect, motor circuit interrupter, or circuit breaker, and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:

.1 Pushbuttons Selector switches: heavy duty, oil tight labelled as indicated.

.2 Indicating lights: heavy duty, oil tight type and color as indicated.

.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.4 FULL VOLTAGE REVERSING MAGNETIC STARTERS

.1 Full voltage reversing magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Two - 3 pole magnetic contactors mounted on common base.

.2 Mechanical and electrical interlocks to prevent both contactors from operating at same time.

.3 Three overload relays with heater elements, manual or automatic reset.

.2 Accessories:

.1 Pushbuttons or Selector switches: heavy duty, oil tight labelled as indicated.

.2 Indicating lights: heavy duty, oil tight type and color as indicated.

.3 Auxiliary control devices as indicated.

2.5 MULTI-SPEED STARTERS

.1 2 speed starters of size, type, rating and enclosure type as indicated. Starter suitable for constant torque or variable torque or constant kW type motor and with components as follows:

.1 One-3 pole contactor for each winding for separate winding motors.

.2 One-3 pole and one-5 pole contactor for each re-connectable winding for consequent pole type motors.

.3 Three overload relays with 3 heater elements and manual reset for each speed.

.2 Accessories:

.1 Pushbuttons Selector switches: heavy duty, oil tight labelled as indicated.

.2 Indicating lights: heavy duty, oil tight, type and color as indicated.

.3 Auxiliary control devices as indicated.

.4 Low speed compelling relay or automatic sequence, accelerating or decelerating relays for each speed.

2.6 MAGNETIC STARTER, REDUCED VOLTAGE, AUTO-TRANSFORMER

.1 Auto-transformer starter closed circuit transition type, of size, type, rating and enclosure type as indicated and with following components:

.1 Three-3 pole contactors.

.2 Auto-transformer with 50%, 65% and 80% taps.

.3 One adjustable pneumatic timing relay.

.4 One-3 pole manual reset overload device.

.5 Thermal overload protection of auto-transformers.

.2 Accessories:

.1 Pushbuttons or Selector switches: heavy duty, oil tight labelled as indicated.

.2 Indicating lights: heavy duty, oil tight type and color as indicated.

.3 Auxiliary control devices as indicated.

2.7 MAGNETIC STARTER REDUCED VOLTAGE STAR-DELTA

.1 Reduced voltage star-delta open transition starter, of size, type, rating and enclosure type as indicated, with components as follows:

.1 Two-3 pole delta contactors with auxiliary relays and interlocks.

.2 One-3 pole star contactor with auxiliary relays and interlocks.

.3 Mechanical interlock to interlock one delta contactor and the star contactor.

.4 One timing relay.

.5 Three pole manual or automatic reset overload relays.

.2 Reduced voltage star-delta closed transition starter, of size, type, rating and enclosure type as indicated, with components as follows:

.1 Two-3 pole delta contactors with auxiliary relays and interlocks.

.2 One-3 pole star contactor with auxiliary relay and interlocks.

.3 One-3 pole transition contactor.

.4 One set of transition resistors.

.5 Mechanical interlock, to interlock one delta contactor and the star contactor.

.6 One timing relay.

.7 Three pole manual or automatic reset overload relays.

.3 Accessories:

.1 Pushbuttons or Selector switches: heavy duty, oil tight labelled as indicated.

.2 Indicating lights: heavy duty, oil tight, type and color as indicated.

.3 Auxiliary control devices as indicated.

2.8 MAGNETIC STARTER REDUCED VOLTAGE PART WINDING

.1 Two-step reduced voltage, part winding starter of size, type, rating and enclosure type as indicated, with components as follows:

.1 Two-3 pole contactors.

.2 Adjustable pneumatic timer.

.3 Six manual or automatic reset overload relays.

.2 Three step reduced voltage part winding starter of size, type, rating and enclosure type as indicated, with components as follows:

.1 Three-3 pole contactors.

.2 One set starting resistors.

.3 Six manual or automatic reset overload relays.

.3 Accessories:

.1 Pushbuttons or Selector switches: heavy duty, oil tight labelled as indicated.

.2 Indicating lights: heavy duty, oil tight type and color as indicated.

.3 Auxiliary control devices as indicated.

2.9 THREE PHASE MANUAL REVERSING STARTER

.1 Three phase manual reversing starter of size, type, rating and enclosure type as indicated, with components as follows:

.1 Two-3 pole manual motor starters, quick make and break.

.2 Six overload relays and manual reset.

.3 Mechanical interlock to prevent both switches from closing at same time.

.2 Accessories:

.1 Pushbuttons or Selector switches: heavy duty oil tight labelled as indicated.

.2 Indicating lights: heavy duty oil tight type and colour as indicated.

2.10 THREE PHASE MANUAL TWO SPEED SEPARATE WINDING STARTERS

.1 Three phase manual two speed separate winding starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Two-3 pole manual motor starters, quick make and break.

.2 Six overload relays and manual reset.

.3 Mechanical interlock to prevent both switches from closing at same time.

.2 Accessories:

.1 Pushbuttons or Selector switches: heavy duty oil tight labelled as indicated.

.2 Indicating lights: heavy duty oil tight type and colour as indicated.

2.11 DC FULL VOLTAGE NON-REVERSING STARTERS

.1 dc full voltage non-reversing starters of size, type, rating and enclosure type as indicated, with components as follows:

.1 Contactor: single or two pole solenoid operated type.

.2 Indirectly-heated, manual reset thermal overload relay.

.2 Accessories:

.1 Pushbuttons: heavy duty, oil tight labelled as indicated.

.2 Selector switches: heavy duty, oil tight labelled as indicated.

.3 Indicating lights: heavy duty, oil tight type and colour as indicated.

2.12 DC FULL VOLTAGE REVERSING STARTERS

.1 Dc full voltage reversing starter of size, type, rating and enclosure type as indicated, with components as follows:

.1 Two contactors: single or two pole solenoid operated type, mechanically and electrically interlocked.

.2 Indirectly-heated, manual reset thermal overload relay.

.2 Accessories:

.1 Pushbutton or Selector switches: heavy duty labelled as indicated.

.2 Indicating lights: heavy duty, oil tight, type and colour as indicated.

.3 Auxiliary control devices as indicated.

2.13 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.14 ACCESSORIES

.1 Pushbutton: heavy duty, oil tight as required.

.2 Selector switches: heavy duty, oil tight as required.

.3 Indicating lights: heavy duty, oil tight, type and colour as indicated.

2.15 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.16 EQUIPMENT IDENTIFICATION

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

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 Magnetic starter designation label, white plate, black letters, size 6 mm engraved as indicated.

2.17 MANUFACTURERS

.1 Design is based on Eaton Cutler Hammer Canada

.2 Acceptable products:

.1 Eaton Cutler Hammer Canada

.2 Schneider Electric Canada

.3 Siemens Canada

.4 General Electric Canada

Part 3 Execution

3.1 INSTALLATION

.1 Install starters and control devices in accordance with manufacturer's instructions.

