

THE MOHAWK COUNCIL OF AKWESASNE
CORNWALL ISLAND SALT STORAGE FACILITY

CONTRACT NO. 26-1002A
EVB PROJECT 22226



CONTRACT DOCUMENTS

Tender for the new Cornwall Island Salt Storage Facility

Project No. 26-1002A

Tenders, sealed in envelopes and clearly marked as to the contents, will be received by Leslie Papineau OAA, MRAIC, Director, Dept. of Infrastructure, Housing and Environment, Administration Building No. 3, Cornwall Island, Ontario K6H 5T3, Telephone (613) 936-1548, ext 1005 until: **Thursday, July 23rd, 2026, 11:00 a.m., Local Time** ,

On the same day, commencing at approximately 11:05 a.m. local time, the tenders will be opened and read publicly.

The work of this Contract includes the construction of a new 21.5m x 39.8m salt storage building comprised of a poured in place concrete foundation supporting a pre-engineered fabric type building. Various civil and electrical site improvements including but not limited to two new site entrances, new electric sliding gates (2), new interior building and exterior asphalt works, various removals of existing concrete foundations, the removal of the existing electrical service and replacement with a new 400A service, and new building associated electrical and mechanical works.

Contract Documents and Addendums may be obtained from the MCA RFP/RFQ Website (<https://www.akwesasne.ca/opportunities/rfp/>) and Biddingo.

Tenders must be accompanied by a tender deposit payable to the Mohawk Council of Akwesasne as follows:

- for First Nations contractors in the form of a certified cheque, bank draft or money order in the amount of **10% of the total tender price to a maximum of \$20,000**
- for all other contractors as a **Bid Bond for an amount equal to 10% of the total tender price.**

Tenders are subject to a formal contract being prepared and executed. The Council reserves the right to reject any or all tenders and the lowest or any tender will not necessarily be accepted.

Note: Non-Mandatory Site Meeting is scheduled for July 14, 2026, at 2:30 p.m. Refer to Instruction to Tenderers.

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BEFORE SEALING THE ENVELOPE, PLEASE CHECK THAT THE FOLLOWING HAS BEEN DONE:

1. Has your tender been signed?
2. Have you enclosed the required Tender Deposit?
3. Have you enclosed the Agreement(s) to Bond signed and sealed by proposed surety?
4. Have you enclosed the COMPLETE written Form of Tender?
5. Has the "Statutory Declaration re: Tender" been completed and included in this submission?
6. All Addenda issued must be acknowledge in your tender submission (see Form of Tender Page 1)

NOTES:

Make sure that you seal the tender envelope and clearly mark it as to its contents.

The Owner reserves the right to reject any or all quotations.

The following bids may be rejected:

- Late tender (tender received after Closing time as specified in quotation document)
- The Form of Tender not completed and signed in ink or by non-erasable medium
- Quotation and/or deposit requirements not being met
- Informal quotations (ie: bonds not provided)

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1. GENERAL INVITATION:

The intent of this package is to obtain an offer to perform work to complete:

The work of this Contract includes the construction of a new 21.5m x 39.8m salt storage building comprised of a poured in place concrete foundation supporting a pre-engineered fabric type building. Various civil and electrical site improvements including but not limited to two new site entrances, new electric sliding gates (2), new interior building and exterior asphalt works, various removals of existing concrete foundations, the removal of the existing electrical service and replacement with a new 400A service, and new building associated electrical and mechanical works.

The Contract Documents are identified as:

Mohawk Council of Akwesasne
Cornwall Island Salt Storage Facility
Project No. 26-1002A

Prepared by:

EVB Engineering
800 Second St. W, Cornwall, ON K6J 1H6
Attn: Greg Esdale, P.Eng

Offers signed under seal, executed and dated, will be received by The Mohawk Council of Akwesasne at the Department of Infrastructure, Housing, and the Environment, Cornwall Island Administration Building No. 3, Cornwall Island, Ontario before **11:00 a.m. local time, on the 23rd day of July, 2026**. Extension of submission will only be considered if requested in writing by contractor and approval through addendum by The Mohawk Council of Akwesasne at the Department of Infrastructure, Housing, and the Environment.

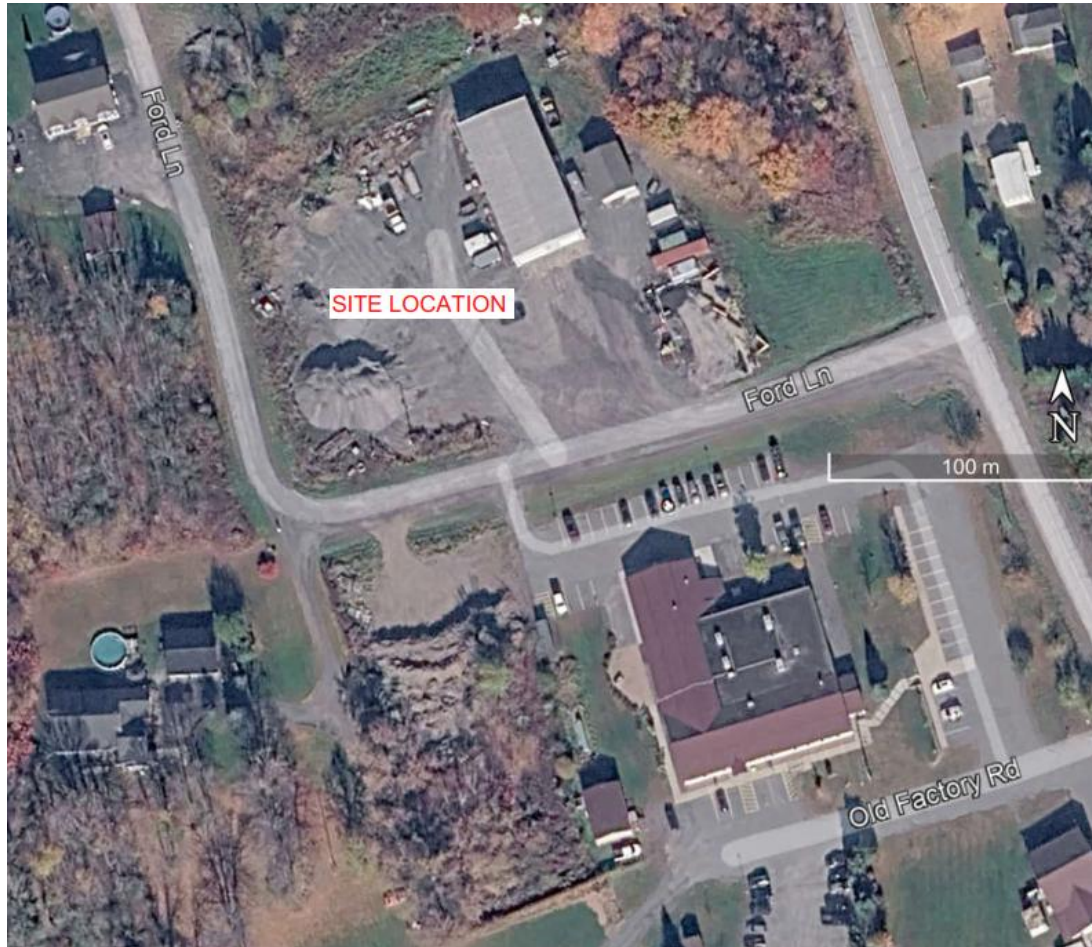
Address Bids to:

Leslie Papineau, OAA, MRAIC, Director
Department of Infrastructure, Housing, and Environment
Mohawk Council of Akwesasne
101 Tewasateni Road
Akwesasne, Ontario K6H 0G5

Title of Project:

Mohawk Council of Akwesasne
Cornwall Island Salt Storage Facility
Project No. 22226

Site Location: 14 Ford Lane, Cornwall Island, Akwesasne ON. K6H 0G5



- Tenders must be legible, written in ink, or by typewriter, and all items must be bid, unless the tender specifically permits otherwise, with the price for every item clearly shown.
- The insertion of written or typed additions to the tender forms, by the Tenderer, will invalidate the tender.
- All bids must be submitted on the appropriate "Form of Tender" bound with this document

Directions:

Completely fill in all blank spaces in the Tender documents.

State numbers in words as well as figures where requested.

The Officer of the Bidding Firm must sign the Tender Form in longhand and affix the Corporate Seal.

Completed Tender shall be without interlineations, alterations, mathematical errors, or erasures.

Tenders which are late or which fail to comply with requirements of the Tender Documents shall be considered informal and may be rejected.

Tender Forms and enclosures, which are improperly prepared, may be declared informal.

Failure to provide security deposit and/or insurance requirements may result in the tender being declared informal.

Each item in the Tender Form shall be a reasonable price for each item under no circumstances will an unbalanced tender be considered. The Construction Manager and/or Engineer will be judges of such matters and should any tender be considered to be unbalanced, then it will be rejected.

When requested by the Owner or Consultants, satisfactory evidence of authority of any signatory on behalf of the Bidder shall be furnished. In the event that the Bidder is in partnership or joint venture, its execution of the contract shall constitute the agreement of each partner to be jointly and severally.

Upon obtaining Bid Documents, each Bidder shall designate an address or telephone/fax number to which the addenda should be directed.

Before Submitting Tender, Bidder Shall:

Carefully examine all drawings and specifications and include in the quotation sufficient sums to cover the cost of all items included in the Contract.

2. **DESCRIPTION OF WORK**

The work to be done under this contract consists of supplying all materials, all required equipment, labour and services for the construction of all facilities and appurtenances, as shown on the Contract Drawings and specified herein. Coordinate with the Construction Manager with respect to all other Contractors working on related works, as appropriate, to ensure the orderly construction of the Cornwall Island Salt Storage Facility.

The tender covered by this document includes the following general scope of work.

Cornwall Island Salt Storage Facility No. 26-1002A– Work of this Contract includes the construction of a new 21.5m x 39.8m salt storage building comprised of a poured in place concrete foundation supporting a pre-engineered fabric type building. Various civil and electrical site improvements including but not limited to two new site entrances, new electric sliding gates (2), new interior building and exterior asphalt works, various removals of existing concrete foundations, the removal of the existing electrical service and replacement with a new 400A service, and new building associated electrical and mechanical works.

3. **TENDER DEPOSITS OR BID BOND**

Each tender shall be accompanied by a tender deposit in the form of a certified cheque, bank draft or money order made payable to the Mohawk Council of Akwesasne, as follows:

- For First Nation contractors in the form of a certified cheque, bank draft or money order for **10% of the total tender price, to a maximum of \$20,000.**
- For all other contractors as a **Bid Bond for an amount equal to 10% of the total tender price.**

The tender deposit or Bid Bond **MUST BE ENCLOSED IN THE SAME ENVELOPE AS THE TENDER.** A tender which does not comply with these requirements shall be considered an improper tender and may be rejected.

The tenderer agrees that in submitting his tender, the required certified cheque, bank draft, money order or bid bond is a fair estimate of damages that may be incurred by the Council as a result of the tenderer failing to enter into the required Contract.

All tender deposits or bid bonds will be returned to the respective bidders within ten days after the tenders have been opened, except the deposit or bid bond of the bidder which the Council elects to retain as the successful bidder. If the bidder fails to enter into a contract

- where a certified cheque was provided for bid surety, the cheque will be cashed and the funds used to make up the difference between the low bid and the next acceptable bid up to the value of the cheque. Unused funds will be returned to the issuer.
- where a Bid Bond was provided for bid surety, the Bonding Company will make up the difference between the low bid and the next acceptable bid up to the value of the bond.

The tender deposit of the successful bidder will be returned when he has fully complied with the conditions outlined in the tender documents.

4. PERFORMANCE AND PAYMENT BONDS

A performance bond in an amount equal to one hundred percent (100%) of the total tender price with a satisfactory Guarantee Surety Company, authorized to carry on business in the Province of Ontario and Quebec, will be required for the faithful performance of the Contract, including the maintenance and warranty period of one (1) year from the date of Substantial Performance.

A labour and material bond in an amount equal to one hundred percent (100%) of the total tender price with a satisfactory Guarantee Surety Company, authorized to carry on business in the Province of Ontario or Quebec, will be required for the faithful payment of all labour and materials related to this Contract.

For native contractors who, because of the Indian Act, are unable to obtain a Performance Bond, an alternate arrangement may be accepted by Council upon receipt of proof of refusal to bond from two bonding companies. The acceptable alternative arrangement will be a performance deposit in the form of a certified cheque, bank draft or money order made payable to the Mohawk Council of Akwesasne for an amount equal to 10% of the total tender price, to a maximum of \$20,000. An irrevocable letter of credit from a bank or an approved financial institution in favour of Mohawk Council of Akwesasne for the amount indicated shall also be acceptable.

5. SALES TAX

This project is to be constructed on Mohawk Territory of Akwesasne therefore is exempt from Provincial and Federal Sales Taxes including the Goods and Services Tax.

6. INSURANCE

The Tenderer shall provide proof that their personnel are fully covered under the Workers Compensation Act, and that their company and workers carry liability and property damage insurance.

Provide a signed “undertaking of insurance” on a standard form provided by the Insurance Company stating their intention to provide insurance to the Tenderer in accordance with the insurance requirements of the Contract Documents.

The Tenderer shall procure and maintain “**All Risk and Liability Insurance**” in accordance with **Sections 20 and 21** of the General Conditions and the requirements set out below unless otherwise specifically stated in the Contract.

The tenderer whose tender has been recommended to the Owner for acceptance shall, on receipt from the Owner of the Agreement for execution, procure and maintain All Risk and Liability Insurance and shall file with the Owner, together with the Agreement executed by him, a Cover Note of such All Risk Insurance and a Certificate of Liability Insurance. The Contractor shall file with the Owner prior to the first progress payment the original policy of such All Risk Insurance or a Certificate of Insurance clearly stating that the requirements hereof. Insurance shall be obtained from a company satisfactory to the Owner.

- (a) The All Risk Insurance shall:
- (1) comply with the requirements of the "Specification for All Risk Insurance" as attached hereto, which specification shall form part of the said policy of All Risk Insurance.
 - (2) be maintained until the Date of Completion of the works has been established as set out in Certificate of Completion and M.C.A. has notified the Tenderer in writing that the Owner has arranged its own All Risk Insurance coverage of the permanent works.
- (b) The Liability Insurance shall:
- (1) have a limit of liability of not less than **\$5,000,000** inclusive for any one occurrence;
 - (2) be Comprehensive Liability Insurance covering all operations and liability assumed under the Contract with the Owner;
 - (3) not contain any exclusions or limitations in respect of shoring, underpinning, raising or demolition of any building or structure, pile driving, caisson work, collapse of any structure or land from any cause;
 - (4) include insurance against liability for bodily injury and property damage caused by vehicles owned by the Contractor and used on the work, and in addition, shall include insurance against liability for bodily injury and property damage caused by vehicles not owned by the Contractor and used on the work. Each such insurance shall have a limit of liability of not less than **\$5,000,000** inclusive for any one occurrence. A "vehicle" shall be as defined in the Highway Traffic Act of the Province of Ontario;

This policy to also include but not be limited to:
Premises and Operation Liability
Blanket Contractual Liability
Products and Completed Operations
Tenants' Legal Liability
Non-Owned Automobile Liability
Owner's and Contractor's Protective Liability
Contingent Employers' Liability
Cross and Several Liability and Severability of Interest Clause
 - (5) be endorsed to provide that the policy or policies will not be altered, cancelled or allowed to lapse without thirty days written notice to the Owner;
 - (6) be endorsed to include the Owner, the Construction Manager, the Engineer and the Geotechnical Sub-consultant as additional named insured.

"The Owner – The Mohawk Council of Akwesasne, and the Consultant – EVB Engineering, as additional named insured with respect to liability arising out of the activities performed by, or on behalf of the Proponent".

NOTE: All insurance shall be obtained from companies satisfactory to the Council. The Contractor will pay for all premiums and expense incurred with the insurance. A certified copy of such insurance policy shall be furnished to the Construction Manager before any work is commenced.

7. TENDER FORM REQUIREMENTS

The Contractor, in submitting the price, agrees to complete the Work by the date indicated in the Contract Documents, but may suggest a revision to the Contract Time with an adjustment to the overall price. The Owner requires that work under this contract be completed within the time period stated.

Bidders shall be solely responsible for the delivery of their Tenders in the manner and time prescribed. Contractor shall accept sole responsibility for any error or neglect to include any sums.

Submit **one** copy of the executed Tender on the forms provided, signed and corporate sealed in a closed opaque envelope, clearly identified with bidders name, project name, and Owners name on the outside.

A list of submitted tenders will be made public, following tender opening. Offers will be opened publicly immediately after the time for receipt of tenders.

Indicate the amount of Native content in your tender as an actual value amount.

Quotations from Bidders shall not contain any recapitulation of work to be done. No oral or telephone proposals or modifications will be considered. Neither the Consultant nor Engineer nor Owner shall be responsible for oral instructions.

8. DISCREPANCIES

Bidders finding discrepancies or omissions in the drawings, in the specifications, or any other documents, or doubts as to the meaning or intent of any information thereof, shall notify the consultant. Any questions or concerns must be received three (3) working days before tender close. All clarifications, instructions, or explanations will be sent to all tenderers.

Direct Inquiries by email To:

EVb Engineering

Greg Esdale, P.Eng.

Email: greg.esdale@evbengineering.com

9. ADDENDA

An Addendum may be issued during the Tender period. All addenda are part of the contract documents and all costs shall be included in the final price. Verbal answers are only binding when confirmed by written addenda.

Clarifications requested by bidders must be in writing **prior to the deadline for questions indicated in the Schedule – Section 23 below**. The reply will be made in the form of an addendum.

10. AWARD OF TENDER

The Owner will not entertain requests for gratuitous payments arising from errors alleged to have been in the accepted tender.

Amendments to a submitted offer will be permitted if received in writing prior to Tender closing and if endorsed by the same party or parties who signed and sealed the offer.

Under no circumstances will tenders be considered which are received after the local time in the advertised closing date for Tenders.

Tenders once opened in the presence of the Consultant/Owner/And Witness, shall remain open to acceptance and shall be irrevocable for a period of sixty (60) days after the bid closing date. After this time, the tender may only be accepted with the consent of the successful bidder.

The Owner has the right to accept or reject any or all offers. After acceptance, the Mohawk Council of Akwesasne will issue a letter of intent to enter into a contract for the work.

It is a condition of the tender that Mohawk labour or Mohawk sub-contractors are used for this project wherever possible. Preference will be given to tenders within the project budget, which have the highest Mohawk labour content.

The Owner may, in its sole and absolute discretion, waive any informality or irregularity. The Owner may also negotiate any of the provisions of a Bid with the respective Bidder. Negotiations may result in changes to a Bid without necessarily entering into similar negotiations with any or all other bidders.

Upon award of tender, the successful bidder shall be required to submit upon request, **within 48 hours** from tender opening, additional breakdowns of the lump sum prices indicated in the Form of Tender. These additional breakdowns will be used for the purposes of establishing monthly payments. The Engineer reserves the right to modify any items that appear unbalanced.

The successful bidder shall commence work at the site within **seven calendar days** of receipt of the letter of intent.

Failure by the successful bidder to meet the above requirements will entitle M.C.A. to cancel the award of the contract due to the successful bidder's default. M.C.A. may then award the contract to one of the other bidders or take such action as it chooses.

M.C.A. reserves the right to reject the tender of any bidder who does not furnish satisfactory evidence of sufficient experience to successfully execute and fully complete the work within the specified time.

11. WORKPLACE SAFETY & INSURANCE BOARD

The Contractor shall, at the time of entering into any contract with the M.C.A., furnish a satisfactory clearance certificate from Workers Safety & Insurance Board (WSIB) stating that all assessment or compensation payable to the WSIB has been paid. Also at any time during the performance and upon completion of such contract, upon request from M.C.A., the Contractor shall furnish a satisfactory clearance certificate from WSIB as outlined above.

12. DELETION FROM CONTRACT

The Mohawk Council of Akwesasne reserves the right to delete up to 20% of the work from the Contract should it be deemed in the interest of the Council to do so without basis for negotiation.