.2 Install and wire starters and controls as indicated.

.3 Ensure correct fuses installed.

.4 Confirm motor nameplate and adjust overload device to suit.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and manufacturer's instructions.

.2 Operate switches and contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

3.3 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

LIGHTING, SECTION 26 50 00

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.

.2 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.3 ASTM International Inc.

.1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Canadian Standards Association (CSA International)

.5 ICES-005-07, Radio Frequency Lighting Devices.

.6 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.

.3 Photometric data to include: VCP Table where applicable spacing criterion.

.3 Samples:

.1 Provide samples if indicated on drawings or requested by the Owner during construction.

.4 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.

.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.4 QUALITY ASSURANCE

.1 Provide mock-ups if indicated on drawings or requested by the Owner during construction, in accordance with Section 01 45 00 - Quality Control.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Divert unused metal materials from landfill to metal recycling facility.

.4 Disposal and recycling of fluorescent lamps as per local regulations.

.5 Disposal of old PCB filled ballasts.

Part 2 Products

2.1 LAMPS

.1 Lamp wattages and types as shown on lighting schedule.

2.2 BALLASTS

.1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic or IC electronic dimmable, as indicated.

.1 Rating: voltage as indicated, for use with instant start lamps.
.2 Totally encased and designed for 40 degrees Celsius ambient temperature.
.3 Power factor: minimum 95% with 95% of rated lamp lumens.
.4 Current crest factor: 1.7 maximum.
.5 Harmonics: 10 % maximum THD.
.6 Operating frequency of electronic ballast: 20 kHz minimum.
.7 Total circuit power: 62 Watts.
.8 Ballast factor: greater than 0.90.
.9 Sound rated: Class A.
.10 Mounting: remote or integral with luminaire as shown on luminaire schedule.
.11 Mounting: indoor, outdoor, remote or integral with luminaire, as shown on luminaire schedule.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

.1 As indicated on lighting schedule.

2.5 LUMINAIRES

.1 As indicated on lighting schedule.

2.6 MANUFACTURERS

.1 As indicated on lighting schedule.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Luminaires shall be independently supported to the building structure.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning and Waste Processing.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

SOIL MATERIALS, SECTION 31 05 13

Part 1 General

1.1 SECTION INCLUDES

.1 Subsoil materials.

.2 Topsoil materials.

1.2 RELATED SECTIONS

.1 Section 31 05 16 - Aggregate Materials.

.2 Section 31 22 19 - Finish Grading.

.3 Section 31 23 18 - Trenching.

.4 Section 31 23 23 - Backfilling.

.5 Section 32 92 20 - Seeding.

1.3 REFERENCES

.1 OPSS MUNI 314 Nov. 2023

.2 OPSS MUNI 511 Nov. 2019

.3 OPSS MUNI 802 Nov. 2019

.4 OPSS MUNI 1004 Nov. 2021

.5 OPSS MUNI 1010 Nov. 2013

.6 AASHTO T180-09 - Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 inch) Drop.

.7 ASTM D698-07e1 - Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/cu ft (600 kN-m/cu m)).

.8 ASTM D1557-09 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu ft (2,700 kN-m/cu m)).

.9 ASTM D2487-06e1 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submission procedures.

.2 According to OPSS 1010.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

.2 Grade Checks According to OPSS 314.07.09.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Closeout Submittals.

1.7 QUALITY ASSURANCE

.1 OPSS MUNI 314

.2 OPSS MUNI 1010

Part 2 Products

2.1 MATERIALS

.1 OPSS MUNI 1004.

.2 OPSS MUNI 1010.

2.2 TOPSOIL MATERIALS

.1 OPSS MUNI 802.05.

2.3 SOURCE QUALITY CONTROL

.1 Testing and Analysis of Subsoil Material: Perform to ASTM D698 ASTM D1557 AASHTO T180.

.2 If tests indicate materials do not meet specified requirements, change material and retest.

.3 Provide materials of each type from same source throughout the Work.

Part 3 Execution

3.1 Construction

.1 According to OPSS MUNI 802.07.

END OF SECTION

AGGREGATE MATERIALS, SECTION 31 05 16

THIS SECTION IS AN AMENDMENT TO ONTARIO PROVINCIAL STANDARD SPECIFICATIONS 314 & 1010

THE CCDC-2 GENERAL CONDITIONS STILL APPLY TO THIS SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Aggregate materials.

1.2 RELATED SECTIONS

.1 Testing aggregate fill materials According to OPSS 314, 1004, and 1010.

.2 Section 31 05 13 - Soil Materials.

.3 Section 31 22 19 - Finish Grading.

.4 Section 31 23 18 - Trenching.

.5 Section 31 23 23 - Backfilling.

1.3 REFERENCES

.1 OPSS. MUNI 314 Nov. 2023

.2 OPSS.MUNI 1010 Nov. 2013

.3 AASHTO M147-65(2004) - Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses.

.4 AASHTO T180-09 - Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 inch) Drop.

.5 ASTM C136-06 - Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM D698-07e1 - Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/cu ft (600 kN-m/cu m)).

.7 ASTM D1557-09 - Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu ft (2,700 kN-m/cu m)).

.8 ASTM D6938 – Standard test method for in-place density and water content of soil and soil aggregate by nuclear methods (shallow depth).

.9 ASTM D2487-10 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).

.10 ASTM D4318-10 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.4 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submittal procedures.

.2 Samples: According to OPSS MUNI 1010.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submittal procedures.

.2 Materials Source: Submit name of imported materials suppliers.

1.6 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Closeout.

1.7 QUALITY CONTROL

.1 Section 01 45 00 Quality Control.

.2 OPSS MUNI 314

.3 OPSS MUNI 1010

.4 **OPSS 1010.08.01 General is amended by the addition of the following:**

QA testing shall be carried out by the Owner for purposes of ensuring that materials used in the Work conform to the physical and production requirements of this special provision. Where materials contain blended or reclaimed aggregates or both, QA samples for testing shall be performed on the final Product.

OPSS 1010.08.03 Sampling is amended by the addition of the following:

QA sampling and testing shall be based on lots established for each aggregate type: Granular A, O, B, M, and SSM. Where more than one aggregate source is used, separate lots shall also be established for each source. Where aggregates are produced with blended or reclaimed materials or both, QA testing shall be performed on the final Product.

Notwithstanding the requirements for QA sampling as indicated in this specification, the Owner reserves the right to obtain a QA sample at any time without notice.
Either QA test results or referee test results, where applicable will be used for the acceptance of physical and production property requirements of this specification. QA testing for physical properties may be waived by the contract Administrator where the delivered quantity of Granular A, O, B, M, or SSM is less than 5,000 tonnes.

Aggregates may be rejected based on the visual identification of unacceptable materials.

QA samples shall be taken in accordance with LS-625 and shall be road samples or delivery samples obtained from the Work at a location determined by the Contract Administrator.

Where required, the Contractor shall provide a front-end loader to obtain material for QA samples.

Where it is not possible to take road or delivery samples, samples of compacted material taken with the permission of the Owner will be used for QA purposes.

In the event that the Contractor is unavailable to take a sample, no further materials shall be placed in the Work until the required QA samples have been taken.

The Contractor shall provide new or clean sample bags or containers that are constructed to prevent the loss of any part of the material or contamination or damage to the contents during shipment. Metal or cardboard containers are unacceptable. QA samples shall be identified both inside and outside of the sample container. Data to be included with QA samples shall conform to the requirements of MTO Form PH-D-10 (Sample Data Sheet).

All QA samples shall have a duplicate sample taken at the same time and location as the QA sample. One of the samples shall be randomly selected for testing by the QA laboratory and the remaining sample shall be retained by the QA laboratory for possible referee testing.

Physical Properties

QA lots for physical properties shall consist of no more than 25,000 tonnes of material. All materials delivered to the Work shall be included within a lot. At least one QA sample shall be randomly obtained from within each lot.

OPSS 1010.08.05 Acceptance is amended by the addition of the following:

1010.08.05.01 Testing of Physical Properties

The QA laboratory shall carry out testing for each physical property requirement given in Table 1, as applicable for each QA sample.

1010.08.05.02 Production Properties

QA for production properties shall consist of sampling and testing of lots selected from material delivered to the Work. The Contract Administrator shall identify each lot according to the following schedule:

i. One lot consisting of the first 5,000 tonnes of material delivered to the Work

ii. a 5,000 tonne lot selected from within the next 15,000 tonnes of delivered material

iii. a 7,500 tonne lot selected from within the next 30,000 tonnes of delivered material

iv. a 10,000 tonne lot selected from within each 50,000 tonnes of delivered material thereafter

Each lot shall be divided into four equal sublots and one QA sample shall be obtained from each sublot. Sublots from different sources or processes shall not be combined within the same lot.

Where changes in source, production or delivery may result in an incomplete lot, the Contract Administrator shall be given prior notification in order to adjust sublot size. If no notification is given, payment adjustments or rejection shall be based on the number of sublots available for that lot. All lots shall be deemed to be complete at the end of each calendar year.

In the event of an incomplete lot and for sources supplying quantities less than 5,000 tonnes, the lot size will apply to the total quantity of material available. Should the size of the lot exceed the indicated quantities for any reason, any adjusted payment or removal shall apply to the entire quantity of the lot.

Where it is necessary to designate the quantity of material in a lot, or part of a lot for the purposes of rejection, the Contract Administrator's estimate of this quantity shall be used.

1010.08.05.03 Testing of Production Properties

The QA laboratory shall conduct sieve analysis (LS-602) and determine test results for each sieve designated in Table 2. The QA laboratory shall also carry out testing for percent crushed particles (LS-607), particles with two or more crushed faces (LS-617), and amount of asphalt coated particles (LS-621) as applicable.

1010.08.05.04 Acceptance of Production Properties

Test results from each sublot within a lot shall be combined to determine the mean and the range of the Lot for each test. All lot means and ranges for LS-602 and LS-607 (as applicable) will be computed to one decimal place.

A lot will be deemed to meet the applicable requirements of this specification for LS-602 and LS-607 if the mean of the lot is within the limits specified in Table 2. Where the lot does not meet the requirements of this specification, the material is rejectable.

A lot will be deemed to meet the applicable requirements of this specification for LS-617 or LS-621 if the mean value of the lot is within the limits specified in Table 2. Where the lot does not meet these requirements, the Contractor shall ensure all necessary changes required to rectify the deficiency are made. No further materials from the source will be accepted until new QC test results demonstrate that materials conform to the requirements of Table 2 for LS-617 or LS-621 have been provided to the Contract Administrator.

Table 1 of OPSS 1010 is deleted and replaced with the following Table 1.

Table 1. Physical Property Requirements

Laboratory Test	**MTO Test Number**	**Granular O**	**Granular A**	**Granular B Type I, Type III**	**Granular B Type II**	**Granular M**	**Select Subgrade Material**
Freeze-Thaw Loss, % Maximum	LS-614	15	-	-	-	-	-
Fine Aggregate Petrographic Requirement	LS-616 LS-709	(Note 1)					
Micro-Deval Abrasion Coarse Aggregate loss, % maximum	LS-618	21	25	30 (Note 2)	30	25	30 (Note 2)
Micro-Deval Abrasion Fine Aggregate loss, % maximum	LS-619	25	30	35	35	30	-
Amount of Contamination	LS-630	(Note 3)					
Plastic Fines	LS-631	NP					
Plasticity Index, max.	LS-704	0	0	0	0	0	0

Note 1: For materials north of the French/Mattawa Rivers only: for materials with > 6.0 % passing the 75 μm sieve, the amount of mica retained on the 75 μm sieve (passing 150 μm sieve) shall not exceed 10 % of the material in that sieve fraction unless testing (LS-709) determines permeability values > 1.0 x 10^{-4} cm/s and/or field experience show satisfactory performance (prior data demonstrating compliance with this requirement will be acceptable provided such testing has been done within the past five years and field performance has been satisfactory.)

Note 2: The coarse aggregate micro-Deval abrasion loss test requirement will be waived if the material has more than 80% passing the 4.75 mm sieve.

Note 3: Granular A,B Type I, B Type III, or M may contain up to 15 percent by mass crushed glass and/or ceramic material. Granular A, O, B Type I, B Type III, and M shall not contain more than 1.0 percent by mass of wood, clay brick and /or gypsum and /or gypsum wall board or plaster. Granular B Type II and SSM not contain more than 0.1 percent by mass of wood.

Table 2 of OPSS 1010 is deleted and replace with the following Table 2.

Table 2. Production Requirements

Lab Test	MTO Test Number	Granular						SSM
		O	A	B (Note 1)			M	
Sieve Analysis, % passing	LS-602 (sieve)			Type I (Note 2)	Type II	Type III (Note 2)		
	150 mm	-	-	100	-	100	-	100
	106 mm	-	-	-	100	-	-	-
	37.5 mm	100	-	-	-	-	-	-
	26.5 mm	95.0-100	100	50.0-100	50.0-100	50.0-100	-	50.0-100
	19.0 mm	80.0-95.0	85.0-100 (87.0-100) Note 3	-	-		100	-
	13.2 mm	60.0-80.0	65.0-90.0 (75.0-95.0) Note 3	-	-		75.0-95.0	-
	9.5 mm	50.0-70.0	50.0-73.0 (60.0-83.0) Note 3	-	-	32.0-100	55.0-80.0	-
	4.75 mm	20.0-45.0	35.0-55.0 (40.0-60.0) Note 3	20.0-100	20.0-55.0	20.0-90.0	35.0-55.0	20.0-100
	1.18 mm	0 –15.0	15.0-40.0	10.0-100	10.0-40.0	10.0-60.0	15.0-40.0	10.0-100
	300 μm	-	5.0-22.0	2.0-65.0	5.0-22.0	2.0-35.0	5.0-22.0	5.0-95.0
	150 μm	-	-		-		-	2.0-65.0
	75 μm	0 -5.0	2.0-8.0 (2.0-10.0) Note 4	0-8.0 (0-10.0 Note 4)	0-10.0	0-8.0 (0-10.0) Note 4	2.0-8.0 (2.0-10.0) Note 4	0-25.0
Percent Crushed, minimum	LS-607	100	60	-	100	-	60	-
2 or more crushed faces, minimum, %	LS-617	85	-	-	-	-	-	-
% Asphalt Coated Particles, Coarse Agg, max.	LS-621	0	30	30	0	30	30	0