13. WARRANTY PERIOD

The Contractor guarantees and warrants that with ordinary wear and tear the said work shall for a period of **12 months**, unless otherwise specified, from the date of completion as set out in the Certificate of Completion, remain in such condition as will meet with the approval of the Construction Manager and the Engineer, and that he will, upon being required by M.C.A. make good, in a manner satisfactory to the Construction Manager, any imperfections therein due to materials used in the construction thereof or workmanship. The decision of M.C.A. as to the nature, extent and cause of such imperfections and the necessity for remedying the same shall be final.

Should the Contractor fail to comply with the directions of M.C.A., the latter may perform the necessary work after giving the Contractor **twenty-four (24) hours written notice**. In the event of an emergency, of which M.C.A. shall be the sole judge, M.C.A. may forthwith without notice perform the necessary work and the cost of such work in either event may be deducted or collected by M.C.A.

If M.C.A. notifies the Contractor in writing of any imperfections prior to the termination of the guaranteed maintenance period, the Contractor shall make good the imperfections as specified above, notwithstanding that the work of making good may commence after or extend beyond the end of the **12 month** period.

14. FEES FOR CHANGES IN THE WORK

The Sub-contractor performing changes in the work is entitled to 10% to cover both overhead and profit.

Duplication of overhead and profit will not be permitted between subtrades, as occurs, for example, when a plumbing subtrade is in turn a subtrade of the ventilation subtrade, or vice versa. Fees for changes to the work will be paid on actual cost, plus percentages stated above.

15. CONTRACT SIGNING

Sole proprietorship: Signature of sole proprietorship in the presence of witness who will also sign. Insert the words "Sole Proprietorship" under signature, affix seal.

Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" against each signature. Affix seal against each signature.

Limited Company: Signature of all duly authorized signing authorities in their normal signatures. Insert the capacity in which each signing officer acts against each signature. Affix the Corporate Seal.

If the tender is signed by officials other than the President and Secretary of the Company, or the President - Secretary - Treasurer of the Company, a copy of the by-law resolution of the Board of Directors authorizing them to do so must also be submitted with the tender envelope.

If the Contractor/Sub-contractor is a joint venture, each party to the joint venture shall execute the Project seal in the manner appropriate to such party.

16. BRIDGE CROSSING TOLL CHARGE / PASSPORTS

Payment of toll charges or similar fees shall be the responsibility of the Contractor/Sub-contractor /Sub-trades. As of January 2001 toll fees are not applicable when delivering materials or goods destined for Mohawk Council of Akwesasne projects.

It is the contractor's responsibility to comply with the requirements of the Canadian and US Border Agencies, security and goods transportation requirements.

17. EXISTING UTILITIES

Further to the General Conditions of Contract, the following shall apply:

No responsibilities will be assumed by M.C.A. for the correctness or completeness of the plans with respect to the existing utilities, pipes, or other objects. The Contractor shall have no claim on this account. M.C.A. does not ensure the accuracy of such information and the Contractor shall not make any claim against M.C.A. for damages or extra work caused or occasioned by his relying upon such records, reports or information either as a whole or in part.

Limitation on Work and Conditions

The work shall be fully supervised and controlled to cause as little disruption, and noise as possible consistent with the Contractor's work process. This supervision will be the responsibility of the successful Contractor.

Washroom

The Contractor shall provide a temporary washroom facility for use by its own and any possible subcontractor enlisted at the site.

Security

The Contractor shall be responsible for their own activities as well as any possible subcontractor that is enlisted for this project. The Contractor shall coordinate all security efforts.

18. LIQUIDATED DAMAGES

a) Time - Time shall be of the essence of this agreement.

b) Progress of the Work and Time for Completion

The Contractor shall substantially complete this Contract within 240 working days after the date of order to commence work. See Item #23 for Schedule.

If the time period 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 day light 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 by the completion date specified. Any additional costs occasioned by compliance with these provisions will be considered to be included in the prices bid for the various items of work and no additional compensation will be allowed therefore.

An extension of time may be granted in writing by the Council in the event of the work being delayed beyond the prescribed date for completion. Such extensions shall be for such time as the Construction Manager may prescribe and the Council shall fix the terms on which the said extension may be

granted. An application for an extension of time shall be made in writing by the Contractor to the Construction Manager at least fifteen (15) days prior to the date of completion fixed by the Contract. The Construction Manager will recommend to the Council acceptance or rejection of the request. The date of expiry of all bonds or other surety furnished to the Council by the Contractor, shall be extended at the expense of the Contractor, to at least two (2) months beyond the extended date of completion, and the Contractor shall furnish the Council with evidence of such extension of the bond or other surety.

Any extensions of time that may be granted to the Contractor shall be so granted and accepted without prejudice to any rights of M.C.A. whatsoever under this Contract, and all such rights shall continue in full force and effect after the time limited in this Contract for completion of the work and whenever in this Contract power or authority is given to M.C.A. or the Construction Manager or any person to take any action consequent upon the act, default, neglect, delay, breach, non-observance or non-performance by the Contractor in respect of the work of contract or any portion thereof.

Such powers or authorities may be exercised from time to time, and not only in the event of the happening of such contingencies before the time limited in this Contract for the completion of the work but also in the event of the same happening after the time so limited in the case of the Contractor being permitted to proceed with the execution of the work under an extension of time granted by M.C.A. In the event of M.C.A. granting an extension of time, time shall continue to be deemed of the essence of this contract.

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 by the completion date as specified above, damage will be sustained by the Council and that it is and will be impracticable and extremely difficult to ascertain and determine the actual damage which the Council will sustain in the event of, and by any reason of, such delay and the parties hereto agree that the Contractor will pay to the Council the sum of **One Thousand Dollars (\$1,000.00)** for each and every **working day** beyond the completion date specified above that the work remains uncompleted and it is agreed that this amount is an estimate of the actual damage to M.C.A. which will accrue during the period in excess of the prescribed completion date.

M.C.A. may deduct any amount due under this paragraph from monies that may be due, or payable to the Contractor on any account whatsoever. The liquidated damages under this paragraph are in addition to, and without prejudice to, any other remedy, action or other alternative that may be available to M.C.A.

The Contractor shall not be assessed with Liquidated Damages for any delay caused by Acts of God, or of the Public Enemy, Acts of the Province or of a Foreign State, Fire, Flood, Epidemics, Quarantine Restrictions, Embargoes or delays of Subcontractors due to such causes.

If the time required for the completion of the work is increased or decreased by reason of alterations or changes in the work required to be performed under this Contract, the completion date shall be increased or decreased as determined by M.C.A.

The actual completion date shall be the date on which the work is accepted by the Construction Manager and the Engineer.

19. **RECORDS**

As work progresses, maintain accurate records to show deviations from contract drawings. Supply one set to the Department of Infrastructure, Housing, and the Environment.

20. REVIEW OF SHOP DRAWINGS

The Contractor (or sub-contractor or equipment supplier acting on behalf of the Contractor) shall submit to the Construction Manager in accordance with procedure to be stipulated by the Construction Manager, all shop, working or setting drawings required in order to make clear the work proposed. The Construction Manager will make the submission of the drawings to the Engineer on behalf of the Contractor. The Contractor shall make all changes in such drawings that the Construction Manager or the Engineer may require and resubmit such drawings to the Construction Manager for additional review. Any drawings submitted by the Contractor (or sub-contractor or equipment supplier acting on behalf of the Contractor) directly to the Engineer, will not be reviewed and will be returned as unacceptable. Any shop drawing not reviewed and stamped by the contractor shall be returned as unacceptable.

When submitting such drawings, the Contractor shall notify the Construction Manager in writing of all respects in which such drawings differ from the requirements of the Contract or from previously notified requirements of the Construction Manager. The Construction Manager's review of such drawings shall not be construed as approval of such differences unless the Contractor has identified all changes and deviations and unless the Construction Manager has specifically approved of such differences in writing.

The Construction Manager's and the Engineer's review of such drawings shall not relieve the Contractor from responsibility for the correctness of the drawings or the adequacy of the details shown on the drawings.

Work shall not be carried out before the Engineer's review of the shop and working drawings relating to such work has been completed.

The review pertains to general design only. Errors in dimensioning, quantity or inaccuracies do not relieve the Contractor from responsibility to complete work to the Consultant's satisfaction.

Do not commence manufacture nor order materials before shop drawing and samples are reviewed.

Responsibility for errors, omissions or deviations from requirements of Contract documents is not relieved by the Engineer's review of submittal.

21. OPERATION AND MAINTENANCE MANUALS

Assemble, coordinate, bind and index required data into Operations and Maintenance manuals.

Submit in binder, with identified subsections the following data:

- Maintenance Instruction for finished surfaces and materials
- Copy of hardware and paint finishes
- Written warranties of all materials used
- Written labour warranty

Supplier's names, addresses, and telephone numbers and components supplied by them must be included. All components must contain a description and be identified by manufacturer's part or supply number.

Include one complete set of final shop drawings indicating corrections and changes made during fabrication and installation.

Submit complete Operation and Maintenance manuals to Engineer **two (2) weeks prior** to application for Interim Certificate of Completion of project.

Submit copies in typed English and organize data into some numerical order as contract specifications. Drawings, diagrams and manufacturer's literature must be legible.

Material: Label each section with tabs protected with celluloid covers fastened to hard paper dividing sheets.

Binders: Vinyl, hard covered, 3 "D" ring, loose leaf, sized for 215mm x 280mm paper, with spine pockets. Identify contents of each binder on spine.

In addition, all Operation and Maintenance Manuals shall be submitted in electronic pdf format.

22. CERTIFICATE OF COMPLETION

1. On the date that the work has been completed, and the Contractor has complied with the contract and all orders and directions made pursuant thereto, (both to the satisfaction of the Construction Manager and the Engineer), the Construction Manager shall issue a Certificate of Completion to the Contractor.
2. If the Construction Manager and the Engineer are satisfied that the work is sufficiently complete to be acceptable for use by the Owner, the Construction Manager may, at any time before issuing a certificate referred to in 1., issue an Interim Certificate of Completion to the Contractor.
3. An Interim Certificate of Completion referred to in 2. shall describe the parts of the work not completed to satisfaction and all things that must be done by the Contractor before a certificate referred to in 1. will be issued.
4. The Construction Manager may, in addition to the parts of the work described in an Interim Certificate of Completion referred to in paragraph two, require the Contractor to rectify any or other parts of the work not completed to his satisfaction.
5. If the contract or a part thereof is subject to a Unit Price Arrangement, the Construction Manager shall measure and record the quantities of labour, plant and material, performed, used and supplied by the Contractor, and shall inform the Contractor of those measurements.
6. The Contractor shall assist and co-operate with the Construction Manager in the performance of their duties (referred to in paragraph 5) and shall be entitled to inspect any record made by the Construction Manager pursuant to 5.
7. After the Construction Manager has issued a Certificate of Completion referred to in 1., he shall, if 5. applies, issue a Certificate of Final Measurement.
 - 7.1 A Certificate of Final Measurement referred to in 7. shall contain the aggregate of all measurement of quantities referred to in 5., and is binding upon and conclusion between the Owner and the Contractor as to the quantities referred to therein.

23. SCHEDULE

Tender Documents released June 30th, 2026

Non-mandatory job showing – July 14, 2026, 2:30 p.m. on-site

Last Day for Questions – End of Day July 16th, 2026

Direct Inquiries To:

EVB Engineering

Greg Esdale, P.Eng.

Email: greg.esdale@evbengineering.com

Tender Closing – 11:00 a.m. July 23rd, 2026 (Refer to Section 1. General Invitation above)

The Contractor shall substantially complete the contract within 240 calendar days after the date of order to commence work (contract agreement execution date)

FORM OF TENDER

Request for Quotation / Proposal:
Cornwall Island Salt Storage Facility, in accordance to the corresponding tender drawings and specifications.

Project No.: 26-1002A
Closing Date: Thursday, July 23rd, 11:00 a.m.
Closing Time: before 11:00am

Tender submissions delivered to:
Mohawk Council of Akwesasne
Department of Infrastructure, Housing and Environment
101 Tewasateni Road, Akwesasne, Ontario K6H 0G9
Attention to: Leslie Papineau, A/Director

Bidder:

_____	_____
Name of Firm	Contact Name
_____	_____
Address	Postal Code

Telephone Number:	

Hereinafter called "the tenderer".

NOTE:
The Tenderer's name and address must be inserted above, and in the case of an incorporated firm/ Business, the name and address of each member of the firm must be inserted below.
.....
.....
.....

Addenda:

Addendum No.	Dated

It is herewith acknowledged that the foregoing Addenda have been received and forms part of the Tender.

TENDER FOR THE CONSTRUCTION OF THE CORNWALL ISLAND SALT STORAGE FACILITY

TO: Leslie Papineau, OAA, MRAIC, Director
Department of Infrastructure, Housing, and Environment
Mohawk Council of Akwesasne
101 Tewasateni Road
Akwesasne, Ontario K6H 0G5

I (WE)
have carefully examined the locality and site of the proposed works, and all contract documents relating thereto, including: The Form of Agreement, Addendum/Addenda No. to No.* inclusive, Special Provisions, if any, Instructions to Tenderers, inclusive, Supplementary General Conditions, if any; General Conditions, Supplementary Specifications, if any; Specifications, if any, Standard Specifications, if any Contract Drawings, Standard Drawings, Form of Tender, forms of Performance Bond and Labour and Material Payment Bond, hereby tender and offer in accordance therewith to enter into a contract within the prescribed time to construct the said works in strict accordance with the contract schedule, contract documents, and such further detail drawings as may be supplied from time to time and to furnish all materials, labour, tools, plant, matters and things necessary therefore complete and ready for the use within the time specified for the sum of

..... dollars

(\$.....) or such other sum as may be ascertained in accordance with the Contract.

The Tenderer agrees to have the works completed by the time, known as the “Time of Completion”.

THE AFORESAID SUM IS MADE UP AS FOLLOWS:

The Tenderer is required to submit his Tender in accordance with the following Schedule of Items and Prices. The Engineer may refuse to accept a breakdown containing prices which are, in his opinion, unbalanced and has the right to adjust the breakdown to correct such balancing.

CORNWALL ISLAND SALT STORAGE FACILITY PROJECT

SCHEDULE OF ITEMS AND PRICES

ITEM NO.	DIVISION	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL PRICE
PART 1 – SPECIAL PROVISIONS						
1.01	3	Concrete Formwork	LS	1		
1.02	3	Concrete Reinforcing	LS	1		
1.03	3	Concrete Supply and Place	LS	1		
1.04	5	Metal Fabrications	LS	1		
1.05	13	Tension Fabric Building Supply and Erect	LS	1		
1.06	26	Electrical	LS	1		
1.07	20-23	Mechanical	LS	1		
1.08	31	Erosion and Sediment Control	LS	1		
1.09	31	Excavation and Backfill	LS	1		
1.10	32	Aggregates – Granular A	T	1480		
1.11	32	Aggregates – Granular B	T	2650		
1.12	32	Asphalt HL-3	T	145		
1.13	32	Asphalt HL-4	T	180		
1.14	32	Fencing and Gates	LS	1		
1.15	32	Topsoil / Hydro Seeding	m ²	5500		
SUB-TOTAL PART 1						

ITEM NO.	DIVISION	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL PRICE
PART 2 - GENERAL ITEMS						
2.01	1	Mobilization and Demobilization	LS	1		
2.02	GC	Pre-Condition Survey	LS	1		
2.03	GC	Other (Indicate here)	LS	1		
2.04	GC	Contingency	LS	1	\$75,000.00	\$75,000.00
SUB-TOTAL PART 2						

ITEM NO.	DIVISION	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL PRICE
PART 3 –ALLOWANCES						
3.01	26	Cornwall Electric works	LS	1	\$20,000	\$20,000
SUB-TOTAL PART 3						\$20,000

PART	DESCRIPTION	TOTAL AMOUNT
1	SPECIAL PROVISIONS	
2	GENERAL ITEMS	
3	ALLOWANCES	\$20,000
	TOTAL TENDERED AMOUNT	

SUMMARY

TOTAL TENDERED PRICE – MCA CONTRACT No: 26-1002A

ESTIMATED VALUE OF NATIVE LABOUR \$ _____

ESTIMATED VALUE OF NON-NATIVE LABOUR \$ _____

ESTIMATED VALUE OF MATERIALS
FROM NATIVE SOURCES \$ _____

ESTIMATED VALUE OF MATERIALS
FROM NON-NATIVE SOURCES \$ _____

ESTIMATED VALUE OF EQUIPMENT
FROM NATIVE SOURCES \$ _____

ESTIMATED VALUE OF EQUIPMENT
FROM NON-NATIVE SOURCES \$ _____

This tender summary is to be submitted within 48 hours of a request from MCA or a delegate of MCA.

STATUTORY DECLARATION:

CANADA
PROVINCE OF QUEBEC / ONTARIO
COUNTY OF _____

(IN THE MATTER of a Proposed Contract for the
(CORNWALL ISLAND SALT STORAGE FACILITY)

TO WIT:

_____ **DO SOLEMNLY SWEAR THAT** the several matters
stated in the foregoing Tender are in all respects true, **AND** _____ make this solemn
declaration, strictly believing it is to be true, and knowing that it is of the same force and effect as if made under oath,
and by virtue of “The Canada Evidence Act”.

DECLARED before me

the.....)
.....)
of)
In the County of)
This day of 2026)

.....
Tenderer

The General Conditions for this project requires that the Tenderer completes and submits this declaration with this tender. Failure to complete the Statutory Declaration may result in the tender being invalidated by Mohawk Council of Akwesasne.

STANDARD TENDER REQUIREMENTS

Period of Validity of Tender

Extra lump sum to extend the period of validity of tender from 60 days to 120 days from the date of submission = \$..... (Refer to Instructions to Tenderers - Liquidated Damages).

The aforementioned lump sum shall apply regardless of any difference between the Final Contract Price and the Original Contract Price.

M.C.A. may in its discretion take into account the extra lump sum tendered above when comparing tenders for awarding a contract.

If this tender is accepted by M.C.A., the Tenderer agrees:

1. To carry out any additional or extra work (including the supplying of any additional materials or equipment pertaining thereto) or will delete any work as may be required by the Engineer in accordance with the Contract;
2. To carry out of any work referred to in Paragraph (1) above or the issuance by the Engineer of a Contract Change Order relating to such work or the acceptance of such Contract Change Order shall not, except as expressly stated in such Contract Change Order, waive or impair any of the terms of the Contract or of any Contract Change Order previously issued by the Engineer or any of the rights of the Council or of the Engineer under the Contract;
3. To pay M.C.A. the sum specified in the Contract (as liquidated damages) for each calendar day that the work under the Contract as modified by all Contract Change Orders issued by the Engineer remains uncompleted after the expiry of the Time of Completion specified in the contract or the extended time for completion allowed in writing by the Engineer. See Instructions to Tenderers, Item No. 18.

The prices applicable to work referred to in Paragraph (1) above shall be determined as follows:

- a) The Schedule of Items and Prices shall apply where applicable;
- b) If the above Schedule is inapplicable the prices shall be determined in accordance with Section 26 of the General Conditions.

The Tenderer agrees that, if so requested in writing by M.C.A., he will enter into a contract with M.C.A. based upon his tender but jointly in the names of the Tenderer and the Tenderer's parent company, if any. The Tenderer further agrees that any request by M.C.A. as indicated above is not and shall not be deemed to be a counteroffer by M.C.A.

STANDARD TENDER REQUIREMENTS (Cont'd)

The Tenderer further declares:

This tender is subject to a formally prepared and executed contract.

This tender is made without any connection, comparison of figures or arrangements with, or knowledge of, any other corporation, firm or person making a tender for the same work and is in all respects fair and without collusion or fraud.

No member of the Mohawk Council and no officer or employee of the Council or of the Engineer is or will become interested directly or indirectly as a contracting party, partner, surety or otherwise, or in the performance of the Contract or in the supplies, work or business to which it relates.

On request, the Tenderer agrees that he will furnish to M.C.A. a copy of his latest financial statement within four (4) days after being requested to do so by M.C.A.