Note 1: Where Granular B is used for granular backfill for pipe subdrains, 100 percent of the material shall pass the 37.5 mm sieve.

Note 2: Where RAP is blended with Granular B Type I or Type III, 100 percent of the RAP shall pass the 75 mm sieve. Conditions in Note 1 supersede this requirement.

Note 3: Where the aggregate is obtained from an iron blast furnace slag source.

Note 4: Where the aggregate is obtained from a quarry or blast furnace slag or nickel slag source.

1.8 Amendment to OPSS 314

OPSS 314, Construction Specification for Untreated Granular Subbase, Base, Shoulder and Stockpiling is amended as follows:

Subsection 314.03 Definitions of OPSS 314 is amended by the addition of the following:

Tolerance – Minus: a construction working tolerance only which:

a) Means narrower than the contract standard pertaining to horizontal dimensions as measured from centerline; and
b) Means lower in elevation than the contract standard pertaining to vertical dimensions.

Tolerance – Plus: a construction working tolerance only which

a) Means wider than the contract standard pertaining to horizontal dimensions as measured from centerline; and

b) Means higher in elevation than the contract standard pertaining to vertical dimensions.

1.9 314.07 CONSTRUCTION

The title of subsection 314.07.06 of OPSS 314 is deleted and replaced with the following:

314.07.06 Tolerances

Clause 314.07.06.01 of OPSS 314 is amended by the addition of the following:

In the event of a conflict between meeting horizontal grading tolerances and meeting vertical grading tolerances, the vertical grading tolerances shall take precedence.

Clause 314.07.06.02 of OPSS 314 is deleted and replaced with the following:

314.07.06.01 Tolerances for Granular Courses

All granular grade surfaces, shall, on completion, be shaped to the specified line, grade and cross section within the following tolerances, and the surface shall not deviate more than 15 mm at any place along a 3m straightedge.

a) Vertical grading tolerances of the finished granular base, subbase and shoulder:
   + 30mm
   - 30mm

b) Horizontal grading tolerances of the finished granular base, subbase and shoulder:
   + 30mm
   - 0mm

Compensation for the cleanup of the stockpile site on completion of the operation, when required, shall be included as part of the granular item cost.

Part 2 Products

2.1 AGGREGATE MATERIALS

.1 According to OPSS 1010.MUNI.

.2 Amendment to OPSS 1010.MUNI, Nov 2013.

OPSS 1010.05 is amended by the addition of the following:

.1 Granular A shall be produced from quarried bedrock.

.2 The use of air-cooled blast furnace slag, nickel slag or steel slag is prohibited.

2.2 SOURCE QUALITY CONTROL

.1 OPSS 1010.04.

END OF SECTION

REMOVALS, SECTION 31 12 14

Part 1 General

1.1 Section Includes

.1 Removal of Surface Debris.

.2 Removal of Asphalt Pavement.

.3 Removal of Concrete Curb and Gutter.

.4 Removal of Concrete Sidewalk.

.5 Removal of Storm Manholes and CBs.

.6 Removal of Sanitary Manholes.

.7 Removal of Valve Chambers.

.8 Removal of Storm Sewers and Culverts.

.9 Removal of Sanitary Sewers and Forcemains.

.10 Removal of Watermains and Appurtenances.

.11 Abandon Watermains.

.12 Removal of Steel Beam Guide Rail.

1.2 REFERENCES

.1 OPSS MUNI 180 Nov. 2021

.2 OPSS MUNI 510 Nov. 2018

Part 2 Requirements

.1 All Removals shall be according to OPSS MUNI 510 and in conjunction with the Contract Documents.

Part 3 Execution

3.1 General

.1 OPSS 510.07

3.2 Management of Excess Materials

.1 OPSS MUNI 180.

.2 Waste Materials shall be transported to the following disposal sites, at no additional costs to the Owner.

.1 Bituminous Pavement – Location to be determined by the Corporation of the Town of Iroquois Falls, assume approximately 20 km haul route (one way).

.2 Concrete and Earth – Location to be determined by the Corporation of the Town of Iroquois Falls, assume approximately 20 km haul route (one way).

.3 Pipe and contaminated soil – Location to be determined by the Corporation of the Town of Iroquois Falls, assume approximately 20 km haul route (one way).

.3 All Areas worked by the Contractor shall be trimmed and graded to a condition satisfactory to the Owner.

.4 Protect trees, plant growth, and features designated to remain, as final landscaping.

.5 Protect benchmarks, survey control points existing structures from damage or displacement.

END OF SECTION

FINISH GRADING, SECTION 31 22 19

Part 1 General

1.1 SECTION INCLUDES

.1 Final Granular 'B' and Granular 'A' Grades

1.2 RELATED SECTIONS

.1 Section 31 05 16 - Aggregate Materials

.2 Section 31 23 18 - Trenching: Backfilling Trenches

.3 Section 31 23 23 - Backfilling: Backfilling Structures

1.3 References

.1 OPSS.MUNI 314 Nov. 2019

.2 OPSS MUNI 1010 Nov. 2013

.3 OPSS MUNI 802 Nov 2019

Part 2 Products

2.1 MATERIALS

.1 OPSS.MUNI 314

.2 OPSS.MUNI 1010

Part 3 Construction

3.1 Quality Control

.1 OPSS.MUNI 314

3.2 PLACING TOPSOIL

.1 According to OPSS.MUNI 802

END OF SECTION

EXCAVATING, SECTION 31 23 16

Part 1 General

1.1 SECTION INCLUDES

.1 Excavating for new construction.

.2 Protection Systems, Sheeting and Shoring.

1.2 REFERENCES

.1 OPSS MUNI 180 Nov. 2021

.2 OPSS MUNI 206 Nov. 2019

.3 OPSS MUNI 539 Nov. 2021

1.3 SUBMISSIONS

.1 Per OPSS 539.04.02, for Temporary Protection Systems

Part 2 Execution

2.1 EXAMINATION

.1 Verify that survey bench mark and intended elevations for the Work are as indicated.