EVALUATION OF TENDERERS

Evaluation of Qualified Tenders

Qualified Tenders will be, at the discretion of the Mohawk Council of Akwesasne, evaluated by the Evaluation Team. The Tenderer is reminded that the lowest bid price will not necessarily be accepted and that the MCA reserves the right to reject any or all tenders.

The following criteria and weighting will be used in the evaluation of qualified tenders:

#	Criterion	Description	Weighting
1.	Total Bid Price	The total bid price as declared in the Form of Tender. The formula for the evaluation of the cost shall be: Lowest Submitted Cost / Submitted Cost x 65 Points Allocated	65
2.	Previous Experience	Bidders must provide 3 references of projects of work of similar size and complexity to describe their experience. References must be completed and submitted with quotation. Failure to submit may cause the quotation to be rejected.	25
3.	Native Content	The value of local Native labour, equipment, operators, and construction materials as declared in the Form of Tender. Include details if the bidder has formed a joint venture partnership with a local Native contractor for the purpose of undertaking the project	10
		TOTAL	100

Right to Accept or Reject Quotation

The Owner reserves the right to reject any or all quotations. The selection of the successful contractor will also be based on references and past performance of the bidder.

The following bids will be rejected:

- Late bid (Bid received after Closing time as specified in quotation document)
- Quotation Bid form not completed in ink or by non-erasable medium
- Quotation Bid form not signed
- Quotation Bid form not used
- Quotation and/or deposit requirements not being met
- Informal quotations (ie: bonds not provided, if required)

References

Each Bidder is required to provide three references from projects of similar in size and scope for which the bidder has provided the same or similar deliverables within the past five years.

The Consultant / Owner in its sole discretion, may confirm the bidder's experience by checking the bidder's references and the provision of the references by the bidder is deemed to be consent to such confirmation/contact with the references.

The Consultant / Owner reserves the right to revisit the bidder's scores in the rated requirements based on information learned during reference checks, should they reveal that there is inconsistency between the bidder's answers to the rated requirements and the results of the reference check.

In terms of Native Content- MCA encourages contractors to utilize the services of our local native contractors. – if qualified as it pertains to specific sections. They may also consider contacting local services to assist with providing secondary services. i.e. dumpster rentals, truck disposal of waste, etc.

Reference #1	
Company name:	
Title of Project:	
Contact name:	
Contact telephone number:	
Contact email address:	
Project, Size, Scope and Value	
In Any, describe use of Native Labour, Material and Equipment. Include company names and estimated percentage of total value.	

Reference #2	
Company name:	
Title of Project:	
Contact name:	
Contact telephone number:	
Contact email address:	
Project, Size, Scope and Value	
In Any, describe use of Native Labour, Material and Equipment. Include company names and estimated percentage of total value.	

Reference #3	
Company name:	
Title of Project:	
Contact name:	
Contact telephone number:	
Contact email address:	
Project, Size, Scope and Value	
In Any, describe use of Native Labour, Material and Equipment. Include company names and estimated percentage of total value.	

QUALIFICATIONS OF SUB-CONTRACTORS

The Tenderer must list on this statement sheet the name of each proposed sub-contractor for the Tenderer's convenience and to ensure that a complete list is submitted with the Tender.

The Tenderer shall make an entry against each possible sub-trade listed whether by naming the proposed sub-trades or by entering "by own forces", whichever applies. No blank spaces shall be left.

In addition, if the Tenderer proposes to sublet a part of the work he shall add the sub-trade and the proposed sub-contractor's name to the following list:

FAILURE TO COMPLY WITH THE AFOREMENTIONED REQUIREMENTS MAY RESULT IN THE TENDER BEING DISQUALIFIED BY MCA.

MAJOR ITEM

SUB-CONTRACTOR

Excavation / Backfill

Fencing/Gates

Concrete Forming

Concrete Rebar

Concrete Supply

Fabric Tension Building

Asphalt

Electrical

Mechanical

Other(s)

The contractor shall not, without written consent of the Owner, change a subcontractor who has been proposed above.

**CONSTRUCTION SUPERVISOR
EXPERIENCE REQUIREMENT**

Site Supervisor Experience Requirement

The tenderer will designate a proposed construction supervisor who will coordinate contractor activity full time on site for the duration of the project.

Substitution will not be allowed without the prior written approval of the MCA Department of Infrastructure, Housing and Environment Director.

The designated construction supervisor must have a minimum of ten (10) years experience in municipal infrastructure projects of a similar size and scope.

The tenderer will attach as part of their tender, a curricula vitae for the proposed construction supervisor outlining his or her experience in municipal infrastructure projects of a similar size and scope.

It is to be noted that the experience of the designated construction supervisor forms part of the contract documents and will form part of the basis of evaluation and recommendation for award of contract.

Should the tenderer not be able to provide a designated construction supervisor with acceptable experience the MCA will have the option of disqualifying the tender.

The tenderer hereby appoints _____ as designated construction supervisor (curricula vitae attached hereto).

Contractor

Date

STANDARD TENDER REQUIREMENTS
(AGREEMENT TO BOND)

The "Agreement to Bond" of the, a company lawfully doing business in the Provinces of Ontario or Quebec, to furnish a Performance Bond and a Labour and Material Payment Bond each in an amount equal to 100% of the Contract price, or in such greater amount as may be required by the Council, if this tender is accepted, is enclosed herewith.

The Tenderer agrees that M.C.A. reserves the right to reject any or all tenders and that the lowest or any tender will not necessarily be accepted. M.C.A. reserves the right to award the contract to an otherwise qualified local bidder if the local bidder's price is within five percent of the lowest total tender price.

A certified cheque in an amount equal to 10% of the total tender price to a maximum of \$20,000.00 applicable to First Nation contractors only, or a Bid Bond for 10% of the Tender amount payable to M.C.A. is attached hereto as the required tender deposit.

If the successful bidder fails to enter into a contract with the Council of Akwesasne:

- where a certified cheque was provided for bid surety the cheque will be cashed and the funds used to make up the difference between the low bid and the next acceptable bid up to the value of the cheque. Unused funds will be returned to the issuer.
- ★ where a Bid Bond was provided for bid surety, the Bonding Company will make up the difference between the low bid and the next acceptable bid up to the value of the bond.

Dated atthis day of, 2026

.....
Signature of Witness

.....
Signature of Tenderer

NOTE: If the tender is submitted by, or on behalf of, a corporation, it must be signed in the name of such corporation by the duly authorized officers and the seal of the corporation, or wafer seal, must be affixed. If the tender is submitted by, or in behalf of, an individual or a partnership, a seal must be affixed opposite the signature of the individual or of each partner and each signature must be witnessed.

AGREEMENT TO BOND

**
**
**
**
Date, 2026

Mohawk Council of Akwesasne
Department of Infrastructure, Housing and Environment
101 Tewasateni Road
Akwesasne, Ontario
K6H 0G5

Dear Sirs:

**Re: Cornwall Island Salt Storage Facility
Project No. 26-1002A**

In Consideration of the Mohawk Council of Akwesasne (hereinafter referred to as "the Owner") accepting the tender of and executing an Agreement with: (hereinafter referred to as "the Tenderer") for the construction of: **Cornwall Island Salt Storage Facility** subject to the express conditions that the Owner receive the Performance Bond and the Labour and Materials Payment Bond in accordance with the said tender, we the undersigned hereby agree with the Owner to become bound to the Owner as surety for the Tenderer in a Performance Bond and a Labour and Material Payment Bond each in an amount equal to 100% of the contract price or other such great amount as may be determined by the Owner, in the forms of Performance Bond and Labour and Material Payment Bond and in accordance with the said tender, and we agree to furnish the Owner with said tender, and we agree to furnish the Owner with the said Bonds within seven (7) days after notification of the acceptance of the said Agreement by the Owner has been mailed to us.

Yours very truly,

(Corporate Seal)

.....

NOTE: This Agreement to Bond must be executed on behalf of the Surety Company by its authorization officers under the Company's corporate seal. Of the two forms bound herein, one shall become a part of the tender and the other shall be retained by the Surety Company.

** Enter the name and address of the Surety company at the top of the page

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1.0 DEFINITIONS

Wherever used in these General Conditions, Special Conditions, Plans, Form of Tender, Instructions for Tenderers, Specifications, Statutory Declarations or other documents forming part of this Contract:

"authorized", "directed", "required", "requested", "approved", "ordered", "sanctioned", "considered" and "satisfactory", shall, unless some other meaning is obvious from the context, mean respectively authorized, directed, required, requested, approved, ordered, sanctioned or considered by or satisfactory to the Consulting Engineer.

"Owner" means the Mohawk Council of Akwesasne.

"Contract" includes the Agreement to do the work entered into with the Owner, the Specifications, the General Conditions, Special Conditions, Information for Tenderers, the Plans, the Tender and all other documents referred to in or bound with the said Agreement and identified as being part of the contract documents.

"Contractor" or a pronoun in place thereof, means the person or persons or corporation who have undertaken to carry out the Contract.

"Construction Manager / Contract Administrator" means the firm or individual designated by the Owner to tender and manage all contracts for this project.

"Engineering/Consulting Engineer" means the Consulting Engineer named in the Form of Quotation, or such other person, Firm or Corporation designated by the Owner.

"Owner" has its natural meaning except when it refers to the Owner of the project.

"period of maintenance" means the period from the date of substantial performance of the contract, as set out in the Certificate of Substantial Performance, to the date of issuance of the Final Certificate and shall be not less than 12 months.

"Plans" means all plans, profiles, drawings, sketches, or copies thereof exhibited, used or prepared for or in connection with the work embraced under the Contract.

"plant" (unless the context requires a different meaning) means every temporary or accessory means necessary or required to carry on or complete the work and extra work, in the time and manner herein provided.

"shall", "may", "herein", "person", "writing" or "written", "surety", and "security" and words used in the singular number of the masculine gender, shall have the meaning and effect as given in the Interpretation Act of the Revised Statutes of Ontario.

"Site Representative" means a site representative for the Owner acting under the direction of the Consulting Engineer.

"Solicitor" means the person for the time being acting as Solicitor for the Owner.

"Subcontractor" includes only a person, firm or corporation having a contract for the execution of a part or parts of the work included in the contract with the Owner, or a person, firm or corporation furnishing material

called for in the contract with the Owner and worked to a special design according to the plans or specifications, but does not include one who merely furnishes material not so worked.

"work" or "works" (unless the context requires a different meaning) means the whole works, materials, matters and things required to be done, supplied, or installed that are mentioned or referred to in the Contract, including all extra or additional work or material, matters or things which may be ordered by the Consulting Engineer, as herein provided.

“Working Day” means any Day

- (a) except Saturdays, Sundays and statutory holidays;
- (b) except a Day as determined by the Contract Administrator, on which the Contractor is prevented by inclement weather or conditions resulting immediately therefrom, from proceeding with a Controlling Operation. For the purposes of this definition, this will be a Day during which the Contractor cannot proceed with at least 60% of the normal labour and equipment force effectively engaged on the Controlling Operation for at least 5 hours;
- (c) except a Day on which the Contractor is prevented from proceeding with the Controlling Operation, as determined by the Contract Administrator by reason of:
 - (1) any breach of Contract or prevention by the Owner, by any other Contractor of the Owner or by any employee of any one of them,
 - (2) non-delivery of Owner supplied materials;
 - (3) any cause beyond the reasonable control of the Contractor which can be substantiated by the Contractor to the satisfaction of the Contract Administrator.
- (d) Working days will not be charged during the period December 15th to May 15th inclusive, unless the Contractor opts to complete contract works during this period.

2.0 TENDERS

All tenders for the execution of the work herein set forth or referred to must be made on the printed forms supplied for that purpose. No others will be considered. Such tenders must be made without any knowledge, comparisons of figures or arrangements with any other person making any tender or estimate for the same purpose, and the tenderers shall declare that such tenders are in all respects fair and without collusion or fraud, and that no employee of the Owner is, shall be, or shall become interested, directly or indirectly, as contracting party, partner, surety or otherwise in, or in the performance of, the Contract, or in the supplies, work or business to which it relates, or in any portion of the profits to be used therein or thereof, or in any of the monies to be derived therefrom. The tender must be verified by the Statutory Declaration of the party or parties making the tender that the several matters stated therein are in all respects true. Tenders must cover the cost of completion of the Contract in every respect, in accordance with the Contract, including all labour, plant, tools, etc.

The Contractor agrees that he is fully informed regarding all of the conditions, local or otherwise, affecting the work to be performed and that his information was secured by personal investigation and that he will make no claim against the Owner based on any estimate or representation of the Owner or of any representative of same.

3.0 SCOPE OF CONTRACT

Stated in general terms, and without in any way limiting the requirements and intent of the Contract, the works required to be done by the Contractor under the Contract comprises construction, completion and maintenance of the works referred to in the Plans, Specifications, General Conditions or other contract documents relating thereto and includes the provision, except where otherwise specifically stated in the Contract, of all labour, plant, materials and equipment required for the complete and proper execution of the work. The contract documents are complementary and what is required by any part thereof shall be considered as being required by the whole thereof. Materials and work which are not specifically described or shown in the contract documents but the necessity of which can reasonably be considered as inferable from the contract documents shall be supplied and performed by the Contractor at no additional cost to the Owner and the Contractor shall not claim extra payment therefore or an extension of the time for completion on account thereof.

In the case of discrepancies between drawings, those of larger scale, or if the scales are the same, those of later date shall govern.

4.0 PLANT, LABOUR AND MATERIAL

The Contractor shall provide all necessary skilled and unskilled labour, and materials, fuel, machinery, tools and all plant, so that the Contract, and all work required to be done under it, can and will be carried on continuously and expeditiously to completion, in all respects to the satisfaction of the Construction Manager and the Consulting Engineer.

All material, plant, machinery, tools and equipment acquired, possessed or provided by the Contractor for incorporation into the works shall be the property of the Owner, whether or not such material, plant, machinery, tools and equipment are brought to or upon the works or upon lands of the Akwesasne Territory and the Contractor is prohibited from removing or disposing of the same, or any part thereof, without the consent or instructions of the Consulting Engineer in writing.

No materials, plant, machinery or equipment reasonably required for the performance of the Contract and not for incorporation into the works, brought to or upon the works or upon lands of the Akwesasne Territory, shall be removed or disposed of during the progress of the works without the written consent or instruction of the Construction Manager or his authorized representative. In case of a difference of opinion between the Contractor and the Construction Manager or his authorized representative as to whether any of the aforesaid items is reasonably required on the works for the satisfactory progress of the works, the Contractor shall abide by the decision of the Consulting Engineer.

5.0 SAMPLES

Before any material of any kind is used on the work, the Contractor shall submit samples thereof for the approval of both the Construction Manager and the Consulting Engineer and must obtain such approval. No material shall be used on the work which is in any inferior to the approved samples. The giving of such approval shall not obligate the Owner to pay for any material other than in accordance with the Contract, shall not prevent the rejection of any material which may be found, in the opinion of the Construction Manager or the Consulting Engineer, to be unsound or unfit for use on the work or not in accordance with the approved samples or the requirements of the Contract and shall not be deemed to be a waiver of objection to the work or any part thereof at any time on account of the materials used not being satisfactory or on any other account. The decision of the Consulting Engineer with respect to the approval or rejection of samples shall be final.

6.0 CONDEMNED AND SURPLUS MATERIALS

Should any plant, appliances or materials which the Construction Manager or the Consulting Engineer may deem to be inferior or unfit for use in or on the works, be brought on the ground, or used, the same shall be wholly removed therefrom within twenty-four (24) hours after notification to that effect from the Construction Manager, and in case of failure or neglect on the part of the Contractor to remove the same, the Construction Manager may cause the same to be taken away at the Contractor's expense and deposited, wasted, or otherwise disposed of, in any locality, place or way he considers convenient or proper, and the Contractor shall forthwith pay to the Owner on demand, all expenses incurred, including storage, if any, or the same may be deducted or collected by the Owner, as provided in the section hereof entitled "Monies Due Owner".

No surplus or other material of any kind, arising from any portion of the work, shall be sold, thrown away, dumped, wasted, or otherwise disposed of without the written sanction of the Construction Manager, and if so disposed of the Construction Manager may ascertain as nearly as he conveniently can the quantities and value, and deduct the same from the Contractor's next progress payment certificate.

Surplus materials are to be offered to adjacent property owners. If the property owner wants the fill, then Contractor is to place and level fill to a height of not more than 2m.

7.0 EQUIVALENTS

Where pursuant to the Specifications the Contractor is required to supply an article or group of related articles designated by a trade or other name or an "approved equal", **the Tender shall be based only upon supplying the article or group of articles so designated, which shall be regarded as the standard of quality required by the Specifications.** After the acceptance of a tender, the Contractor may apply to the Construction Manager, who will apply on behalf of the Contractor to the Consulting Engineer to substitute as an approved equal another article or group of related articles identified by a different trade or other name for an article or group of related articles designated as aforesaid. The application shall be in writing and shall state the price for the proposed substitute article or group of related articles, the price for the article or group of articles designated as aforesaid and such other information as the Consulting Engineer may require.

8.0 APPROVALS AND PERMITS

The construction of the works and all operations connected therewith are subject to the approval, inspection, by-laws and regulations of Owner, provincial and federal and other authorities having jurisdiction in respect to any matter embraced in this Contract. The Contractor will obtain and pay fees, if any, for approvals and permits, unless otherwise specifically stated in the tender documents.

9.0 ERRORS AND OMISSIONS BY CONTRACTOR

Errors, mistakes, omissions or unauthorized changes made by the Contractor or his agents, workmen or employees and all damage and delay costs that may result therefrom shall be rectified and paid for by the Contractor at his own expense.

10.0 DELAYS

If, after the execution of the Contract, the Contractor suffers damage by reason of delay with respect to construction of the works arising from causes other than adverse weather or labour disputes and beyond his control, the Owner may in its discretion compensate the Contractor wholly or in part for such damage.

The Contractor shall take all steps necessary or advisable to reduce or eliminate all damage or loss by reason of delay with respect to construction of the works arising from any cause whatsoever.

11.0 ORAL ARRANGEMENTS

In all cases of misunderstandings or disputes, oral arrangements will not be considered, but the Contractor must produce written authority in support of his contentions, and shall advance no claim in the absence of such written authority, and shall not use, or attempt to use, against the Owner any conversation with any parties.

12.0 DECISIONS BY THE CONSULTING ENGINEER

Should any discrepancies appear or differences of opinion or misunderstanding arise as to the meaning of the Contract or as to any omissions therefrom or statements therein in any respect, or as to the quality or dimensions or sufficiency of the materials, plant or work or any part thereof, or as to the due and proper execution of the works, or as to the measurement or quantity or evaluation of any works executed or to be executed under this Contract, or as to extras thereto or deductions therefrom, or as to any other questions or matters arising out of the Contract, the same shall, subject to the terms of the Contract, be determined by the Consulting Engineer, who shall have the right at all reasonable times to visit, enter and carry out site reviews at any buildings, factories, workshops, works or sites of the Contractor or others wherever any materials are being prepared, manufactured or treated, or other work is being done in connection with this Contract and the right also to take such samples therefrom as he may deem necessary and the Contractor shall immediately when ordered by the Consulting Engineer, proceed with and execute the work or works, or any part thereof, forthwith in accordance with such order and with such additions to or deductions from the contract price as are provided under the terms of the Contract, without making any claim for any extension of time in completing the work, unless arranged in writing with the Construction Manager as herein provided.

13.0 SITE REPRESENTATIVE AND SITE REVIEW

All work to be done under the Contract shall be done to the satisfaction of the Construction Manager and the Consulting Engineer or of an agent or Site Representative authorized by the Construction Manager to act for him. The Site Representative is required by the Consulting Engineer to see that the provisions of the Contract are faithfully adhered to, especially as regards to the quality of the workmanship and materials, and may stop the work entirely if there is not a sufficient quantity of suitable and approved material on the site to carry on the work properly or for any good and sufficient reason. In particular, but without limiting the powers of the Site Representative, orders given by the Site Representative relating to the quality of material or workmanship or in respect of safety or public convenience must at once be obeyed by the Contractor. The Site Representative shall have the power to suspend any worker for incompetency, drunkenness, negligence or disregard of orders and the Contractor shall ensure that any worker so suspended is forthwith removed from the site.