.2 OPSS 539.04.02.03, Preconstruction Survey for Temporary Protection System when necessary, by extent of excavation.

2.2 PREPARATION

.1 Identify required lines, levels, contours, and datum locations.

.2 Locate, identify, and protect utilities that remain from damage.

.3 Notify utilities for locates.

.4 Identify locations where excavation requires Protection Systems to be installed as required by Occupational Health and Safety Act and/or as identified in the Contract Documents.

.5 Design, Construction, Maintenance, Monitoring and removal of a Temporary Protection System when necessary, by extent of excavation.

.6 Protect plant life, lawns, and other features remaining as a portion of final landscaping.

.7 Protect bench marks, survey control points, existing structures, fences, sidewalks, and paving curbs that are not identified for removals from excavation operations, excavating equipment and vehicular traffic.

2.3 EXCAVATING

.1 In accordance with the Occupational Health and Safety Act

.2 Per OPSS.MUNI 206

.3 Per OPSS.MUNI 539 Temporary Protection System

.4 Waste material to be disposed of in accordance with OPSS.MUNI 180 at locations identified by the Owner or as specified in the Contract Documents at no additional costs to the Owner.

.5 The Contractor shall schedule the Work so that there will be no open excavation adjacent to a lane carrying traffic overnight and on non-Working Days except where a traffic barrier designed to restrain errant vehicles is located between the traffic and the excavation. Excavations within 4 m of lanes carrying traffic shall be backfilled with the specified material up to profile grade and compacted prior to closing down operations each day.

.6 The Contractor shall ensure that pedestrian and vehicular access to all businesses will not be disrupted.

END OF SECTION

TRENCHING, SECTION 31 23 18

Part 1 General

1.1 SECTION INCLUDES

.1 Excavating trenches for sanitary and storm sewers, sanitary forcemains and watermains.

.2 Compacted fill from top of utility bedding to subgrade elevations.

.3 Backfilling and compaction.

1.2 REFERENCES

.1 OPSS MUNI 180 Nov. 2021

.2 OPSS MUNI 206 Nov. 2019

.3 OPSS MUNI 401 Nov. 2021

.4 OPSS MUNI 410 Nov. 2018

.5 OPSS MUNI 490 Nov. 2020

.6 OPSS MUNI 492 Nov. 2020

.7 OPSS MUNI 501 Nov. 2017

.8 OPSS MUNI 517 Nov. 2021

.9 OPSS MUNI 539 Nov. 2021

1.3 DEFINITIONS

.1 Utility: Any buried pipe, duct, conduit, or cable

.2 Protection System OPSS 539.03

.3 Shoring Wall OPSS 539.03

1.4 SUBMITTALS

.1 OPSS 539.04.02

.2 OPSS 539.04.02.04.01.01, Mill Certificates.

1.5 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Closeout

Part 2 Products

2.1 MATERIALS

.1 Section 31 05 13 - Soil Materials

.2 Section 31 05 16 - Aggregate Materials

Part 3 Execution

3.1 EXAMINATION

.1 OPSS 490

.2 Section 01 31 00 – Coordination.

.3 Section 01 35 26 – Environmental Protection

3.2 PREPARATION

.1 OPSS.MUNI 490

.2 OPSS.MUNI 539.04.02.03, Preconstruction Survey

3.3 EXCAVATING

.1 Section 31 23 16 – Excavating

.2 Dewatering OPSS.MUNI 517.

.3 Stockpile excavated material in area designated by Owner and remove excess material not being used, from site as per OPSS.MUNI 180.

3.4 BEDDING AND BACKFILLING

.1 OPSS.MUNI 401

.2 OPSS.MUNI 410

.3 OPSS.MUNI 492

.4 Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

.5 Bedding material shall be Granular A as specified in Section 31 05 16 - Aggregate Materials.

.6 Bedding Depth shall be 0.150m Min. with Geotextile separator between chinked rock (if required) and bedding up to the centre of the pipe (springline).

.7 Cover material shall be Granular B type I modified (max. 26.5mm stone size) 300mm above the top of pipe followed by suitable native material as required.

.8 Compaction as per OPSS.MUNI 501.

.9 Remove surplus fill materials from site as per OPSS.MUNI 180 to locations identified elsewhere in the contract and at no additional cost to the Owner.

.10 Leave fill material stockpile areas completely free of excess fill materials.

3.5 TOLERANCES

.1 Section 01 73 00: Execution.

.2 OPSS.MUNI 206

.3 OPSS.MUNI 501

.4 OPSS 539.07.03.03, Monitoring.

.5 Pipe shall be laid straight and true to grade:

.6 Horizontal tolerance 0.020m ±

.7 Vertical tolerance 0.006m ±

3.6 PROTECTION OF FINISHED WORK

.1 OPSS.MUNI 492.

END OF SECTION

BACKFILLING STRUCTURES, SECTION 31 23 23

Part 1 General

1.1 SECTION INCLUDES

.1 Consolidation and compaction as scheduled

.2 Backfilling to structures

1.2 RELATED SECTIONS

.1 Section 01 35 91 – Restoration Procedures

1.3 REFERENCES

.1 OPSS.MUNI 402 Nov 2016

1.4 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submittal procedures

Part 2 Products

2.1 FILL MATERIALS

.1 Section 31 05 13 - Soil Materials.

.2 Section 31 05 16 - Aggregate Materials

Part 3 Execution

.1 Per OPSS.MUNI 402

END OF SECTION

SEEDING, SECTION 32 92 20

Part 1 - General

1.1 SECTION INCLUDES

.1 Preparation of subsoil.

.2 Placing topsoil.

.3 Seeding.

.4 Maintenance.

1.2 RELATED SECTIONS

.1 Section 31 05 13 - Soil Materials: Topsoil material.

.2 Section 31 22 19 - Finish Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

.3 Section 31 23 18 - Trenching: Rough grading over cut.

.4 Section 31 23 23 - Backfilling: Rough grading of site.

1.3 DEFINITIONS

.1 Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 SUBMITTALS FOR INFORMATION

.1 Section 01 33 00: Submission procedures.

1.5 CLOSEOUT SUBMITTALS

.1 Section 01 78 10: Submission procedures.

.2 Maintenance Contracts:

.1 Provide service and maintenance of seeded areas for three (3) months from Date of Substantial Completion.

.2 Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for two (2) cuttings.

.3 Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.6 QUALITY ASSURANCE

.1 Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.7 **REGULATORY REQUIREMENTS**

.1 Comply with regulatory agencies for fertilizer and herbicide composition.

1.8 **DELIVERY, STORAGE, AND PROTECTION**

.1 Section 01 61 00: Transport, handle, store, and protect products.

.2 Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

.3 Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

Part 2 - Products

2.1 **SEED SUPPLIERS**

.1 Suppliers:

.1 Contractor to submit Shop Drawings of proposed Seed Mixture.

.2 Substitutions: Refer to Section 01 62 00.