14.0 OCCUPANCY OF THE WORKS

The use or occupancy of the works or any part thereof by the Owner shall not be taken in any manner as an acceptance by the Owner of any work of material not in accordance with the Contract or to relieve the Contractor or his surety from liability, whether heretofore or hereafter incurred or arising, in respect of the observance or performance of any covenant or condition in the Contract not then performed, whether such covenant or condition be by way of indemnity to the Owner or otherwise, save to the extent that loss or damage is caused during such use or occupancy by the Owner or by employees of the Owner for whom the Owner is responsible. In particular, without limiting the generality of the foregoing, the use or occupancy of the work or any part thereof by the Owner shall not release the Contractor from liability to pay to the Owner,

or waive or impair the right of the Owner to deduct and retain, liquidated damages and resident engineers' and inspectors' fees, in accordance with the Contract.

15.0 ABSENCE OF CONSTRUCTION MANAGER AND CONSULTING ENGINEER AND HIS AGENT

The Owner may appoint a Construction Manager or a Firm of Construction Management, Consulting Engineer or Firm of Consulting Engineers as agents of the Consulting Engineer for the purpose of reviewing the work performed under this Contract. In the absence of the Consulting Engineer or his duly appointed agent, any inspector who has been designated by the agent to review the work shall have full power to decide as to the manner of conducting and executing the work in every particular and the Contractor shall follow the instructions or orders of the person so designated.

16.0 CONTRACTOR'S ABSENCE

In the absence of the Contractor from the works (whether permanent or temporary) he must provide and leave a competent and reliable superintendent in charge of the entire works for him at all times, notwithstanding the extent of subletting, and such person shall be considered as acting in his place, and all notices, communications, orders or instructions given or sent to or served upon such person shall be taken as served upon and received by the Contractor.

17.0 CONVENIENCES

The Contractor shall provide, and properly maintain in clean condition, suitable and convenient privy or water closet accommodation for the benefit of all Contractors.

18.0 PUBLIC CONVENIENCE AND SAFETY

If at any time the Construction Manager or his authorized representative considers the works to be unsafe he may order the Contractor to take measure forthwith to ensure adequate safety. Should the Contractor fail to take adequate measures, the Construction Manager or his representative may order the work to cease until such measures have been taken. The Contractor shall not be entitled to additional payment for, or an extension of time for the performance of the Contract by reason of, such safety measures. The fact that the Construction Manager or his representative has ordered or has failed to order additional safety measures shall not relieve the Contractor of responsibility for the adequacy of the safety measures taken.

19.0 LOSS OR DAMAGE

The Owner shall not in any manner be answerable or accountable for any loss or damage by fire or otherwise that shall or may happen to the work or any part or parts thereof; or for any of the materials or other things used and employed in finishing and completing the work, or for any injury to any person or persons, including workmen and the public, or for damage to adjoining property, against all of which injuries and damages to persons or property, the Contractor shall properly guard, and shall make good all damage of whatsoever nature or origin which may arise out of, or be occasioned by any cause connected with the Contract, or the work done by the Contractor, and shall indemnify and keep indemnified the Owner against same until the completion of all the work hereunder and the termination in accordance with the Contract of the insurance which the Contractor is required by the Contract to provide.

20.0 INSURANCE

- (a) The Contractor shall insure and shall maintain insurance for, in the joint names of the Contractor, the Construction Manager, the Consulting Engineer, the Geotechnical sub-consultant and of the Owner, and in an insurance company satisfactory to the Owner, the work and all the material, plant, fuel, machinery, tools and equipment are brought to or upon the work or upon lands of the Owner, in an amount not less than 100% of the total value of such work and material, plant, fuel, machinery, tools and equipment and such additional amount, not exceeding the contract price, as may be directed by the Owner, against all risk, so that any loss under such insurance shall be payable to the Owner and the Contractor as their respective interests may appear. The Contractor shall deposit with the Owner a cover note of such insurance in the form attached hereto and the original policy of such insurance in the form attached hereto and the original policy of such insurance or a Certificate of Insurance, clearly stating that the policy of insurance provided as aforesaid complies with these provisions. The Contractor shall pay all insurance premiums as they become due; provided that the Owner may pay the premiums and deduct the amount thereof from monies due the Contractor. Any loss or damage which may occur shall not affect the rights and obligations of the Contractor or of the Owner under this Contract except that in such event the Construction Manager may in writing extend the time for completion for such period as he thinks reasonable. If the Construction Manager does not extend the time for completion, then the work must be completed within the time fixed in the Contract. Monies paid to the Contractor under such insurance shall be used for the purpose of replacing, rebuilding, repairing and completing the work, and all such material, plant, fuel, machinery, tools and equipment which have been damaged or destroyed. Such replacing, rebuilding, repairing and completion shall be carried out in every way subject to the terms and conditions of the Contract.
- (b) The Contractor shall maintain and pay for such insurance and shall pay such assessments as will protect him from claims under the Worker's Compensation Act and from any other claims for damages arising from bodily injury, including death, and from claims for property damage which may arise from his operations under this Contract. The Contractor shall deposit with the Owner a Certificate of such insurance, in the form attached hereto, clearly stating that the policy of insurance so provided complies with these provisions.
- (c) The insurance required under paragraphs (a) and (b) shall be maintained in full force until the Construction Manager has issued a Certificate of Completion or until the Owner has otherwise approved in writing save that if the Contractor continues to work at the site after the date of completion as established by the Certificate of Completion or returns to the site to work after such date, he shall maintain or renew for the duration of such work the Insurance required by the Contract.

21.0 CONTRACTOR'S LIABILITY

The Contractor shall assume the defence of and indemnify and save harmless the Owner and its officers and agents from all claims relating to labour and materials furnished for the work, and to inventions, copyrights, trademarks, royalties or patents, and rights thereto, relating to or used in doing the work, or the subsequent use and operation of the work or any part thereof upon completion. In carrying out the works from their inception, and until the final acceptance of the same, the Contractor must be careful to cause as little injury or damage as possible to any adjacent property, public or private, or to any sidewalks, roadways, curbs, gutters, drains, hydrants, manholes, frames, covers or street gullies, boulevards, grass plots, sodding, trees, shrubs, or structures, works or things on or near the line or in the vicinity of the works or elsewhere, and, except as in this Contract is otherwise provided, if injury or damage is done, he must make good the same, at his own expense, in the manner directed by, and to the satisfaction of, the Construction Manager. The Contractor shall be responsible for any and all damages, or claims for damages for injury or accidents done or caused by him or his employees or agents, or resulting from the prosecution of the works, or any of his operations, or caused

by reason of the existence or location or condition of the works, or of any materials, plant or machinery used thereon or therein, or which may happen by reason thereof, or arising from any act of commission or omission on his part, or on the part of any of his agents or employees, in connection with the Contract, and covenants and agrees to hold the Owner harmless and indemnified from all such damages and claims for damage; and in case of the Contractor's failure, neglect or omission to observe and perform faithfully and strictly, all the provisions of the Contract, the Construction Manager may, either with or without notice (except where in this Contract, notice is specially provided for, and then upon giving the notice therein provided for), take such steps, procure such material, plant, trucks and men, and do such work or things as he may deem advisable toward carrying out and enforcing the same, and any and all expenses so incurred may be deducted or collected by the Owner under the provisions of Section 34 hereof, entitled "Monies Due Owner", and any such action by the Construction Manager as he is herein empowered to take, shall not in any way relieve the Contractor or his surety from any liability under the Contract.

22.0 NIGHT, SUNDAY AND HOLIDAY WORK

The Construction Manager may order the work to proceed on a two or three eight-hour shift basis if he deems this necessary to speed up the work, or he may order any work to be carried out in whole or in part at night, and the Contractor shall have no claim for extra compensation in respect thereof. No work, however, shall be undertaken at night without the consent in writing of the Construction Manager.

Whenever, in the judgment of the Consulting Engineer, it may be necessary or expedient to do work at night or after or before the regular time of ending or beginning labour, such night or overtime work shall be performed by the Contractor without additional or extra cost to the Owner beyond the price bid for the work.

23.0 NOTICE TO CONTRACTOR

Any notice or communication to the Contractor shall be deemed to be well and sufficiently given and served if handed to the Contractor or any of his clerks or agents, or if posted or sent to the address given in the Agreement, or to his domicile or usual place of business, or to the place where the work is to be or is being carried on, or if posted to or left at his last known address, and any papers so left, sent or addressed shall be considered to be, and to have been legally served upon the Contractor.

24.0 RELEASE OF HOLDBACK TO SUBCONTRACTORS

Notwithstanding that the Contract as a whole has not yet been substantially performed, the Construction Manager may, if requested in writing by the Contractor, approve the completion of a Subcontract and the release to a Subcontractor through the Contractor of the 10% holdback retained by the Owner in respect of the work covered by the said Subcontract provided that:

- (a) the Contractor certifies:
 - (1) that the said Subcontract has been completed satisfactorily, or
 - (2) that the said Subcontract has been completed satisfactorily except for work not exceeding in value the lesser of
 - (i) one percent of the Subcontract Price, and
 - (ii) \$1,000.00

and gives reasons why the uncompleted work is still outstanding.

- (b) the Construction Manager is satisfied:
 - (1) that the said Subcontract has been completed satisfactorily, or
 - (2) that the said Subcontract has been completed satisfactorily to the fullest extent reasonably possible at that date and that the work remaining to be completed does not exceed in value the sum derived from (a)(2) above.
 - (3) that all required or necessary inspection and testing of the works covered by the said Subcontract have been carried out and that the results are satisfactory.
- (c) the Contractor has furnished to the Construction Manager:
 - (1) a release by the Contractor in a form satisfactory to the Construction Manager releasing the Owner from all further claims (excepting holdback monies) relating to the said Subcontract.
 - (2) evidence satisfactory to the Construction Manager that the said Subcontractor has discharged all liabilities incurred by him in carrying out the said Subcontract and that all liens in respect of the completed Subcontract have expired or have been satisfied, discharged or provided for by payment into Court.
 - (3) a satisfactory clearance certificate or letter from the Worker's Compensation Board relating to the said Subcontractor.
 - (4) the required maintenance security in respect of the said Subcontract as provided in Section 39 hereof.
 - (5) as-built drawings and maintenance manuals approved by Construction Manager, Consulting Engineers and accepted as satisfactory by the Owner.
- (d) The Consulting Engineer has completed a review of the facilities and is satisfied.
- (e) the Construction Manager retains sufficient money to cover the cost of completing any work which remains uncompleted under the said Subcontract.

The Construction Manager shall, within seven days after he approves a certificate wherein it is certified that the Subcontract has been completed, give a copy of the said certificate to the Contractor and to the Subcontractor concerned.

On receipt of the holdback monies from the Owner, the Contractor shall forthwith pass to the Subcontractor concerned the payment due under the said Subcontract and shall pass to the Construction Manager a copy of the transmittal letter showing the amount of the said payment.

The period of maintenance for the work carried out under the said Subcontract shall continue until the issuance of the Final Certificate for the Contract.

Release of holdback monies by the Owner in respect of a Subcontract in accordance with the foregoing shall not relieve the Contractor or his surety of any of their responsibilities and shall not be made until a period of 45 days has elapsed from the date of approval of the certificate certifying the said Subcontract to be completed.

25.0 MEASUREMENTS

- (a) Approximate monthly accounts of the works completed under the Contract shall be made by the Construction Manager at the end of each calendar month except where the work has been delayed or suspended. An authorized representative of the Contractor shall assist the Construction Manager in

- taking such measurements and shall furnish all particulars required by the Construction Manager. The Construction Manager shall notify the Contractor when such a measurement will be made.
- (b) The said monthly accounts shall not bind the Construction Manager in any manner in the preparation of his final account of the works constructed by the Contractor under this Contract, but shall be construed and held to be approximate only.
 - (c) The final measurement shall be prepared in detail as soon as the whole of the works have been completed, and this final measurement shall be approved and accepted in writing by the Construction Manager. Thereafter the Completion Payment Certificate shall be issued and payment shall be made in accordance with Section 39 hereof.

26.0 VALUATION OF VARIATIONS

- (a) The Construction Manager shall determine the amount, if any, to be added to, or deducted from, the sum named in the Tender, in respect of any extra or additional work done, or work omitted by his order. All such work shall be valued at the price as set out in the Schedule of Items and Prices or the Schedule of Additional Unit Prices if, in the opinion of the Consulting Engineer, the same shall be applicable.
- (b) If the Contract does not contain any prices applicable to the extra, additional, or omitted work, then the Contractor and Construction Manager may agree on a price for such work, in which case the price shall be comparable to prices quoted on work of a similar nature.

27.0 BOOKS AND RECORDS OF THE CONTRACTOR

- (a) The Contractor shall keep proper books and records showing names, trades, and addresses of all workers in his employ and wages paid to, and the time worked by, such workers; also records, books, and invoices showing all costs, expenditures, payments, settlements, receipts, and balances in connection with the construction of the works.
- (b) All records of the Contractor relevant to the valuation of the works including payrolls, time books of account, invoices, and statements, shall be maintained on the site or at some other place approved by the Construction Manager and shall be open at all reasonable times for review by the Construction Manager. The Contractor shall in every way assist such review for the purpose of establishing and determining labour costs, the cost of extra work, and progress payments to be made.

28.0 PAYMENT

- (a) The Contractor shall submit to the Construction Manager at the end of each calendar month a fully itemized statement showing the estimated value of the permanent work executed up to the end of the month based on the unit prices shown in the Contract and the section covering Valuation of Variations, together with a fully itemized statement of the value of major items of material and equipment on site for incorporation into the permanent works.
- (b) From each monthly statement including the statement based on the final measurement, the Construction Manager will prepare a Monthly Payment Certificate and will include therein so much as he considers fair and reasonable in respect of the value of the work executed and of the major items of material and equipment on site.
- (c) Ten percent (10%) of all monies due the Contractor in accordance with the Monthly Payment Certificate up to a limit of 10% of the contract price, shall be retained by the Owner (except as may otherwise be provided for in the Contract) and shall be termed the holdback.

- (d) The Monthly Payment Certificate will show the Construction Manager's gross valuation of the work performed and materials supplied, the deduction of the appropriate amount of holdback, the previous payments to the Contractor and the amount due him.
- (e) No progress estimate or payment shall be held to bind the Construction Manager in his valuation of the work on its completion and the Consulting Engineer may on any Monthly Payment Certificate make correction or modification to any previous certificate he has made.
- (f) At the time of issuance by the Construction Manager of the Certificate of Substantial Performance in accordance with Section 44 of the General Conditions, the Construction Manager shall:
 - (1) Notify the Contractor of the value of the maintenance security required by Section 43.
 - (2) Prepare a Substantial Performance Payment Certificate showing:
 - (i) the value of work completed to-date.
 - (ii) the value of outstanding or uncompleted work.
 - (iii) the value of the required maintenance security.
 - (iv) the amount of the 10% holdback (allowing for any previous release of holdback to the Contractor in respect of completed Subcontracts and deliveries of pre-selected equipment).
 - (v) the amount due the Contractor.
 - (3) Prepare a Payment Certificate releasing to the Contractor the 10% holdback due in respect of work performed up to the date of substantial performance. Subject to the submission by the Contractor of the following documents such holdback shall become payable after 45 days from the date of publication of the Certificate of Substantial Performance:
 - (i) A written undertaking by the Contractor to complete expeditiously any outstanding work and to discharge all unfulfilled obligations under the Contract.
 - (ii) The Contractor's final claim (except in respect of outstanding work).
 - (iii) A release by the Contractor in a form satisfactory to the Consulting Engineer releasing the Owner from all further claims relating to the Contract (except in respect of outstanding work).
 - (iv) A Statutory Declaration in a form satisfactory to the Consulting Engineer that all liabilities incurred by the Contractor and his Subcontractors in carrying out the Contract have been discharged and that all liens in respect of the Contract and Subcontracts thereunder have expired or have been satisfied, discharged or provided for by payment into Court.
 - (v) A satisfactory Clearance Certificate from the Workers' Compensation Board.
- (g) At the time of issuance by the Construction Manager of the Certificate of Completion in accordance with Section 44 of the General Conditions, the Consulting Engineer shall:

- (1) Prepare a Completion Payment Certificate showing:
 - (i) the Final Contract Price.
 - (ii) the amount of the further 10% holdback (based on the value of further work completed over and above the value of work completed shown in the Substantial Performance Payment Certificate referred to in (f) above).
 - (iii) the value of the required maintenance security.
 - (iv) the amount due the Contractor.
- (2) Prepare a Payment Certificate releasing to the Contractor the further 10% holdback. Subject to the provisions of The Construction Lien Act and the submission by the Contractor of the documents required by Section 44 hereof, such further 10% holdback shall become payable after 45 days from the date of completion of the works as established by the Certificate of Completion.

29.0 PAYMENT OF INTEREST

Delay by the Owner in making payment to the Contractor shall be deemed not to be a breach of contract by the Owner.

In the event that, following substantial performance of the Contract or completion of the Contract as established by the relevant certificate issued by the Construction Manager, payment by the Owner to the Contractor in respect of work done or release of holdback is delayed by the Owner, the Contractor shall be entitled to payment of interest from a date or dates derived from the following:

- (a) Payment for Work Done:

A date 45 days after the date when the Contractor satisfactorily complete submission of the documentation required by the Contract and complied with the other requirements of the Contract.

- (b) Release of Statutory Holdback:

A date 30 days after the date established by Section 44 of the General Conditions, (whichever applies), as the earliest date for release of holdback.

The applicable rate of interest shall be that established from time-to-time by ISC.

30.0 SUSPENSION OF WORK

The Construction Manager or Consulting Engineer may, by an order in writing, at any time stop or suspend any part of the work, or direct any portion to be commenced or completed in priority to any other part or portion, or may cancel the order to proceed with the work, or with any part thereof, and the Contractor shall not thereby be entitled to any additional payment, or to claim for loss of profit or anticipated profit, or for damages or otherwise howsoever, by reason of such order except as may be allowed in accordance with Section 12 hereof. When in the opinion of the Construction Manager or the Consulting Engineer, it is deemed advisable for any reason to discontinue the work, or any part thereof, for the winter, the Contractor must, on notice of the required discontinuation, forthwith place the work in proper and satisfactory condition for the accommodation and safety of the public and for the effectual protection of the work against damage from rain, snow, frost, ice, or other causes, and must so maintain the work.

31.0 SUBLETTING

The Contractor shall keep the work under his personal control, and shall not assign, transfer, or sublet any portion without first obtaining the written consent of the Construction Manager. The consent of the Construction Manager to any such assignment, transfer, or subletting, shall not, however, relieve the Contractor of any responsibility for the proper commencement, execution, and completion of the work according to the terms of the Contract. If the Construction Manager consents to any such assignment, transfer or subletting the Contractor shall, either in person or through an accredited agent, receive all notices, communications, orders, instructions, or legal service, as if he were performing the work with his own plant and his own workers.

32.0 SETTING OUT

The Construction Manager will provide the Contractor in writing with bench marks and points of reference to be used by him in setting out the works. The Owner will be responsible only for the correctness of the information so supplied. From these bench marks and points of reference the Contractor will do his own setting out.

The Contractor shall be responsible for the true and proper setting out of the works and for the correctness of the position, levels, dimensions and alignment of all parts of the works, and for the provision of all necessary instruments and labour in connection therewith.

33.0 ASSISTANCE

The Contractor is to furnish the Consulting Engineer, the Contract Manager, or any of their assistants, with any reasonable help which he or they may require at any time in checking the work. He shall also furnish the said parties, or any of the Site Representatives, at all times, with convenient means of access to all parts of the works, and also with all required assistance to facilitate thorough examination of the same, and inspection, culling and removal of doubtful or defective material, and for any other purpose required in connection with the said works or in the discharge of their respective duties, for which services no additional allowance will be made.

34.0 MONIES DUE OWNER

All monies payable to the Owner by the Contractor under any stipulation herein or to the Workers' Compensation Board, may be retained out of any monies then due, or which may become due, from the Owner to the Contractor under this or any other contract with the Owner, or otherwise howsoever, or may be recovered from the Contractor or his surety jointly or severally in any court of competent jurisdiction, as a debt due to the Owner; and the Owner shall have full power to withhold any estimate or certificate, if circumstances arise which may indicate to it the advisability of so doing, though the sum to be retained may be ascertained.

35.0 DISPUTES

(a) Contractor's Claims

Any claim which the Contractor may have against the Owner based on any dispute or difference of any kind whatsoever arising out of the Contract or work shall not be ground for delay in the work but shall be referred by the Contractor in writing to the Construction Manager not later than fifteen (15) days after the Contractor becomes aware of the circumstances giving rise to such dispute or difference. Such reference shall contain a concise statement of the relevant facts. The Construction Manager may require any additional information.

The claim shall be settled by the Construction Manager who shall communicate his decision in writing to the parties and such decision shall forthwith be given effect by the parties, and the Contractor shall proceed with the works with all due diligence in accordance therewith whether or not such claim shall be referred to arbitration as hereinafter provided.

Except in those circumstances where it is provided in the Contract that the decision of the Construction Manager shall be final, any dispute or difference persisting after the delivery of the Construction Manager's decision shall, within thirty days, be referred to arbitration in accordance with the Arbitration Act of Ontario and as herein provided. Compliance by the Contractor with the provisions of Section 39 hereof and with time limits stipulated herein shall be a condition precedent to such arbitration.

The arbitration shall be by a board of three members except as provided for in the following paragraph hereof. Either party shall notify the other party in writing of its desire to submit the dispute or difference to arbitration and the notice shall contain the name of the first party's appointee to the arbitration board. The recipient of the notice shall within fourteen (14) days inform the other party of the name of its appointee to the arbitration board. The two members, so selected, shall within fourteen (14) days of the appointment of the second of them appoint a third person who shall be a lawyer and who shall be the chairman of the arbitration board, unless the parties to the dispute agree that the said chairman need not be a lawyer.

Alternatively, the arbitration board may consist of a sole arbitrator provided that:

- (a) the Owner and the Contractor so agree, and
- (b) the Owner and the Contractor agree upon the person to be appointed as sole arbitrator.

Either party may appeal from the arbitration award.

Reference to arbitration by the Contractor as herein provided shall be a condition precedent to any legal action by him with respect to any dispute or difference of any kind whatsoever which the Contractor may have with the Owner arising out of the Contract or work.

- (b) Owner's Claims

Any claim which the Owner may have against the Contractor based on any dispute or difference of any kind whatsoever arising out of the Contract or work may, at the option of the Owner, and after notification in writing to the Contractor, be settled in accordance with the procedure set out in sub-section (a) hereof and the provisions thereof shall apply 'mutatis mutandis'.

36.0 RESTORATION

Where the Contractor enters into the lands, buildings, highways or roads under the jurisdiction and control of the Owners for the purpose of making a survey, examination, investigation, inspection or lays any pipes or appurtenances and in so doing disturbs any such lands, buildings, highways or roads, such lands, buildings, highways or roads shall be restored to their original condition without delay.

37.0 DRAINAGE

The Contractor shall keep all portions of his work properly and efficiently drained during construction and until completion, and he will be held responsible for all damage which may be caused or result from water backing up or flowing over, through, from or along any part of the works, or which any of his operations may cause to flow elsewhere. The Contractor shall dewater all work sites and excavations as necessary or as

directed to enable the works to be constructed in a satisfactory manner. The Contractor shall not be entitled to any additional payment for compliance with the requirements hereof beyond the prices tendered for the construction of the works.

38.0 BARRIERS, LIGHTS AND DETOURS

The Contractor must, at his own expense, and without further or other order, provide, erect and maintain all requisite barriers, fences or other proper protection; and must provide, keep and maintain watchmen and lights with red globes, as may be necessary or as may be ordered by the Construction Manager, in order to ensure safety to the public as well as to those engaged about the premises or works. Should the Contractor neglect to carry out the above requirement, the Construction Manager is hereby authorized to place such watchmen, lights, barriers, etc., as are required, and to charge the cost to the Contractor, without relieving the Contractor of any claims for damages or accident. The Contractor must (where it is practicable in the opinion of the Construction Manager) keep the roadway open for travel for the use of the public, for such width as the Construction Manager may direct. Where, in the opinion of the Construction Manager, it is not practicable to keep a roadway open for the full flow of traffic, he may permit the Contractor to close or partially close such roadway and to provide for a detour of the traffic or a part thereof. In each such case and before putting into effect the closure or detour, the Contractor shall present his proposal for closure or detour to the municipal or other authority or authorities having jurisdiction over any of the roadways which will be affected by the proposed closure or detour and shall obtain the written authorization to such proposal of the said authority or authorities. The Contractor must provide a sufficient number of "NO THOROUGHFARE", "DETOUR" or other proper notices, which he must cause to be placed and maintained in good order in conspicuous places wherever any roadway, sidewalk, or thoroughfare is torn up or dangerous, and so long as it remains unsafe or unfinished.

When any work is carried on at night, the Contractor must supply, at his own expense, a sufficient number of electric or other approved and efficient lights, to enable the work to be done in an efficient and satisfactory manner, and the Construction Manager shall have the power to order additional lights to be put on at the Contractor's expense if in the opinion of the Construction Manager, they are or may be required.

39.0 ALTERATIONS, EXTRAS, DEDUCTIONS AND CLAIMS

The Consulting Engineer and the Construction Manager shall have the right to make or order any alterations and changes as they may deem advisable at any time before or during the execution of the works, including any line, grade, plan or detail thereof. The Consulting Engineer and the Construction Manager may suspend or omit any portion of the work, change the dimensions of any part of the works, vary the work contracted for, order any additional or extra work to be done, or order additional or extra materials to be furnished. Upon written orders from the Construction Manager the Contractor shall proceed with, carry out and execute the works as directed, shall supply such additional materials, and do such additional or extra work as the Construction Manager requires. The Contractor is not entitled to any extension of time for completion or any additional payment on account thereof, except only as herein provided.

Before commencing any work or procuring any materials required to do work beyond the requirements of the Contract, the Contractor must obtain a written order from the Construction Manager stating:

- (a) The work is an extra and will be paid for as such, clearly define the nature of such extra work or material, and the amount the Contractor is to receive, or the terms under which the work is to be paid for; or
- (b) The work is considered to be part of the Contract and not an extra and that no additional payment shall be made.

Before beginning any such work or commencing to deliver any such material, notify the Construction Manager in writing of his intention to commence work thereon or delivery thereof, so that a proper account or record of the same may be kept by the Construction Manager. If the Contractor proposes to claim additional payment for work or materials which the Consulting Engineer considers to be a part of the Contract and not an extra, the Contractor shall so notify the Construction Manager in writing before commencing such work or delivering such materials.

In case of the Contractor's neglect or failure to observe fully and faithfully the above conditions in this section contained, he shall forfeit all right to payment therefor which he otherwise might have had, and shall not make any claim in respect thereof, and if made, the Consulting Engineer may reject the same as invalid.

40.0 OTHER'S RIGHTS

The Contractor must afford all necessary and reasonable facilities to the Owner, any of its employees or workers, as well as to any company, corporation or person owning or operating any railway, tramway, wires, pipes, conduits, works or property, on, along, or near the line of the works. He shall notify all such parties before interfering with any of their property, rights or privileges and must work in harmony with them; otherwise he shall notify the Construction Manager in writing of his failure so to do, or of any difficulty that may at any time arise which he may be unable to overcome, in which case the Construction Manager shall deal with the matter as in his judgement may seem right or proper, and the Contractor shall abide by the decision and the direction of the Construction Manager. Any property of such parties which the Construction Manager orders to be moved by the Contractor must be handled with care, and must be neatly piled up and preserved free from injury or loss, and must be properly and satisfactorily replaced, all of which must be done by the Contractor without extra charge (unless specifically provided for in the Contract) and to the satisfaction of the Construction Manager. The Consulting Engineer shall have the right, at any time before or during the construction, or after the completion of the work, to open up any portion of the work or works, or the ground or roadway, or to grant permission for such opening to be made or left by the Contractor, as he, the Consulting Engineer, may deem advisable, for the purpose of examining, repairing or laying any water, gas or other pipe, sewer, drain, track or other underground or surface construction or to cause any such work as he may deem necessary or advisable to be done, and such permission, or the exercise of such rights, either by the Consulting Engineer or by any other person or corporation having the requisite authority (either statutory or otherwise) shall not relieve the Contractor from any of his responsibilities or obligations, nor shall the opening up of any portion of the work for these or any other purposes, or by any other parties, relieve the Contractor of such responsibilities or obligations, except only for the portion of the work actually torn up and destroyed, and then only in case the Contractor applies in writing for such relief at the time the work is being done, or within ten days afterwards, and can furnish sufficient cause, in the opinion of the Consulting Engineer, why such relief should be granted.

41.0 NON-FULFILMENT OF CONTRACT

If in the opinion of the Consulting Engineer or Construction Manager and at any time or times prior to the issuance of the Final Certificate, the Contractor neglects or fails to commence work, or becomes bankrupt or insolvent, or compounds with his creditors, or commits any act of insolvency, or transfers, assigns or sublets the Contract or any part thereof without the written consent of the Consulting Engineer/Construction Manager, or has not executed or is not executing the work or any part thereof in a sound and workmanlike manner and in accordance with the Contract, or is not performing the work so as to ensure its completion within the time stipulated in the Contract or has failed to complete the works within the said time, or fails or refuses to take down, rebuild, repair or rectify any imperfect work for which the Contractor is responsible, or fails to remove any condemned material or to replace such material with proper material, or fails to comply with any reasonable order given to him by the Consulting Engineer/Construction Manager, or abandons the

work, or fails to observe or perform any of the provisions of the Contract, then in each and any such case the Consulting Engineer/Construction Manager shall, after giving the Contractor 48 hours written notice, have the right and power, at his discretion without process or action at law, to take possession and control of the whole work, or any part or parts thereof specified in the said notice, from the Contractor, and the Contractor, upon receiving the said notice, shall give possession and control of the said work, or the part or parts thereof specified in the said notice, peaceably to the Consulting engineer, and the Consulting Engineer/Construction Manager may employ such means as he may deem necessary or advisable to complete the work to his satisfaction with such changes therein as in the Consulting Engineer's/ Construction Manager's opinion are necessary or advisable by reason of the Contractor's non-fulfilment of the Contract as set out herein. In the event of an emergency in any manner due to the Contractor's non-fulfilment of the Contract as set out above or in Section 30 hereof, the Consulting Engineer/Construction Manager shall have the right and power at his discretion without process or action at law or any notice to the Contractor to take possession and control of the works, or any part thereof, from the Contractor and the Consulting Engineer/Construction Manager may take such measures as he may deem necessary or advisable to deal with the emergency and the decision of the Consulting Engineer/ Construction Manager as to the existence of such an emergency and as to the measures to be taken in regard thereto shall be final. If, in the event of an emergency as aforesaid, the Consulting Engineer/Construction Manager takes measures in regard there to as provided for above, he shall notify the Contractor thereof as soon after the commencement of the emergency as is practicable. The Contractor and his surety in every case provided for above shall be liable for all loss, damage, expense, expenditures and cost which may be incurred by reason of the Consulting Engineer's/Construction Manager's exercise of the rights and powers provided for herein. If the said loss, damage, expense, expenditure or cost exceeds the sum which would have been payable under the Contract if the same had been completed by the Contractor, the Contractor or his surety shall pay the amount of such excess to the Owner together with the amount of liquidated damages from the date fixed for the completion of the work, and the same may be deducted or collected by the Owner as provided for in Section 48, entitled "Monies Due Owner". All the powers of the Consulting Engineer/Construction Manager with respect to the Determination of any doubts, disputes and differences, and the determination of the sum or sums, or balance of money to be paid to or received from the Contractor or his surety in respect of the Contract, shall nevertheless continue in force. The fulfilment by the Contractor of any stipulation in the Contract may be enforced by legal proceedings and judgement, or order of court, without prejudice to any other remedy herein contained.

In case possession and control of the work, or any part thereof, is taken from the Contractor, the completion of the work shall not be delayed. Neither an extension of time for any reason beyond the date fixed herein for the completion of the Contract, nor the payment for any portion of the work shall be deemed to be a waiver by the Consulting Engineer, Construction Manager or the Owner of their rights under this Contract.

42.0 POUR RELEASE FORMS

Concrete shall not be poured until "pour release forms" have been signed by all trades, contractors and the Construction Manager.

43.0 MAINTENANCE SECURITY

The Contractor shall provide to the Owner for the duration of the period of maintenance, a maintenance security the value of which shall be derived from the following table:

CONTRACT PRICE		VALUE OF MAINTENANCE SECURITY \$
FROM \$	TO \$	
Less than 0.1 M		4% of Final Contract Price
0.1M	0.5M	4,000 on first 0.1M + 3.0% on next 0.4M
0.5M	1.0M	16,000 on first 0.5M + 2.4% on next 0.5M
1.0M	2.0M	28,000 on first 1.0M + 2.2% on next 1.0M
2.0M	4.0M	50,000 on first 2.0M + 2.0% on next 2.0M
4.0M	6.0M	90,000 on first 4.0M + 1.8% on next 2.0M
6.0M	10.0M	126,000 on first 6.0M + 1.5% on next 4.0M
Over 10.0M		186,000 on first 10.0M + 1.0% on balance

The maintenance security, which is at no time a part of the statutory holdback, shall be retained by the Owner in increments from monies that would otherwise be payable to the Contractor, commencing during the latter part of the period of construction, so that by the date of substantial performance of the contract the full value of the required maintenance security has been retained.

Except as otherwise provided hereunder, the maintenance security, less any deductions made therefrom as provided for in the Contract, plus interest thereon over the period of maintenance and compounded annually at the applicable rate(s) of interest set from time-to-time by the Minister of Finance shall be paid to the Contractor following the issuance by the Construction Manager of the Final Certificate at the end of the period of maintenance.

The Contractor may apply in writing to the Construction Manager who will request the approval of the Consulting Engineer at the time of substantial performance to substitute for the monies retained as the maintenance security an alternative maintenance security of equivalent or greater value comprising:

- (a) one or more irrevocable letters of credit, or
- (b) another readily negotiable security.

Acceptance of any such alternative shall be at the direction of the Consulting Engineer and the Solicitor for the Owner.

Following receipt and acceptance of any such alternative, the Construction Manager shall release to the Contractor the monies previously retained for maintenance security purposes.

The Construction Manager and the Consulting Engineer together may, in their discretion, allow the total maintenance security to be made up in part of monies retained under the Contract and in part of an alternative maintenance security as indicated in (a) and (b) above provided that the total value of such parts, as determined by the Construction Manager, shall be not less than the required value as derived from the table set out above.

Such alternative maintenance security or the monies derived therefrom, less any deductions made as provided for in the Contract, shall be released to the Contractor following the issuance by the Construction Manager of the Final Certificate at the end of the period of maintenance. Interest shall only be paid on monies, if any, derived from the said security and which remain unexpended in the maintenance security fund.

Where the Construction Manager proposes to release the statutory holdback to a Subcontractor through the Contractor as provided for in Section 44, hereof, the Consulting Engineer shall arrange for "the required maintenance security in respect of the said Subcontract", as referred to in Section 44 hereof, to be provided by a retention from monies that would otherwise be payable to the Contractor. The value of the required maintenance security shall be determined by applying to the value of the Subcontract work the same effective percentage retention, derived from the foregoing table, as applies to the Contract as a whole.

The Contractor may apply in writing to the Construction Manager to substitute for the maintenance security referred to in the preceding paragraph an irrevocable letter of credit in the name of the Contractor.

Following the substantial performance of the Contract, the Construction Manager may require the Contractor to consolidate all letters of credit provided pursuant to the foregoing into one or two letters of credit covering the Contract as a whole.

The Contractor shall allow his Subcontractors to provide letters of credit to the Contractor in conformity with the foregoing procedures. The Contractor shall provide the Consulting Engineer with copies of any or all such letters of credit on request.

44.0 CERTIFICATES OF COMPLETION - to be read with Section 28.0 of the General Conditions.

- (a) The Contract shall be considered as substantially performed when:
 - (1) the works have satisfactorily passed the required inspection and testing and are ready for use or are being used for the purposes intended, and
 - (2) the works are capable of being completed or, where there is a known defect, corrected at a cost of not more than:
 - (i) 3 percent of the first \$500,000 of the Contract Price plus,
 - (ii) 2 percent of the next \$500,000 of the Contract Price plus,
 - (iii) 1 percent of the balance of the Contract Price.
- (b) Where the works or a substantial part thereof are ready for use or are being used for the purposes intended but part of the works cannot be completed expeditiously for reasons beyond the control of the Contractor or where the Owner and the Contractor agree to delay completion of the works, the cost, as determined by the Construction Manager and the Engineer, of completing the outstanding work shall be deducted from the Contract Price in determining substantial performance and the value of the work completed.
- (c) As soon as, in the opinion of the Construction Manager and the Engineer, the Contract has been substantially performed in accordance with the foregoing, the Construction Manager will issue a Certificate of Substantial Performance.
- (d) The Consulting Engineer shall set out in the Certificate of Substantial Performance the date on which the Contract was substantially performed and within seven days after signing the said certificate he shall provide a copy to the Contractor.

- (e) Upon receipt of a copy of the Certificate of Substantial Performance, the Contractor shall forthwith, publish a copy of the said certificate in a construction trade newspaper. Such publication shall include placement in the Daily Commercial News.
- (f) Where the Contractor fails to publish a copy of the Certificate of Substantial Performance as required above within seven days after receiving a copy of the said certificate signed by the Consulting Engineer, the Owner may publish a copy of the certificate at the Contractor's expense.
- (g) Except as otherwise provided, the 45-day period prior to the release of holdback, shall commence from the date of publication of the Certificate of Substantial Performance as provided for in (e) and (f) above.
- (h) The works shall be deemed to be completed when:
 - (1) the works have satisfactorily passed the required inspection and testing, and
 - (2) the cost of completion of all outstanding work and known defects is not more than the lesser of:
 - (i) one percent of the Contract Price, and
 - (ii) \$1,000.00
- (i) As soon as, in the opinion of the Construction Manager, the works have been completed in accordance with paragraph (h) above, the Construction Manager will issue a Certificate of Completion on submission by the Contractor of the following documents:
 - (1) The Contractor's Final Claim.
 - (2) An up-to-date release by the Contractor in a form satisfactory to the Construction Manager releasing the Owner from all further claims relating to the Contract.
 - (3) An up-to-date Statutory Declaration in a form satisfactory to the Construction Manager that all liabilities incurred by the Contractor and his Subcontractors in carrying out the Contract have been discharged and that all liens in respect of the Contract and Subcontracts thereunder have expired or have been satisfied, discharged or provided for by payment into Court.
- (j) The Construction Manager shall set out in the Certificate of Completion the date on which the works were completed and within seven days of signing the said certificate he shall provide a copy to the Contractor.
- (k) **Payment due to the Contractor following issuance of the Certificate of Completion shall be as provided for in Section 28 hereof.**
- (l) On the expiration of a period of 12 months from the date of substantial performance, as set out in the Certificate of Substantial Performance, and after all known imperfect work has been rectified in accordance with the Contract and to the satisfaction of the Construction Manager and the Consulting Engineer to the best of their knowledge that the Contractor has discharged all his obligations under the Contract, the Construction Manager and the Consulting Engineer will issue the **Final Certificate approving the release to the Contractor of the maintenance security (see Section 44(h) hereof)**, less any deduction as provided for in the Contract.

- (m) On the expiration of a period of 12 months from the date of substantial performance, as set out in the Certificate of Substantial Performance, the Construction Manager may approve the release to the Contractor of a part of the maintenance security on such terms and conditions as the Construction Manager deems advisable notwithstanding that the Final Certificate has not been issued and that all imperfect work has not been rectified in accordance with the Contract.
- (n) The Construction Manager may in his discretion direct or approve that the works covered by the Contract be divided into two or more parts for the purpose of issuing Certificates of Completion and releasing holdback monies. In that event, the Contractor shall submit documentation as set out above in respect of each such part.