2.2 **SOIL MATERIALS**

.1 Topsoil: As specified in Section 31 05 13.

.2 Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots.

.3 Topsoil: Excavated from site and free of weeds.

2.3 **ACCESSORIES**

.1 Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks [are] [are not] acceptable.

.2 Fertilizer: Type recommended for soil and grass, with 50% of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil as indicated in analysis

.3 Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.

.4 Erosion Fabric: Jute matting, open weave.

.5 Stakes: Softwood lumber, chisel pointed.

.6 String: Inorganic fibre.

Part 3 - Execution

3.1 **EXAMINATION**

.1 Section 01 70 00: Verify existing conditions before starting work.

.2 Verify that prepared soil base is ready to receive the work of this section.

3.2 PREPARATION OF SUBSOIL

.1 Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

.2 Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

.3 Scarify subsoil to a depth of 75 mm (3 inches) where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted sub-soil.

3.3 PLACING TOPSOIL

.1 Spread topsoil to a minimum depth of 100 mm (4 inches) over area to be seeded. Rake until smooth.

.2 Place topsoil during dry weather and on dry unfrozen subgrade.

.3 Remove vegetable matter and foreign non-organic material from topsoil while spreading.

.4 Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

.5 Install edging at periphery of seeded areas in straight lines to consistent depth.

.6 Coordinate with installation of underground sprinkler system piping and watering heads.

3.4 FERTILIZING

.1 Apply fertilizer in accordance with manufacturer's written instructions.

.2 Apply after smooth raking of topsoil and prior to roller compaction.

.3 Do not apply fertilizer at same time or with same machine as will be used to apply seed.

.4 Mix thoroughly into upper 50 mm (2 inches) of topsoil.

.5 Lightly water to aid the dissipation of fertilizer.

3.5 SEEDING

.1 Do not seed areas in excess of that which can be mulched on same day.

.2 Do not sow immediately following rain, when ground is too dry, or during windy periods.

.3 Apply water with a fine spray immediately after each area has been mulched. Saturate to 100 mm (4 inches) of soil.

END OF SECTION

DIRECT BURIED UNDERGROUND CABLE DUCTS, SECTION 33 65 76

Part 1 - General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results for Electrical

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.1 Certificates: signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

.2 Manufacturer's Instructions: for installation and special handling criteria, installation sequence, and cleaning procedures

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return of waste in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 - Products

2.1 PVC DUCTS AND FITTINGS

.1 Rigid PVC duct: Type DB2/ES2, with moulded fittings, for direct burial expanded flange ends, Trade size 5 or 6 where applicable.

.1 Nominal length: 6 m plus or minus 12 mm.

.2 Rigid PVC split ducts.

.3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make a complete installation.

.4 Rigid PVC 90 degrees, 45 degrees bends, and 5 degrees angle couplings as required.

2.2 SOLVENT WELD COMPOUND

.1 Solvent cement for PVC duct joints.

2.3 CABLE PULLING EQUIPMENT

.1 6 mm stranded nylon pull rope tensile strength 5 kN.

2.4 MARKERS

.1 Concrete type cable markers: as indicated, with words: "Cable", "Joint" or "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

2.5 WARNING TAPE

.1 Standard 4-mil polyethylene 76 mm wide tape, yellow with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW ".

Part 3 - Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install duct in accordance with manufacturer's instructions and at elevations as indicated.

.2 Clean inside of ducts before laying.

.3 Install plastic duct spacers and ensure full, even support every 1.5 m and smooth transition throughout duct length.

.4 Slope ducts with 1 to 400 minimum slopes.

.5 Install plugs and cap both ends of ducts to prevent entrance of foreign materials during and after construction.

.6 Pull through each duct steel mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign material.

.1 Pull stiff bristle brush through each duct immediately before pulling-in cables.

.7 Install a pull rope continuous throughout each duct run with 3 m spare rope at each end.

.8 Place continuous strip of warning tape 300 mm above duct before backfilling trenches.

.9 Install markers as required.

.10 Notify the Consultant for field review upon completion of direct buried ducts and obtain acceptance prior to backfill.

3.3 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

UNDERGROUND ELECTRICAL SERVICE – SECTION 33 71 73.02

Part 1 - General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results for Electrical

.2 Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA A23.1-04 /A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

.2 Regulatory Requirements:

.1 Perform Work to comply with applicable Provincial/Territorial regulations.

.2 Co-ordinate and meet requirements of power supply authority.

.1 Ensure availability of power when required.

.3 Certificates: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.

.4 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 - Products

2.1 MATERIALS

.1 Underground ducts: rigid type as indicated, size as indicated.

.2 Rigid steel galvanized conduit and fittings: size as indicated.

.3 Conductors: aluminum, type TECK-90, size and number of conductors as indicated on drawing.

.4 Meter socket: weatherproof, and approval of supply authority.

.5 Concrete: to CAN/CSA A23.1/A23.2.

.6 Backfill: clean and free of debris.

.7 Pulling Iron:

.1 22 mm diameter hot dipped galvanized steel bar with exposed triangular shaped opening.

Part 3 - Execution

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Install cables in trenches and in conduit in accordance with Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.

.2 Allow adequate conductor length for connection to supply by power supply authority.

.3 Install metre socket and conduit.

.4 Allow adequate conductor length for connection to service equipment.

.5 Make grounding connections in accordance with Section 26 05 28 - Grounding - Secondary.

.6 Install concrete encased ducts for electrical systems as indicated and in accordance with CAN/CSA A23.1.

.7 Install pulling irons as required.

.8 Seal ducts and conduits at building entrance location after installation of cable.

3.3 FIELD QUALITY CONTROL

.1 Site Tests:

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform additional tests if required by authority having jurisdiction.

.2 Submit written test results to Consultant approval and review.

3.4 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 WORK INCLUDED

.1 The Contractor shall supply all supervision, labour, quality control, plant, transportation, materials (other than those specifically identified as being supplied by the Owner) and consumables for the handling, fabrication, installation and testing of the Iroquois Falls Waste Water Treatment Plant mechanical piping and valves including all work within and exterior to the building.

.2 The work generally includes:

.1 Supply of all pipes, fittings, hangers, pipe supports, supplementary steel, hardware, and specified manual and automated valves.

.2 Handling, fabrication, assembly, placement and erection of pipe, fittings, valves, in-line instrumentation, expansion joints, pipe hangers, pipe supports, supplementary steel, and equipment.

.3 All scaffolding, staging, temporary supports, etc., as required for installation and completion of the work as specified.

.4 All studs, bolts, washers, gaskets, nuts, and lubricants required for installation of the valves as specified.

.3 The Contractor shall remove, upon completion of installation, all scaffolding, staging and temporary supports.

.4 The Contractor shall properly dispose of all shipping crates and packaging materials.

.5 The Contractor shall replace or repair all materials and/or equipment damaged during installation. All repairs shall be approved by the Engineer.