CONSTRUCTION SAFETY GUIDELINES

1. **SCOPE**

This section applies to the period of construction of all projects. It concerns the safety of the worker on the project and the public affected by the project.

2. **GENERAL**

No project shall be commenced or continued unless sufficient land space is available to permit compliance with all requirements.

3. **PUBLIC WAY PROTECTION**

When work is being carried out on a dwelling or other structure within 4.6m (15') of a public way, provision shall be made to protect the public, by a strongly constructed fence or boarding at least 1.8m (6') in height around the construction site. If the structure is 2m (6'-8") or less from the public way, overhead protection shall also be provided.

Where an excavation is more than 1.2m (4') deep, it shall be shored and protected by a barricade which shall be at least 1065mm (42") high and be located a distance equal to the depth of the excavation from the top of any wall of the excavation. Where an excavation is left open over night flashing lights shall be provided in each direction of the public way.

4. **TRAFFIC CONTROL**

Temporary roadways shall be marked for the passage of vehicle traffic. Workers directing traffic during working hours shall wear approved clothing, ie: a fluorescent and coloured (blaze orange or red) vest or hat and sleeves extending from above the elbow to the wrist. Signs shall be used to direct traffic during non-working hours.

If a major traffic way is obstructed when making service connections, procedures shall be established to allow emergency vehicles access around the obstructed area. Band Police or local law enforcement agency shall be requested to provide assistance.

5. **PERSONAL PROTECTIVE CLOTHING, EQUIPMENT AND DEVICES**

Every worker shall wear appropriate clothing (no loose sleeves etc.) and shall wear or use such protective clothing, equipment or device as is necessary for personal protection. This equipment may be, but is not limited to, safety hats, safety eyeglasses, safety footwear, ear protectors, gloves, etc.

6. **EXCAVATION**

All excavations shall be well marked for pedestrian and vehicle traffic with an access route marked for the passage of emergency vehicles. A worker shall be delegated to direct emergency vehicles in case of an emergency while work is in progress on site.

Care shall be taken not to damage any existing underground system (gas, water, sewer, electrical conduits) which shall be supported where necessary to prevent failure or breaking. Call before you dig.

No vehicle or other machinery shall be driven, operated or located so near to the edge of the excavation as to endanger a person by affecting the stability of the walls of the excavation.

Every excavation shall be kept reasonably free of water at all times.

No worker shall enter or remain in an excavation which is greater than 1.2m (4') in depth unless the excavation is properly shored.

7. HOUSEKEEPING

No object shall be placed where it is likely to endanger a worker or the public.

Formwork ties or nails protruding from concrete shall be removed or cut off as soon as the formwork has been removed.

Except where the scrap material or lumber is stored in an acceptable container for removal, waste material and debris shall be removed daily.

Each trade shall respect the work of other trades and shall keep the workplace clean and safe. Incomplete work shall be left in such state as not to be a potential hazard to other workers.

No material shall be thrown or permitted to fall freely from one story to another, or from a roof.

8. STORAGE OF MATERIALS

Material to be used on a project, or to be removed from a project, shall be stored in an orderly manner so as not to endanger any worker or the public. Care shall also be taken when moving or transporting material.

No construction material shall be stored, stocked or piled within 1.8m (6') of a floor or roof opening, or the open edge of a floor or an excavation, except where they can be handled by one worker and provided that the height of a pile is less than the distance of the face of the pile from the edge.

Lumber and similar materials shall be stored so that the pile is secure against collapsing or tipping. Crosspieces shall be used to provide stability on all piles of lumber exceeding 1.2m (4') in height.

Masonry units shall be stacked on level wood planks, platforms or bases in tiers with header units in the pile where necessary to provide stability. The pile shall not exceed 1.8m (6') in height.

Bagged material shall be piled with cross – piles on the exterior of the pile and be not more than ten bags high.

Pipe and reinforcing steel shall be stocked, supported or braced as to prevent accidental movement.

9. SANITATION

A reasonable supply of potable water shall be kept readily accessible for the use of the workers.

At least one flush toilet, chemical toilet or privy shall be provided or made available to the workers.

10. FIRE PROTECTION

A 4.5 kg (10 lb.) ABC fire extinguisher shall be provided at the construction site. If running water is available, a 15m (50') garden hose with a jet spray nozzle may be used.

Consult the local fire brigade chief to establish the fire protection measures available before work starts.

11. ELECTRICAL SUPPLY

Precautions shall be taken to prevent danger to the public or workmen from any live electrical conductors (wires) or from any electrical equipment.

A panel board shall be securely mounted on a vertical surface, kept clear of any obstruction, readily accessible, located in an area where water will not accumulate and be protected from the weather.

No worker shall use any cord-connected electrical equipment or tool unless the equipment is sufficiently grounded.

No worker shall bring any object, move a back-hoe shovel, crane or other similar lifting device or its load closer than the length of the boom of the lifting device to an electrical power line of more than 750 volts unless he has another worker stationed within his view to warn him when any part of the lifting device or its load is approaching minimum distance from the power line as shown on Table 11.A.

Table 11.A
Forming part of Article 11

MINIMUM DISTANCE FROM LIVE POWER LINES

<u>Voltage of Live Power Line</u>	<u>Minimum Distance</u>
750-15,000 volts	3.1m (10')
15,001-250,000 volts	4.6m (15')
Over 250,000 volts	6.1m (20')

12. CONSTRUCTION EQUIPMENT

All vehicles, cranes, machines, tools or other pieces of equipment shall be maintained in such condition that they will not endanger a worker when in use. For loading lifting equipment where equipment certification is required, the manufacturer's recommendations will be followed. Regular inspections will be conducted as per manufacturer's recommendations. A logbook of inspections, repairs, tests, modifications, etc. shall accompany equipment at all times. Inspections shall be conducted by a certified person.

No worker shall operate any piece of equipment on a project unless he has the required training and experience specific to the equipment being operated. For load lifting equipment requiring operator certification, the manufacturer's recommendation shall be followed. Regular inspections will be conducted as per manufacturer's recommendations. Proof of certification will accompany the operator at all times and may be requested from time to time.

No worker shall mount a platform, bucket or load support by a crane, hoist, fork-lift, front-end loader or similar machine.

Where the operator may be exposed to overhead hazards, a cab, screen or other adequate overhead protection shall be provided.

No person shall operate a power-shovel, backhoe or similar excavating machine in such a manner that any part of its load will pass over a worker.

No person shall begin to disconnect or carry out repairs on a pipeline under pressure until he has ensured that the disconnection or repair will endanger no person.

13. EXPLOSIVES

No fire or other flame shall be taken or be within 7.6m (25') of any magazine vehicle, building or place in which explosives are stored, handled or transported.

An acceptable, competent person shall be appointed by the superintendent to be in charge of all blasting, control and storage of the explosives.

14. PLATFORMS, RUNWAYS AND RAMPS

All runways, ramps or platforms shall be designed to hold the expected loads to be applied to them and be 485mm (19") or more in width. Slopes shall not exceed more than 300mm (1') vertically to 900mm (3') horizontally. Cross-cleats must be used on runs steeper than 1:3.

15. LADDERS:

All ladders shall be securely fastened and be placed so the base of the ladder is not less than one-quarter and not more than one-third of its length from the wall face. The ladder shall extend at the upper level a minimum of 900mm (3') with at least 150mm (6") clearance behind each rung.

When a stepladder is being used, the legs shall be fully spread and locked. The top of the stepladder and pail shelf shall not be used as steps.

16. STAIRS

Temporary stairs shall have a clear width of not less than 510mm (20"), be not more than 4.6m (15') vertically between landings and shall be equipped with handrails.

17. GUARDRAILS

Guardrails shall be provided at the perimeter, open sides and ends of a floor, scaffold, working platform, runway or ramp and be not less than 910mm (36") and not more than 1065mm (41") above the surface, floor, scaffold or roof.

18. SCAFFOLDS

No worker shall use a barrel, box or other loose object to stand upon while working, or to support a scaffold or working platform.

A scaffold shall be anchored and capable of supporting at least twice the maximum load to which it is likely to be subjected, and have uprights diagonally braced, with footings, sills, or supports capable of supporting the load.

The scaffold platform or other work platform shall be at least 460mm (18") wide.

A person with scaffold use training shall be responsible for the use of the scaffold.

19. FORMS AND FALSEWORK

Forms and falsework shall have sufficient bracing in the vertical and horizontal planes to prevent movement and bucking.

Falsework shall be braced to withstand all loads during and after placing of the concrete. Falsework design shall be approved by the design engineer or consultant or otherwise acceptable.

Forms or falsework shall not be removed unless the concrete has attained sufficient strength to support any load likely to be applied to it.

20. EXPLOSIVE ACTUATED TOOLS

All explosive-actuated fastening tools shall have a safety mechanism that will prevent the tools from being fired while being loaded, during preparation for firing, or if dropped; and be capable of operation only when the muzzle end is held against a working surface.

An explosive-actuated fastening tool shall be used only by a worker who has been instructed in the proper and safe manner of its use and who is wearing safety protection equipment (safety hat, safety glasses, safety boots and ear protection)

The load for an explosive actuated fastening tool shall be so marked that the operator can identify its strength. The load and tool shall not be left unattended and when not in use, shall be stored in a locked container.

21. SMOKING

Where conditions are such as to make smoking a fire or explosion hazard, smoking shall be permitted only in specifically acceptable smoking areas.

The areas where smoking is not permitted shall be identified by signs. Signs prohibiting smoking shall have black lettering at least 50mm (2") high with a 12mm (1/2") stroke on a yellow background. Symbols at least 150mm (6") by 150mm (6") may be used in lieu of lettering.

Schedule of Fines and Procedures for Infractions of Safety Procedures

First warning will be a verbal warning to employee of breach of safety procedure and to Employer/Contractor by Safety Officer of the Department of Infrastructure, Housing, and the Environment.

Second warning must be a written warning to Employee of a continuing breach of the same safety procedure and to Employer/Contractor by Safety Officer of the Department of Infrastructure, Housing, and the Environment.

Third warning following a continuing breach of the same safety procedure results in written notice to Employee as well as to the Employer/Contractor by the Safety Officer of the Department of Infrastructure, Housing, and the Environment. This written notice documents the two previous infractions and levies the fine. The fines may not exceed a maximum of:

- a) \$500.00 for Employee
- b) \$5,000.00 for Employer/Contractor

Following the imposition of fines, further persistent breaches of safety procedures will result in termination of the contract between the Employer/Contractor and the Mohawk Council of Akwesasne.

CONSTRUCTION SAFETY PROGRAM

Introduction

All accidents in Akwesasne can be prevented.

Working to this goal is expected of each employee of the Mohawk Council and all contractors, subcontractors and their employees.

Safety Policy

Working safely is a condition of awarding contractors and for any individual's presence on Mohawk Council Construction Projects.

All contract work at Akwesasne must be performed in full compliance with Ontario Health and Safety Standards and additional procedures as set out by the Mohawk Council Infrastructure, Housing, and the Environment Safety Department.

Failure to comply may be used as a basis for denying an individual permission to work on Mohawk Council projects.

All work performed at Akwesasne must be done in full compliance with Ontario Regulations 213/91 Construction Projects, Occupational Health and Safety Act. Also, the Construction Health and Safety manual published by the Construction Safety Association of Ontario. This manual is easy to read and well illustrated; copies are available at the Infrastructure, Housing, and the Environment Safety Office.

Planning and Communication Safety

- Work Plan
- Hazard Identification
- Safety Meeting

All work activity must be planned as follows:

1. Work Plan

A weekly work plan for the following week must be completed each Friday, outlining the work planned.

2. Hazard Identification

A weekly work plan for the following week must be completed each Friday, identifying the safety hazards, potential accidents, safety procedures to be followed and safety equipment to be used to prevent any accident or injury when performing the planned work.

3. Weekly Safety Meeting

A safety meeting must be held on the morning of the first working day of each week. The weekly work plan and hazard ID sheet will have created the agenda, ie: the work plan for the week

- ~ hazards in performing the planned work
- ~ safety procedures to follow
- ~ safety equipment to be used

Each employee in attendance is required to sign “report of the meeting” in the space provided. It is each contractor’s responsibility to ensure that the above procedure is strictly followed by his supervisors, foreman and subcontractors.

Copies of the weekly work plan (a) and hazard identification sheet (b) are to be delivered to the MCA Safety Office by 2:00 p.m. every Friday.

A copy of the safety meeting report is to be delivered to the MCA Safety Office by 2:00 p.m. of the first working day of each week.

Forms (a), (b) and (c) will be provided by MCA Safety Office. The MCA Safety Coordinator will provide assistance if required to complete forms (a), (b) and (c).

Safety Audits/Site Inspections

The MCA Safety Coordinator conducts random site safety audits on a daily basis and a formal safety audit every week on all MCA construction projects. Any unsafe conditions or unsafe act is recorded.

We require that the site supervisor accompany the Safety Coordinator on these weekly audits. ANY UNSAFE CONDITION OR ACT MUST BE CORRECTED IMMEDIATELY.

A written report is made of each audit and copies distributed to Project/Construction Managers and Site Supervisors.

MCA Safety Coordinator

The role of the MCA Safety Coordinator is a supportive one, providing assistance and guidance in all safety concerns. His/Her role in safety in no way relieves the contractor’s responsibility for the safety of their employees including subcontractor employees.

PLAN SAFETY INTO EVERY WORK ACTIVITY
THE BETTER THE PLAN
THE BETTER THE RESULT

AGREEMENT

I, _____
(Contractor's Name)

agree to comply with all of the above safety requirements.

Signed

Date

WORK PLAN

Contractor _____

Foreman _____

for week starting Monday, _____

ACTIVITY #	WORK PLAN	MON.	TUES.	WED.	THURS.	FRI.	SAT.	SUN.

Contractor _____

Foreman _____

Date _____

Mohawk Council of Akwesasne

HAZARD IDENTIFICATION SHEET

NO.	WORK ACTIVITY	HAZARDOUS CONDITION	POTENTIAL ACCIDENT	PREVENTATIVE MEASURES	SAFETY EQUIPMENT REQUIRED

MOHAWK COUNCIL OF AKWESASNE

WEEKLY MONDAY MORNING

SAFETY MEETING

HAZARD IDENTIFICATION

(list of attendees to be included with minutes)

Contractor _____ Foreman _____ Date _____

SAFETY HAZARDS TODAY (refer to Hazard Identification Sheet)			
PREVENTATIVE ACTIONS AND SAFETY EQUIPMENT REQUIRED		EMPLOYEE SUGGESTIONS	
ATTENDEES	✓	ATTENDEES	✓
SAFETY DOESN'T HAPPEN BY ACCIDENT			

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1. **USE OF SITE AND FACILITIES**

It is essential that the on-going operations of the homeowners/occupants be maintained with minimal disruption during the period of new construction and alterations/modifications.

2. **PARKING CONSIDERATIONS**

Parking for construction personnel shall be at designated locations.

3. **TRAFFIC CONSIDERATIONS**

It will be necessary to make provisions for the movement of vehicular traffic at all times. The Contractor will be responsible for performing the work so that the least inconvenience is caused to traffic. Temporary traffic measures to be in accordance with Ontario Traffic Manual Book 7.

Flagging for traffic control on this contract shall be in conformance to Mohawk Council of Akwesasne Construction Safety Guidelines.

Workers directing traffic during working hours shall wear approved clothing - ie: a fluorescent and coloured (blaze orange or red) vest, or hat and sleeves extending from above the elbow to the wrist. Signs shall be used to direct traffic.

4. **CONSTRUCTION SCHEDULE**

Upon the award of the contract, Contractor shall, **within seven days** from receipt of MCA's letter of intent to commence work, and submit his schedule to the Construction Manager for approval.

The schedule of construction should clearly show in weekly stages the proposed progress on the main items and sub-trades of the contract. The Construction Manager may require the Contractor to revise the schedule at any time.

The Contractor shall provide a list of names of all construction crews to be employed for the duration of the contract.

5. **EXISTING SERVICES AND USE OF FACILITIES**

Execute work with least possible interference or disturbance to the normal use of premises.

Install a portable toilet facility on premises for the use of construction workers.

Work is to be performed in such a manner as to be transparent to the residents, all construction materials, tools, equipment shall be kept within the contract limits throughout construction.

The work site is deemed to be under the sole control of the contractor and shall accept full responsibility for full time security of the work site, and for materials stored within.

6. **HEALTH AND SAFETY**

Comply with the terms from MCA Construction Health and Safety Guidelines referred to in these specifications as well as the Ontario Safety Act.

The Contractor is to supervise and instruct employees in safety practices as set out in the Occupational Health and Safety Act and Regulations for Construction projects, latest amendments, including WHMIS training.

Provide and/or enforce the use of all safety equipment, apparatus and clothing, etc. as required by Act and regulations. Ensure that any sub-trade employed provides and/or enforces the use of all safety equipment, apparatus and clothing for all of their work forces.

Erect and maintain warning signs where the need exists. Provide and maintain suitable illumination during the hours of darkness at all danger points.

Do not close or obstruct streets, sidewalks, exits, passageways or parking areas without permission from the Volunteer Fire Department and the Department of Infrastructure, Housing, and the Environment.

Ensure that no part of the work is loaded during construction with a load greater than it is able to bear safely.

7. **REMOVED MATERIALS**

The Contractor shall be responsible for removed material. For disposal of excess or unsuitable materials, see appropriate item specification.

8. **NEW MATERIAL STORAGE**

Contractor is responsible to store and protect all materials on site from damage or vandalism prior to installation. Any damaged material so designated by the Contract Administrator shall be removed and replaced at no additional cost to the Owner.

9. **NOISE LIMITATION**

Cooperate at all times to keep noise to a minimum, ie: trucks and similar equipment.

10. **CLEAN-UP**

Clean-up promptly during the progress of work and remove all debris from the site.

At the completion of the work, remove from the project, all tools, equipment, surplus products, temporary enclosures or partitions, etc. Daily housekeeping and clean-up and the care and handling of products required in connection with the work is a requirement of the Contract.

11. **CONTRACT LIMIT**

The Contractor shall confine his operation to the limit of the site, unless specified or shown otherwise, or unless otherwise directed by the Construction Manager or unless written approval is received from the property owners concerned.

12. **PROTECTION**

Protect finished work and adjacent areas against damage until take-over.

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APPENDIX A – GEOTECHNICAL REPORT

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Work covered by Contract Documents.
- .2 Contractor use of premises.
- .3 Owner occupancy.

1.2 **WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract includes the construction of a new 21.5m x 39.8m salt storage building comprised of a poured in place concrete foundation supporting a pre-engineered fabric type building. Various civil and electrical site improvements including but not limited to two new site entrances, new electric sliding gates (2), new interior building and exterior asphalt works, various removals of existing concrete foundations, the removal of the existing electrical service and replacement with a new 400A service, and new building associated electrical and mechanical works.

1.3 **CONTRACTOR USE OF PREMISES**

- .1 Contractor has restricted use of site provided that all relevant MCA by-laws are adhered to including but not limited to noise, traffic, use of highways and accessibility.
- .2 Modifications to the facility can proceed with controlled interference to the operation of the existing facility (the existing facility serves as a maintenance garage). Bringing new works into operation will affect certain operational procedures and these must be discussed and approved/coordinated with MCA project managers before proceeding.
- .3 Coordinate use of premises under direction of Contract Administrator.
- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .5 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .6 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Contract Administrator.

1.4 OWNER OCCUPANCY

- .1 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage. Recognize that the existing facility is potentially required 24 hours per day, seven days per week.
- .2 In the event of conflict between construction operations and routine facility operations, facility operations shall have priority. Every precaution shall be taken to avoid interfering with routine facility operations and maintenance. Reschedule construction activities as required.
- .3 Give one week's written notice where the construction schedule requires that a portion of the existing works be taken out of service to facilitate construction. MCA project managers shall review the proposed timing. Prepare and submit a detailed description and timeline of the proposed works for review and approval a minimum of two weeks prior to impending shutdowns and tie-ins.
- .4 Depending on the complexity of the proposed shutdown or tie-in, prepare a sketch and attach of said work. The Sketch shall clearly identify impacted equipment, isolated systems, tie-in points, operated valves, etc. to assist MCA better understand the scope of the proposed shutdown and tie-ins.