.6 The Contractor shall ensure that all items covered by this specification are appropriate for the pressure rating.

1.2 RELATED WORK

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 26 05 00 – Common Work Results for Electrical.

1.3 CODES AND STANDARDS

.1 The design, materials, construction, inspection and testing of all work covered by this Tender Document shall comply with the latest editions and revisions thereto, of the appropriate publications of the following authorities and technical organizations insofar as they affect Canadian practice and are in effect at the date of Tender. Where there is disagreement between any standard and this Tender Document, this Tender Document shall govern.

.1 All applicable federal, provincial and municipal laws, ordinances and regulations.

.2 Canadian Standards Association (CSA):

.1 CSA Z245.15, Steel Valves (including amendments 1-6, Feb. 1990).

.2 CSA Z245.12, Steel Flanges (including amendments 1-16, Feb. 1990).

.3 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME):

.1 ASME B1.1, Unified Screw Threads.

.2 ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.

.3 ANSI B16.3, Malleable Iron Threaded Fittings.

.4 ASME B16.5, Steel Pipe Flanges and Flanged Fittings.

.5 ASME B16.10, Face-to-Face and End-to-End Dimensions of Valves.

.6 ANSI B16.11, Forged Steel Fittings, Socked Welding and Threaded.

.7 ANSI B16.15, Cast Bronze Threaded Fittings Class 125 & 250.

.8 ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.

.9 ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.10 ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings.

.11 ASME B16.25, Butt-Welding Ends.

.12 ASME B16.34, Valves - Flanged Threaded and Welding End.

.13 ANSI B31.1, Power Piping.

.14 ANSI B36.10M, Welded and Seamless Wrought Steel Pipe.

.15 ASME B36.19M-2018, Stainless Steel Pipe.

.16 ASME SA 358, Stainless Steel Pipes Dealers.

.4 Manufacturer's Standardization Society for the Valve Fitting Industry (MSS):

.1 MSS-SP-6, Finishes for Contact Faces of Pipe Flanges and Connecting Flanges of Ferrous Valves and Fittings.

.2 MSS-SP-25, Markings for Valves, Fittings, Flanges and Unions.

.3 MSS-SP-61, Hydrostatic Testing of Steel Valves.

.4 MSS-SP-84, Socket Weld and Threaded Valves.

.5 American Society for Testing and Materials (ASTM):

.1 Appropriate publications for material specifications as applicable.

.2 ASTM A182 / A182M – 19, Standard Specification for Forged or Rolled Alloy and Stainless-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.

.3 ASTM A193 / A193M – 17, Standard Specification for Alloy-Steel and Stainless-Steel Bolting for High Temperature or High-Pressure Service and Other Special Purpose Applications.

.4 ASTM A 312 / A312M - 18a, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless-Steel Pipes.

.5 ASTM A380 / A380M – 17, Standard Practice for Cleaning, Descaling, and Passivation of Stainless-Steel Parts, Equipment, and Systems.

.6 ASTM A778 / A778M - 16 Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.

.6 American Petroleum Institute:

.1 STD 607, Fire Test for Soft Seated Quarter Turn Valves.

.2 STD 526, Flanged Steel Safety Relief Valves.

.7 Underwriters Laboratories (Canada):

.1 UL 1106, Standard for Safety Manually Operated Shut-Off Valves for Flammable Liquids.

.2 UL S620, Standard for Valves for Flammable and Combustible Liquids.

.8 American Society of Mechanical Engineers (ASME):

.1 ASME - Power Test Code PTC 25.3, Safety and Relief Valves.

.9 Fluid Controls Institute (FCI).

.10 American Water Works Association (AWWA):

.1 Appropriate publications for specifications as applicable.

.11 American Welding Society (AWS):

.1 AWS B3.0, Welding Procedures and Performance Qualifications.

.2 AWS C1.1M, Recommended Practice for Resistance Welding.

.12 Plastics Pipe Institute (PPI)

.1 PPI Handbook of Polyethylene Pipe – 2009 (2ndEdition).

.2 PPI Municipal Advisory Board (MAB) Generic Electrofusion Procedure for Field Joining of 12 Inch and Smaller Polyethylene (PE) Pipe.

.3 PPI Material Handling Guide for HDPE Pipe and Fittings.

.4 PPI TR-33 Generic Butt Fusion Joining Procedure for Polyethylene Gas Pipe.

.5 PPI TR-34 Disinfection of Newly Constructed Polyethylene Water Mains.

.6 PPI TR-38 Bolt Torque for Polyethylene Flanged Joints.

.7 PPI TN-42 Recommended Minimum Training Guidelines for PE Pipe Butt Fusion Joining Operators for Municipal and Industrial Projects.

1.4 SUBMITTALS

.1 Submit product data for all valves and equipment supplied in accordance with Section 01 33 00 – Submittal Procedures.

Part 2 Products

2.1 PROCESS PIPING

.1 Stainless Steel Piping (Process):

.1 Stainless Steel: ASTM A 312 / A312M - 18a.

.2 Type: 316L Schedule 10.

.3 All above ground piping to be Insulated and Jacketed as per Section 23 07 19 – Piping Insulation

.4 Joints:

.1 Butt-Welded to ASTM A778 / A778M.

.2 Flanged to ASTM A182 / A182M.

.1 Pressure Class 150.

.2 Faced and drilled to Class 150 ASME B16.5 standard.

.3 Bolt circles and holes to Class 150 ASME B16.5 standard.

.5 Bolts:

.1 Flange bolts, nuts and washers: Stainless Steel, Grade B7M to ASTM A193.

.2 Heavy hex head series.

.3 Size, number and length as shown in AWWA C110 and C115 for plain flange connections.

.4 Bolts, nuts and washers for special connections: to manufacturers requirements.

.5 Where no requirements are mentioned, use flange bolts, nuts and washers of size, number and length to suit.

.6 Bolts to have isolation sleeve kits when dissimilar metals are present.

.6 Flange Gaskets:

.1 Gaskets shall be preformed EDPM gaskets with pressure rating to match flange class. All Gaskets are to have flange di-electric isolation kits when matching dissimilar metals.

2.2 Valves

.1 Gate Valve.

.1 BNW Manual Gate Valve

2.3 PIPING ACCESSORIES

.1 Tools and Spare Parts:

.1 Special tools required for normal operation and maintenance of the equipment are to be furnished with the equipment by the manufacturer.

.2 Provide supplier/manufacturer's recommended spare parts for an operating period of one (1) year.

.2 Pipe Support Systems:

.1 Pre-engineered 12-gauge continuous slot channel system and components: Unistrut, B-Line, Power Strut or equivalent. Stainless steel for stainless piping and galvanized for all other piping, or as indicated on drawings.

.2 Steel pipe supports as indicated on drawings.

.1 Steel tubing: to ASTM A500, Grade C.

.2 Anchor bolts, steel plate, channels, and angles: to ASTM A36, Grade 36.