1.5 ON-SITE DOCUMENTS

- .1 Maintain at job site documents as indicated in Section 01 31 00 – Project Management and Coordination.
- .2 Maintain at job site, a minimum of one copy of each document as follows:
 - .1 Contract Drawings
 - .2 Specifications
 - .3 Addenda
 - .4 Reviewed Shop Drawings
 - .5 List of Outstanding Shop Drawings
 - .6 Change Orders
 - .7 Other Modifications to Contract
 - .8 Field Test Reports
 - .9 Copy of Approved Work Schedule
 - .10 Health and Safety Plan and Other Safety Related Documents
 - .11 Other Documents as specified.

1.6 PERMITS AND FEES

- .1 Owner will be responsible for plumbing permits, road cut and boulevard permits.
- .2 The Contractor will be responsible for:

a) electrical permits per the Electrical Safety Authority (ESA)

b) All other applicable permit and connection fee's

.3 Cornwall Electric costs covered by an allowance

1.7 CONTRACT METHOD

.1 Construct the work under the Lump Sum contract as outlined in the Form of Tender.

1.8 WORK BY OTHERS

.1 Cooperate with other contractors in carrying out their respective works and carrying out instructions from the Contract Administrator.

.2 Coordinate work with that of other Contractors. In any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Contract Administrator, in writing, any defect which may interfere with proper execution of Work.

1.9 PARTIAL OWNER OCCUPANCY [NOT USED]

.1 Schedule and substantially complete designated portion so Work for Owner's occupancy prior to Substantial Performance of entire Work as require to phase and complete the project as per the approved schedule and in accordance with the Contract Administrator.

1.10 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING FACILITIES

.1 Execute work with least possible interference or disturbance to public and normal use of premises. Arrange with the Contract Administrator to facilitate execution of work.

1.11 EXISTING SERVICES

.1 Notify the Contract Administrator and utility companies of intended interruption of services and obtain required permission and permits.

.2 Where work involves breaking into or connecting to existing services, give the Owner 1 week notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to vehicular traffic and services.

.3 Provide alternative routes for vehicular traffic as required.

.4 Establish location and extent of service lines in area of work before starting work. Notify Contract Administrator of findings.

- .5 Submit schedule to and obtain approval of Contract Administrator for any shutdown or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide adequate bridging over trenches or entrances to permit normal traffic.
- .7 Where unknown services are encountered, immediately advise Contract Administrator and confirm findings in writing.
- .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .9 Record locations of maintained, re-routed and abandoned service lines.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION**

3.1 **RECOMMENDED SEQUENCE OF CONSTRUCTION**

- .1 Prepare schedule, sequencing and plan, complete preliminary planning for all construction works.
- .2 Engage building and material/equipment suppliers, issue purchase orders and coordinate the shop drawing process in order to begin fabrication as soon as possible.
- .3 Obtain all require permits (if applicable)
- .4 Install and test all mechanical, electrical and process components in both permanent and temporary power conditions. Note that existing site power shall not be disrupted for more than 2 hours during normal working hours.
- .5 Commission the new facility in coordination with the Owner and Contract Administrator.
- .6 Provide as-built drawings, warranties, and operation and maintenance manuals.

3.2 **CONSTRAINTS**

- .1 Project restraints include but are not limited to the following:
 - .1 Coordination of work with the electrical utility provider
 - .2 Lead times for the delivery of the pre-engineered building and equipment
 - .3 Facilitate work to permit continued operation and use of the existing maintenance facility

- .4 Health and Safety for the staff and workers and delineation of the work area
- .5 Protection of the critical services and continuity of services

END OF SECTION

PART 1 **DEMOLITION**

- .1 Inclusion of Allowances in the Tender Price is not to be construed as implying that any or all of the Allowances will be expended.
- .2 Expend each allowance as directed by Contract Administrator.

PART 2 **CASH ALLOWANCES**

- .1 Cash Allowances cover only the net cost to the Contractor of the items, materials, services or contract referred to, as verified by invoices to be submitted to Contract Administrator.
- .2 The Contract Price, and not the cash allowances, includes all construction machinery and equipment, freight, handling, unloading, storage, installation, coordination, supervision, overhead and profit and other costs necessary to incorporate the allowance products, services, or contracts into the project, except as otherwise noted.
- .3 Each cash allowance will be adjusted to actual cost as defined hereunder and contract price will be amended accordingly by written order.
- .4 Contract Price will be adjusted by written order to provide for an excess or deficit to each cash allowance.
- .5 Progress payments for work and material authorized under cash allowances will be made in accordance with contract terms of payment.
- .6 The Contract Price and not cash allowance, includes contractor's overhead and profit in connection with such cash allowance.
- .7 Progress payments on accounts of work authorized under cash allowances shall be included in monthly certificate for payment.
- .8 Schedule shall be prepared jointly by Contract Administrator and Contractor to show when items called for under cash allowances must be authorized by Contract Administrator for ordering purposes so that progress of work will not be delayed.
- .9 Provide the following Cash Allowances.
 - .1 Include **\$20,000** excluding HST for Cornwall Electric Utility charges (only if applicable).

PART 3 **PRODUCTS (NOT APPLICABLE)**

PART 4 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Inspecting and testing by inspecting firms or testing laboratories designated by Contract Administrator

1.2 **RELATED REQUIREMENTS SPECIFIED ELSEWHERE**

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Contract Administrator are specified under various sections.

1.3 **APPOINTMENT AND PAYMENT**

- .1 Contract Administrator will appoint and pay for services of testing laboratory except as follows:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests specified to be carried out by Contractor under the supervision of Contract Administrator.
 - .6 Additional tests specified in the following paragraph.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Contract Administrator to verify acceptability of corrected work.

1.4 **CONTRACTOR'S RESPONSIBILITIES**

- .1 Provide labour, equipment and facilities to:
 - .1 Provide access to Work to be inspected and tested.
 - .2 Facilitate inspections and tests.
 - .3 Make good Work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to cure test samples.
- .2 Notify Contract Administrator sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Contract Administrator.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Coordination work with other contractors and subcontractors under administration of Contract Administrator.
- .2 Scheduled project meetings.

1.2 **RELATED SECTIONS**

- .1 Section 01 11 00 - Summary of Work.
- .2 Section 01 91 13 – General Commissioning (Cx) Requirements.

1.3 **DESCRIPTION**

- .1 Coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities, and construction Work, with progress of Work of other contractors and subcontractors under instructions of Contract Administrator.

1.4 **PROJECT MEETINGS**

- .1 Project meetings to be held at times and locations as determined by Contract Administrator.
- .2 Contract Administrator will arrange project meetings, record and distribute minutes.

1.5 **CONSTRUCTION ORGANIZATION AND START-UP**

- .1 Within ten (10) working days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Establish time and location of meetings and notify parties concerned minimum 5 days before meeting.
- .3 Agenda to include following:
 - .1 Appointment of official representative of participants in Work.
 - .2 Schedule of Work, progress scheduling in accordance with Section 01 32 00 - Construction Progress Documentation.
 - .3 Schedule of submission of shop drawings, samples, colour chips in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 51 00 - Temporary Utilities.

- .5 Delivery schedule of specified equipment in accordance with Section 01 32 00 - Construction Progress Documentation.
- .6 Site security in accordance with Section 01 52 00 - Construction Facilities.
- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
- .8 Record drawings in accordance with Section 01 78 00 - Closeout Submittals.
- .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Take-over procedures, acceptance, and warranties in accordance with Section 01 77 00 - Closeout Procedures and 01 78 00 - Closeout Submittals.
- .11 Monthly progress claims, administrative procedures, photographs, and holdbacks.
- .12 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 - Quality Control.
- .13 Insurances and transcript of policies.
- .4 Comply with Contract Administrator's allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- .5 During construction coordinate use of site and facilities through Contract Administrator's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.
- .6 Comply with instructions of Contract Administrator for use of temporary utilities and construction facilities.

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 List of outstanding shop drawings.
 - .6 Change orders.
 - .7 Other modifications to Contract.
 - .8 Field test reports.
 - .9 Copy of approved Work schedule.
 - .10 Health and Safety Plan and other Safety related documents.
 - .11 Manufacturers' installation and application instructions.

- .12 Labour conditions and wage schedules.
- .13 Other documents as specified.

1.7 SCHEDULES

- .1 Submit preliminary construction progress schedule in accordance with Section 01 32 00 - Construction Progress Documents to Contract Administrator coordinated with Contract Administrator's project schedule. Schedule to show anticipated progress stages and final completion of work within time period required by contract documents.
- .2 After review, revise and resubmit schedule to comply with project schedule requirements.
- .3 During progress of Work revise and resubmit at project progress meetings or as directed by Contract Administrator.

1.8 SUBMITTALS

- .1 Make submittal to Contract Administrator for review.
- .2 Submit preliminary shop drawings, product data and samples in accordance with Section 01 33 00 – Submittal Procedures 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 Contract Administrator.
- .3 Submit requests for payment for review to Contract Administrator.
- .4 Submit requests for interpretation of Contract Documents, and obtain instructions through Contract Administrator.
- .5 Process change orders through Contract Administrator.
- .6 Deliver closeout submittals for review by Contract Administrator.

1.9 COORDINATION DRAWINGS

- .1 Provide information required by Contract Administrator for preparation of coordination drawings.
- .2 Review and approve revised drawings for submittal to Contract Administrator.
- .3 Contract Administrator may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in contract documents.

1.10 CLOSEOUT PROCEDURES

- .1 Notify Contract Administrator when Work is considered ready for Substantial Performance.

- .2 Accompany Contract Administrator on preliminary inspection to determine items listed for completion or correction.
- .3 Comply with Contract Administrator's instructions for correction of items of Work listed in executed certificate of Substantial Performance and for access to Owner-occupied areas.
- .4 Notify Contract Administrator of instructions of items of Work determined in Contract Administrator's final inspection.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 77 00 - Closeout Procedures.

1.2 **SCHEDULES REQUIRED**

- .1 Submit schedules as follows:
 - .1 Construction Progress Schedule.
 - .2 Submittal Schedule for Shop Drawings and Product Data.
 - .3 Submittal Schedule for Samples.
 - .4 Product Delivery Schedule.
 - .5 Cash Allowance Schedule for purchasing Products.
 - .6 Shutdown or closure activity.

1.3 **FORMAT**

- .1 Prepare schedule in form of a horizontal bar chart.
- .2 Provide a separate bar for each major item of work, trade or operation.
- .3 Split horizontally for projected and actual performance.
- .4 Provide horizontal time scale identifying first work day of each week.
- .5 Format for listings: chronological order of start of each item of work.
- .6 Identification of listings: By Systems description.

1.4 **SUBMISSION**

- .1 Submit initial format of schedules within 15 working days after award of Contract.
- .2 Submit schedules in electronic format, forward on digital storage device as PDF files.
- .3 Submit one opaque reproduction, plus 2 copies to be retained by Owner's Representative.
- .4 Owner's Representative will review schedule and return review copy within ten (10) working days after receipt.
- .5 Resubmit finalized schedule within seven (7) working days after return of review copy.
- .6 Submit revised progress schedule with each application for payment.

- .7 Distribute copies of revised schedule to:
 - .1 Job site office.
 - .2 Subcontractors.
 - .3 Other concerned parties.
- .8 Instruct recipients to report to Contractor within ten (10) working days, any problems anticipated by timetable shown in schedule.

1.5 CRITICAL PATH SCHEDULING

- .1 Include complete sequence of construction activities.
- .2 Include dates for commencement and completion of each major element of construction as follows.
 - .1 Site utilities and site works
 - .2 Foundation Work.
 - .3 All Concrete Works.
 - .4 Structural framing/Miscellaneous metals.
 - .5 Roofing Systems.
 - .6 Process Mechanical.
 - .7 Building Mechanical.
 - .8 Electrical
 - .9 Instrumentation and Controls
 - .10 Special Subcontractor Work.
 - .11 Process Equipment Installations.
 - .12 TSSA Review Stages.
 - .13 Finishes.
- .3 Show projected percentage of completion of each item as of first day of month.
- .4 Indicate progress of each activity to date of submission schedule.
- .5 Show changes occurring since previous submission of schedule:
 - .1 Major changes in scope.
 - .2 Activities modified since previous submission.
 - .3 Revised projections of progress and completion.
 - .4 Other identifiable changes.
- .6 Provide a narrative report to define:
 - .1 Problem areas, anticipated delays, and impact on schedule.
 - .2 Corrective action recommended and its effect.
 - .3 Effect of changes on schedules of other prime contractors.

1.6 SUBMITTALS SCHEDULE

- .1 Include schedule for submitting shop drawings, product data, and samples.
- .2 Indicate dates for submitting, review time, resubmission time, last date for meeting fabrication schedule.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTIONS INCLUDE**

- .1 Shop drawings and product data.
- .2 Samples.
- .3 Certificates and transcripts.

1.2 **RELATED SECTIONS**

- .1 Section 01 32 00 – Construction Progress Documentation.
- .2 Section 01 45 00 – Quality Control
- .3 Section 01 78 00 – Closeout Submittals

1.3 **ADMINISTRATIVE**

- .1 This section specifies general requirements and procedures for contractor's submissions of shop drawings, product data, samples and mock-ups to Contract Administrator for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with work until relevant submissions are reviewed by Contract Administrator.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are coordinated.

- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator review of submission, unless Contract Administrator gives written acceptance of specific deviations.
- .10 Make any changes in submissions which Contract Administrator may require consistent with Contract Documents and resubmit as directed by Contract Administrator. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.
- .11 Notify Contract Administrator, in writing, when resubmitting, of any revisions other than those requested by Contract Administrator.
- .12 Keep one reviewed copy of each submission on site.

1.4 SUBMITTALS

- .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 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow fifteen (15) working days for Contract Administrator review of each submission.
- .5 Adjustments made on shop drawings by Contract Administrator are not intended to change contract price. If adjustments affect value of Work, state such in writing to Contract Administrator immediately after receipt of approval of shop drawings. If value of work is to change, a change order must be issued prior to proceeding with work.
- .6 Structural Attachments:
 - .1 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.

- .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's (and subcontractors) name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Specification section, subsection, unique tag number to be coordinated with the Contract Administrator, and other identifying numbers.
 - .4 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .5 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .6 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Contract Administrator review, distribute copies.
- .10 Submit electronic copy in PDF format of shop drawings for each requirement requested in specification Sections and as Contract Administrator may reasonably request.
- .11 Submit electronic copy in PDF format of product data sheets or brochures for requirements requested in Specification Sections and as requested by Contract Administrator where shop drawings will not be prepared due to standardized manufacture of product.

- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 Cross-reference product data information to applicable portions of Contract Documents.
- .15 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of work may proceed. All resubmissions must be complete, resubmission of parts of the shop drawing is not acceptable, whole submissions are required.
- .16 Samples: examples of materials, equipment, quality, finishes, workmanship. Label samples with origin and intended use.
- .17 Notify Contract Administrator in writing, at time of submission of deviations in samples from requirements of contract documents.
- .18 Where colour, pattern or texture is criterion, submit full range of samples.
- .19 Adjustments made on samples by Contract Administrator are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- .20 Make changes in samples, which Contract Administrator may require, consistent with Contract Documents.
- .21 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.
- .22 Submit drawings stamped and signed by Professional Contract Administrator registered or licensed in the Province of Ontario.

1.5 MOCK-UPS

- .1 Mock-up: Field erection example of work complete with specified materials and workmanship.
- .2 Provide mock-ups requested in various sections of specifications and as may be reasonably required by the Owners Representative.
- .3 Erect mock-ups at locations acceptable to the Owners Representative.
- .4 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.

- .5 Erect mock-ups in accordance with Section 01 45 00 - Quality Control.

1.6 SAMPLES

- .1 Submit samples requested in various sections of specification and as may be reasonably required by the Contract Administrator.
- .2 Submit samples of adequate size and range of colours or textures to represent material in intended use on project.
- .3 Unless the precise colour and pattern is specifically described in the contract documents, wherever a choice of colour or pattern is available in a specified product, submit accurate colour and pattern charts to the Contract Administrator for selection.
- .4 Material used on project shall match approved samples for quality, colour and texture, finish and performance. Do not proceed with work until samples are approved.

1.7 PROGRESS PHOTOGRAPHS

- .1 Progress photograph to be electronically formatted and labelled as to location and view. These should be submitted monthly with the progress payment certificate.

1.8 SHOP DRAWINGS REVIEW

- .1 The review of shop drawings by Contract Administrator is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that Contract Administrator approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub-trades.

1.9 STRUCTURAL ATTACHMENTS

- .1 Contractor to engage a third party Professional Structural Contract Administrator, licensed to practice in the Province of Ontario, for submission of stamped and signed shop drawings indicating acceptable mounting procedures for all equipment which is suspended, mounted or otherwise attached, as per Section 01 91 13 – Commissioning (Cx) Requirements. The Structural Contract Administrator to also verify correct installation of the equipment.

1.10 DOCUMENTATION REQUIRED BEFORE CONSTRUCTION START

- .1 Insurance Forms
- .2 Performance Bond and Labour & Material Payment Bond as called for in the Information for Tenders and the General Conditions.
- .3 WSIB Clearance Certificate, naming the project. This will also be required with each monthly progress claim, Workplace Safety and Insurance Board Clearance Certificate.

1.11 STATUTORY DECLARATION

- .1 Submit, with each monthly progress claim, a Statutory Declaration certifying that claim all payments for any liability for which the Owner might become responsible, if unpaid, have been paid.

1.12 AS-BUILT DRAWINGS

- .1 Maintain contract drawings at site office for record purposes. Record accurately deviations from contract documents caused by site conditions, change orders, site instructions, and addenda. Mark in red ink. Provide one table for this set to be placed on. The As-Built records must be maintained up-to-date and prepared as the work progresses. In order for any progress payment to be issued, the contractor is required to review the as-built drawings with the Owners Representative prior to submitting any/all progress claims.
- .2 Consult Mechanical and Electrical Divisions for other particular requirements.
- .3 Prior to start of Testing and Commissioning, finalize production of as-built drawings.
- .4 Identify each drawing in lower right hand corner in letters at least 12mm high as follows: - AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW PROCESS SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
- .5 Submit to Contract Administrator for approval and make corrections as directed.
- .6 Commissioning to be performed using as-built drawings.
- .7 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .8 Submit copies of as-built drawings for inclusion in final Operation and Maintenance Manuals.

1.13 SCHEDULE OF VALUES

- .1 Itemize separately: individual sections of specifications, different phases of the work, bonds & permits, mobilization field supervision and layout, temporary

facilities and controls, major equipment, material costs delivered, installation costs, each allowance, clean up, hand over and commissioning.

- .2 Prior to submission of the first progress draw, submit a cash flow of all anticipated progress draw values by month for the entire project duration before deduction of holdback amounts and exclusive of anticipated changes.

1.14 PROGRESS REPORTS

- .1 Contractor shall prepare daily reports of their operations. Daily report shall contain at least the following information:
 - weather conditions
 - manpower on the job in each trade
 - major items of equipment on the job
 - a brief summary of work accomplished that day
 - materials, equipment, or owner-furnished items arriving or leaving site
 - inspection reports
 - significant events
 - any tests made and their final results, if known
 - any oral instructions received
 - visitors to the job
- .2 Contractor shall maintain a file of copies of all daily reports on the site and make it available to the Owners Representative upon request.
- .3 Commissioning forms, as further described in sections 01 91 13, 01 91 33, and 01 91 41, shall be submitted at appropriate times.