.3 High strength bolts to ASTM A325.

.4 Fabricated supports to be approved by the Engineer.

.3 Manufactured Pipe Support Elements:

.1 All supports and parts are to be as shown or noted and to conform to the latest requirements of the ASME Code for Pressure Piping B31.3 and MSS Standard Practice SP-58, SP-69, SP-89 and SP-90 and be manufactured by Mason, Anvil, Standon, or approved equal.

.4 Miscellaneous Components:

.1 All unlisted or unspecified products necessary to complete a functional system are to be Contractor supplied and are to match existing similar products used on site where possible and are to be as approved by the Engineer or to be as indicated in other Contract Documents.

.5 Flexible joints:

.1 Standard of acceptance: George Fisher Waga Multi Joint 3000, or approved equivalent.

.2 Center Sleeve: Cast Ductile Iron

.3 End Rings: Cast Ductile Iron

.4 Gaskets: EDPM

.5 Fasteners: 5/8" NC T304 Stainless Steel, Nuts coated with anti-galling compound, Torque: 70-80 ft. lbs.

.6 Coating: Corrosion Protective Epoxy coating

Part 3 Execution

3.1 PIPING FABRICATION AND EXECUTION

.1 General:

.1 All piping systems covered by this specification shall be designed and installed in accordance with the requirements of the ANSI/ASME B31.3, and ANSI/AWWA C206 using procedures to conform to AWS B3.0, AWSC1.1.

.2 Welded joints to be visually inspected and not less than 5% of circumferential butt and miter grove weld shall be examined fully by random radiography in accordance with ASME B31.3 (Normal Fluid Service)

.3 The Contractor shall allow adequate field fit trim allowances on all piping during fabrication. In locations where field trimming is not practical, the Contractor shall field measure to confirm proper fit prior to any fabrication.

.4 Dimensions shown on the piping general arrangement and detail drawing must be field measured and adjusted, if necessary, by the Contractor, to allow installation to occur.

.5 All piping shall be installed in the locations shown on the drawings, or alternately as close to these locations as physically possible.

.6 Piping spool dimensional changes, as determined by field measurement, of ± 300 mm or less are considered within the range of normal field fitting and as such, will not be considered as scope changes affecting the contract value.

.7 The Contractor shall be responsible for the correct fitting of the piping systems and equipment outlined in this specification and for proper installation procedures and shall ensure that installed pipe and fixtures are free from blockage of flow or foreign debris. The Contractor shall correct all errors of detailing or fabrication.

.8 The location and routing of all piping 50mm diameter and smaller, shown on the drawings, shall be considered as approximate with the pipes subject to field routing as required.

.9 Where changes to pipe locations are necessary, the Contractor shall notify the Owner as soon as possible of the need to make these changes and obtains the Owner's approval before proceeding with the installation. This approval could, in some cases, depend on the results of an additional analysis by the Engineer and the Contractor must allow reasonable time for this work in his planning.

.10 All dirt, rubbish, snow, ice or other substances which may prevent proper installation of any component of the piping system shall be removed before commencement of work by the Contractor.

.11 The Contractor shall be responsible for cutting all holes required in concrete, steel floors or walls. The Contractor shall determine the required size and location for each such hole and obtain the approval of the Engineer prior to cutting. A diamond drill shall be used when cutting through concrete. Holes shall be of enough size to accommodate the pipe insulation thickness (if applicable) and an additional 50 mm clearance between the edge of the insulation and the grating or cover plate to allow for thermal movement.

.12 Contractor shall supply 125mm x 6mm thick mild steel kickplates and weld the kickplates around the entire periphery of holes in grating or cover plate and add steelwork to support the grating or cover plate where the hole has reduced the strength of the grating or cover plate.

.13 Contractor shall cut and remove handrailing to facilitate erection of the piping only to the extent necessary. Contractor shall perform fitting, welding, and grinding necessary to re-install handrailing to the satisfaction of the Engineer following completion of piping erection.

.14 No drilling, welding, or cutting of walls or other parts of the building structure for the installation of piping, fixtures or pipe supports shall be carried out without the prior approval of the Engineer.

.2 Piping Fabrication:

.1 The layout drawings may indicate pipe slopes for achieving proper drainage of the systems. These slopes shall be maintained in the installed position of the piping system. The fabrication and erection shall be done in such a way as to ensure that these slopes are maintained. Elbows, tees and other fitting joints shall have off-square dimensions, where required to achieve the desired slopes.

.2 Flame cutting shall, wherever practicable, be done by machine. Machine flame cut edges shall be substantially as smooth and regular as those produced by machining and shall have all traces of slag removed. Contours of all weld end preparations shall be smooth without any burrs or rough edges.

.3 Pipe assemblies shall be fabricated in such a way as to avoid any difficulty in field erection. In so far as practical, the number of joints for field fitting shall be held to a minimum and be limited to accessible circumferential joints.

.4 All piping and fittings prior to fabrication shall be shop cleaned inside and outside thoroughly with rotary wire brushes and compressed air to remove all sand, loose rust and other foreign matter.

.5 Piping which is to be assembled with socket weld fittings shall be saw-cut square to the axis of the pipe. The dimensions shall conform to ASME B16.5 and B31.3. Butt-weld end preparation shall conform to ASME B31.3. The use of backing rings with butt-welded joints is not acceptable; however, consumable inserts are acceptable. All burrs and slag deposits shall be removed from the pipe before welding.

.6 All branch connections shall provide full pressure strength with reinforcing as required.

.7 For systems that will be left for extension by others, the pipe ends shall be left covered. All pipe end openings shall be flanged.

.8 All welding shall be carried out using contractor-supplied portable generator-powered welding machines where 600V power is not available.

3.2 SUPPORT OF PIPING

.1 General:

.1 All pipe supports and hangers, including supplementary steel, shall be supplied and installed by the Contractor, unless otherwise usable current supports are suggested for use.

.2 All piping shall be supported in accordance with the ASME B31.3 code with an adequate number of supports and hangers. The most suitable support location shall be approved by the Engineer prior to erection. Hanger supports shall be of the adjustable swivel ring or clevis type.

.3 The Contractor shall comply with the following requirements when installing pipe hangers:

.1 Wherever welding or bolting of supports to the structural steel is involved, prior approval of the Engineer or his authorized representative shall be obtained before executing the Work. Welding shall be in accordance with the requirements of CSA W59 - Welded Steel Construction.

.2 Piping shall not be supported from the building floor grating or checker plate.

.4 Supplementary steel shall be primer coated prior to installation and final coated using two coats of Aquapon Polyamide-epoxy 4 to 6 mils WFT per coat.

.2 Temporary Supports:

.1 The Contractor shall supply, install, and remove all temporary supports that may be required for the erection of the piping systems.

3.3 HYDROSTATIC TESTING

.1 All process piping must be hydrostatically tested to 150 PSI for a duration of 2-hours.

END OF SECTION