1.15 OPERATIONS AND MAINTENANCE MANUALS

- .1 Prior to substantial performance, inspection, submit to Contract Administrator, Instruction and Maintenance Manuals as follows:
 - .1 Submit one (1) complete set of Equipment Operations and Maintenance Manuals for review.
 - .2 Upon receipt of comments from Contract Administrator, update the Equipment Operations and Maintenance Manuals and prepare final paper and digital copies, in accordance with the most recent Project Documentation Deliverables requirements.
- .2 Contractor shall be provide electronic copies, in searchable pdf format.
- .3 All operation and maintenance manuals to be submitted in English only.
- .4 Neatly type lists and notes. Use clear drawings, diagrams or manufacturer's literature.
- .5 Contents:

- .1 As called for in individual sections of these specifications.
- .2 Maintenance instructions for exterior and interior floor, wall, and ceiling surfaces as well as all installed fittings as printed by manufacturer.
- .3 Operating and maintenance instructions for mechanical and electrical equipment called for in Division 20 through 29, bound separately.
- .4 Colour schedule; hardware schedule.
- .5 Copies of all guarantees and warranties.
- .6 Complete set of final approved shop drawings, bound separately, indicating corrections and charges made during fabrication and installation.
- .7 Names, addresses, and phone numbers of sub-contractors and suppliers.
- .8 WHMIS Manual described in Section 01 35 30.

1.16 MAINTENANCE MATERIALS

- .1 Compile a complete list of all materials and spare parts contained within the various sections of the contract. Turn over these materials and spare parts to the Owners Representative and obtain receipt transmittal. Submit materials in unbroken cartons or if not available in cartons, strongly packed. Identify item, function, colour, room number, unit number, tag number and area materials used on an indelible tag affixed to the packaging.

1.17 DOCUMENTS REQUIRED FOR SUBSTANTIAL PERFORMANCE

- .1 Documents required prior to Substantial Performance include:
 - .1 As-Built Record Drawings.
 - .2 Manuals of Instruction and Maintenance including:
 - .1 Warranties
 - .2 Final approved shop drawings
 - .3 Schedules
 - .4 WHMIS Manual.
 - .3 Post construction survey drawings.
 - .4 Mechanical
 - .1 Testing, Adjusting and Balancing (TAB) reports
 - .2 Operation and Maintenance Manual
 - .3 Demonstration and Operating and Maintenance Instruction
 - .4 Individual equipment certification and training session outlined in Mechanical Sections and mechanical process section.
 - .5 Electrical
 - .1 Operation and Maintenance Manual
 - .2 Electrical Inspection Certificate
 - .3 F/A verification certificate (where applicable)

.4 Demonstration and Operating and Maintenance Instruction

.6 Process

.1 Operation and Maintenance Manual.

.2 Commissioning and testing reports.

.3 CAD "As-built" and/or record drawings.

.4 Individual equipment certification by the manufacturers.

.5 Training sessions as outlined by Division 01 91 41 and Division 44 have been completed.

.6 Piping inspection reports.

.7 Results of cleaning and disinfection.

1.18 WARRANTIES

.1 Warranty certificates included in the O&M manuals to include the following:

.1 Name and address of project(s)

.2 Warranty commencement date

.3 Duration of warranty

.4 Clear indication of what is being guaranteed and what remedial action will be taken under guarantee

.5 Signature and seal of Guarantor

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 **GENERAL**

1.1 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-Z259.1 Body Belts and Saddles for Work Positioning and Travel Restraint.
 - .2 CAN/CSA-Z259.10 Full body Harnesses.
 - .3 CAN/CSA-Z259.11 Energy Absorbers and Lanyards.
 - .4 CAN/CSA-Z259.2.1 Fall Arresters, Vertical Lifelines and Rails.
 - .5 FCC No. 301 Standard for Construction Operations.
 - .6 CSA Z275.2 Occupational Safety Code for Diving Operations.
 - .7 CSA Z275.4 Competency Standard for Divers Operations.
 - .8 CSA Z797, Code of Practice for Access Scaffold.
- .2 FCC No. 302 Standard for Welding and Cutting.
- .3 Transportation of Dangerous Goods Act Regulations.
- .4 Occupational Health and Safety Regulation for Construction Projects, Revised Statutes of Ontario, Chapter 321, as amended Regulation 691.
- .5 The Workplace Safety & Insurance Act 1997, and regulations as amended.
- .6 Ontario Building Code 1997 Regulation 403/97 as amended.
- .7 The Occupational Health and Safety Act – Revised Statutes of Ontario, Revised Regulation 692/80.
- .8 Consolidated Ontario MOL Regulations 860 WHMIS Regulations Under the Occupational Health and Safety Act
- .9 Consolidated Ontario and Regulations Occupational Health and Safety Regulations under the Occupational Health and Safety Act.
- .10 Canada Labour Code, Part 2.
- .11 National Building Code of Canada.
- .12 Department of Transportation and Works Occupational Health and Safety Manual.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.

- .2 Section 01 35 43 - Environmental Procedures.
- .3 Section 01 41 00 - Regulatory Requirements.
- .4 Section 02 82 00.02 – Asbestos Abatement.

1.3 SUBMITTALS

- .1 At least Fifteen (15) working days prior to commencing any site work: submit to Contract Administrator copies of:
 - .1 A complete Site Specific Health and Safety Plan. Health and Safety Plan must include:
 - .1 Site-specific safety hazard assessment and measures to be taken to address the anticipated hazards.
 - .2 Contractor's and Sub-contractor's Safety Communication Plan. Must include contract information for all key contacts.
 - .3 Contract Administrator will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan within 5 days after receipt of comments. Comments received from Contract Administrator should not be construed as approval and does not reduce the Contractor's overall responsibility for the Health and Safety of the construction site.
 - .4 Submit records, upon request, of the Contractor's Health and Safety meetings or daily/weekly tailgate meetings.
 - .2 If work entails confined space, submit the following:
 - .1 Copies of current confined space entry training certificates acceptable to WHSCC, as well as copies of confined space entry programs, confined space assessment, safe work practices and rescue plans.
- .2 Acceptance of the Site Specific Health and Safety Plan and other submitted documents by the Contract Administrator shall only be viewed as acknowledgement that the contractor has submitted the required documentation under this specification section.
- .3 Contract Administrator makes no representation and provides no warranty for the accuracy, completeness and legislative compliance of the Site Specific Health and Safety Plan and other submitted documents by this acceptance.
- .4 Responsibility for errors and omissions in the Site Specific Health and Safety Plan and other submitted documents is not relieved by acceptance by Contract Administrator.
- .5 Submit copies of reports or directions issued by Federal, Provincial or Territorial Health and Safety Inspectors.

- .6 Submit copies of incident and accident reports.
- .7 Submit WHMIS MSDS – Material Safety Data Sheets.
- .8 Submit Workplace Safety and Insurance Board (WSIB) – Experience Rating Report.

1.4 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to commencement of Work.
- .2 If project requires diving, a separate Notice of Project needs to be filed with Provincial Authorities prior to commencement of work.
- .3 Submit copies of Notice(s) of Project to the Contract Administrator.
- .4 File all other required notices in accordance with Acts and Regulations of the Province of Ontario.
- .5 Keep copy of Notice of Project onsite at all times.

1.5 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with the following hazardous materials:
 - .1 Watermain, water contaminated equipment, pipes, etc., the contractor will be responsible to clean any and all materials to their satisfaction in order to complete the project work.
 - .2 Silica in concrete (from concrete demolition and new concrete) and potentials soils.
 - .3 Corroded metals.
 - .4 Benzene in fuel oil, paints and adhesives (for new materials).
 - .5 Volatile organic compounds.
- .2 On-site Hazards include, but are not limited to:
 - .1 Working near, under and/or adjacent to electrical wires.
 - .2 Working around heavy machinery and moving equipment.
 - .3 Working near, above and/or in water and/or sewage.
 - .4 Working at heights
 - .5 Working in Confined Space and Confined Space Access
 - .6 Icy surfaces and/or ice covered water bodies.
 - .7 Falling hazards.
 - .8 Extreme temperatures or weather conditions
 - .9 Pressurized piping containing water, chemicals or gases.

1.6 OCCUPATIONAL HEALTH AND SAFETY (SITE SPECIFIC HEALTH AND SAFETY PLANS)

- .1 Conduct operations in accordance with latest edition of the Ontario Occupational Health and Safety (OHSA) Act and Regulations, with specific reference to codes and standards.
- .2 Prepare a detailed Site Specific Health and Safety Plan that shall identify, evaluate and control job specific hazards and the necessary control measures to be implemented for managing hazards.
- .3 Provide a copy of the Site Specific Health and Safety Plan upon request to Ministry of Labour and the Contract Administrator.
- .4 The written Site Specific Health and Safety Plan shall incorporate the following:
 - .1 Hazard assessment results.
 - .2 Engineering and administrative demonstrative controls (work-practices and procedures) to be implemented for managing identified and potential hazards, and comply with applicable federal and provincial legislation and more stringent requirements that have been specified in these specifications.
 - .3 An organizational structure which shall establish the specific chain of command and specify the overall responsibilities of contractor's employees at the work site.
 - .4 A comprehensive work plan which shall:
 - .1 define work tasks and objectives of site activities/operations and the logistics and resources required to reach these tasks and objectives.
 - .2 establish personnel requirements for implementing the plan.
 - .5 A personal protected equipment (PPE) Program which shall detail PPE:
 - .1 Selection criteria based on site hazards.
 - .2 Use, maintenance, inspection and storage requirements and procedures.
 - .3 Decontamination and disposal procedures.
 - .4 Inspection procedures prior to, during and after use, and other appropriate medical considerations.
 - .5 Limitations during temperature extremes, heat stress and other appropriate medical consideration.
 - .6 An emergency response procedure, refer to Clause 1.5 Supervision and Emergency Response Procedure of this section for requirements.
 - .7 A hazard communication program for informing workers, visitors and individuals outside of the work area as required. This will include but not be limited to a visitor safety and orientation policy and program that will include education on hazards, required PPE and accompaniment while on site.

- .8 A hearing conservation program in accordance with the OHS Regulations.
- .9 A recent (current year) inspection form for all powered mobile equipment that will be used in fulfilling the terms of the contract. The inspection form shall, at a minimum, state that the equipment is in a safe operating condition.
- .10 A complete listing of employee names, their driver's license classification, expiry date, endorsements and the type of equipment that they are qualified to operate for the complete scope of work for this project. The Driver's License Number should not be provided as this is confidential information.
- .11 An acceptable parking policy for all powered mobile equipment to be used on this project. The policy shall, at a minimum, be based on a hazard assessment that considers factors such as equipment type, potential for roll over, load capacity of the parking area, pedestrian and vehicular traffic, and potential for equipment tampering, equipment energy, and equipment contact with power lines.
- .12 A health and safety training program which includes a safety training matrix.
- .13 General safety rules.
- .5 Periodically review and modify as required each component of the Site Specific Health and Safety Plan when a new hazard is identified during completion of work and when an error or omission is identified in any part of the Site Specific Health and Safety Plan.
- .6 Review the completeness of the hazard assessment immediately prior to commencing work, when a new hazard is identified during completion of work and when an error or omission is identified.
 - .1 Be solely responsible for investigating, evaluating and managing any report of actual or potential hazards.
 - .2 Clearly define accident incident investigation procedures.
 - .3 Clearly define policy and processes for early and safe return to work.
 - .4 Retain copies of all completed hazard assessments at the project site and make available to the Contract Administrator immediately upon request.
- .7 Implement all requirements of the Site Specific Health and Safety Plan.
 - .1 Ensure that every person entering the project site is informed of requirements under the Site Specific Health and Safety Plan.
 - .2 Take all necessary measures to immediately implement any engineering controls, administrative controls, personal protective equipment required or termination of work procedures to ensure compliance with the Site Specific Health and Safety Plan.

1.7 CONTRACTORS HEALTH AND SAFETY OFFICER

- .1 The contractor shall employ/designate a Contractor's H&S Coordinator (CSO).

- .2 The CSO shall:
 - .1 Be responsible for developing, implementing, daily enforcement, monitoring and updating of the Site Specific Health and Safety Plan.
 - .2 Be responsible for the delivery of the site safety orientation and ensure that the personnel who have not been orientated are not permitted to enter the site. This applies to workers, inspectors and visitors.
 - .3 Report directly to and be under direction of the Site Superintendent or Contractor's Project Manager.
 - .4 Prior to mobilization on-site, hold an orientation meeting with the contractors, subcontractors and Contract Administrator to review project occupational health and safety. Include but not limit meeting to a review of:
 - .1 Site Specific Health and Safety Plan.
 - .2 Construction Safety Measures.
 - .3 Supervision and Emergency Rescue Procedures.
 - .4 Hazard Assessments
 - .5 Maintain a daily log of inspections, meetings, infractions and mitigating measures. Log is to be filed daily and copies to be provided to the Site Superintendent and Contract Administrator.

1.8 HEALTH AND SAFETY COMMITTEE

- .1 Establish an Occupational Health and Safety Committee where ten or more workers are employed on the job site as per the OH&S Act and Regulations.

1.9 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with Site Specific Health and Safety Plan.
- .3 Where safety risks exist, the contractor must stop the work until such time as the risk can be mitigated to a safe level.
- .4 Take appropriate steps to ensure that the hazards are mitigated to a safe level, workers are notified of the hazards and how to protect themselves. As well, workers must be provided with any new safe work practices or information regarding mitigation of the risk.

1.10 UNFORSEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, follow procedures in place for

Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Contract Administrator verbally and in writing.

1.11 INSTRUCTION AND TRAINING

- .1 Workers shall not participate in or supervise any activity on the work site until they have been trained to a level required by this job function and responsibility. Training shall as a minimum thoroughly cover the following:
 - .1 Federal and Provincial Health and Safety Legislation requirements including roles and responsibilities of workers and person(s) responsible for implementing, monitoring and enforcing health and safety requirements.
 - .2 Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.
 - .3 Limitations, use, maintenance and disinfection-decontamination of personal protective equipment associated with completing work.
 - .4 Limitations, use, maintenance and care of engineering controls and equipment.
 - .5 Limitations and use of emergency notifications and response equipment including emergency response protocol.
 - .6 Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.
- .2 Provide and maintain training of workers, as required, by Federal and Provincial legislation.
- .3 Provide copies of all training certificates to Contract Administrator for review, before a worker is to enter the work site.
- .4 Authorized visitors shall not access the work site until they have been:
 - .1 Notified of the names of persons responsible for implementing, monitoring and enforcing the Site Specific Health and Safety Plan.
 - .2 Briefed on safety and health hazards present on the site.
 - .3 Instructed in the proper use and limitations of personal protective equipment.
 - .4 Briefed as the emergency response protocol including notification and evacuation process.
 - .5 Informed of practices and procedures to minimize risks from hazards and applicable to activities performed by visitors.
 - .6 Accompanied while on site, and provided with the appropriate PPE.
- .5 All workers will be instructed and trained on the hazards associated with work they will perform and how to protect themselves. This will include a review of all safe work practices, the reporting and documentation of hazards, reporting

accidents and injuries as well as, formal training in areas of high risk (i.e. fall protection, power line hazards, traffic control persons training).

- .6 The work site shall have the appropriate number of persons trained in emergency and Standard First Aid according to the First Aid Regulations.

1.12 CONSTRUCTION SAFETY MEASURES

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

1.13 POSTING OF DOCUMENTS

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

1.14 HEALTH AND SAFETY MONITORING

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

1.15 NOTIFICATION

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

1.16 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Contract Administrator.
- .2 Provide Contract Administrator with written report of action taken to correct non-compliance of health and safety issues identified within ten (10) working days.
- .3 Contract Administrator may stop work if non-compliance of health and safety regulations is not corrected.

1.17 WHMIS

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

1.18 OVERLOADING

- .1 The Contractor's Full Time CSO and/or Site Superintendent shall ensure no part of work or associated equipment is subjected to loading that will endanger its safety or will cause permanent deformation.

1.19 FALSEWORK

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

1.20 SCAFFOLDING

- .1 Design, erect, inspect, operate, modify, and dismantle scaffolding in accordance with CSA Z797, the OH&S Act and Regulations, and the scaffold manufacturer's written instructions.
- .2 Provide trained and certified Competent Scaffold Erectors for all scaffold erection, modification and dismantling. Training certification must be valid at time of erection, modification and dismantling of scaffold.
- .3 Conduct and document daily inspections of scaffolding by trained and certified Competent Scaffold Inspectors or Erectors. Training certification must be valid at the time of inspection.
- .4 Provide a scaffold tagging system as described in CSA Z797.
- .5 Ensure that all industry best practices for safe scaffold usage, including fall protection, proper loading, safe access, electrical hazards, exit door management and other concerns are strictly adhered to.

1.21 WORKING AT HEIGHTS

- .1 Ensure that fall restraint or fall arrest devices are used by all workers working at elevations greater than 3.05 meters above grade or floor level in accordance with CSA Z259, where alternate fall protection systems are not provided in accordance with Occupational Health and Safety Act and Regulations O.Reg. 297/13.
- .2 All workers performing work at height and who will be required to utilize a fall arrest system must be trained in a fall protection program certified by the WHSCC. Training must be current and valid at the time of use.
- .3 Prior to working at height workers shall be instructed in a Contractor Safe Work Practice for working at height and associated Rescue Plan for working at heights, developed specific to the work to be performed, locations and risks.

1.22 PERSONAL PROTECTIVE EQUIPMENT

- .1 Ensure workers on the jobsite use personal protective equipment appropriate to the hazards identified in the Site Specific Health and Safety Plan and those

- workers are trained in the proper care, use, and maintenance of such equipment.
- .2 PPE selections shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, task-specific conditions, duration and hazards and potential hazards identified on site. PPE must also be fitted for the worker.
 - .3 Provide workers and visitors to the site with proper respiratory protection equipment.
 - .1 No work shall be performed in an area where an airborne contaminant exceeds recommendations of the ACGIH, do not meet the appropriate standards for the specific contaminants or are not in accordance with the OHS regulations..
 - .2 Respiratory protection shall be provided in accordance with the requirements of the Occupational Health and Safety Branch, Services NL and these specifications.
 - .3 Establish, implement and maintain a respirator inspection and maintenance program in accordance with the CSA standard identified in the OHS Regulations.
 - .4 Copies of all respirator owners' maintenance manuals shall be kept at all times at the contractor's site office.
 - .4 Provide and maintain a supply of dermal protection equipment to allow visitors and all workers proper dermal protection.
 - .1 Dermal protection shall be sufficient to act as a protective barrier between the skin and an airborne contaminant or hazardous material. Dermal protection shall also be provided for all physical hazards.
 - .2 Dermal protection equipment shall not be used after exceeding 75% of the break through time. The break through time shall be based on the contaminant which requires the least amount of time to break through the protective equipment
 - .3 Copies of all dermal protection user specifications, owners and maintenance manuals shall be kept at all times at the contractor's site office.
 - .4 Establish, implement and maintain air inspection program to ensure proper dermal protection in accordance with CSA, NIOSH, U.S. EPA and manufacturer's requirements.
 - .5 Provide all workers and up to five (5) visitors to the site with proper hearing protection. Workers and visitors shall not be exposed to noise levels greater than 85 dB (A) over an eight hour shift without proper hearing protection, in accordance with the Hearing Conservation Program.
 - .6 Provide all workers and up to five (5) visitors to the site with CSA approved eye protection sufficient to act as a protective barrier between the eye and airborne contaminants, hazardous materials and physical hazard.

- .7 Provide workers and up to five (5) visitors to the site with CSA approved hard hats meeting the CSA Z94.1.
- .8 Provide high visibility apparel as defined in Occupational Health and Safety Regulations.
- .9 Provide CSA approved safety boots meeting CSA Z195.
- .10 Provide other personal protective equipment, as may be required by the owner, depending on duties being performed.

1.23 TRAFFIC CONTROL

- .1 Provide traffic control measures when working on, or adjacent to, roadways in accordance with the Ontario Traffic Manual (as amended) Book 7 Temporary Conditions and O.Reg 471/16.

1.24 EXCAVATION SAFETY

- .1 Protect all excavations in accordance with Part III of O.Reg 471/16 Construction Projects.

1.25 CONFINED SPACE WORK

- .1 Comply with the Ontario Occupational Health and Safety Regulations.
- .2 Ensure a hazard assessment has been conducted related to the confined space and the work to be performed within the space.
- .3 Provide approved air monitoring equipment where workers are working in confined spaces and ensure any test equipment to be used is calibrated, in good working order and used by trained persons.
- .4 Ensure all required PPE is provided to the workers and workers are trained in its use, care and selection.
- .5 Develop a confined space entry (CSE) program specific to the nature of work performed and in accordance with OH&S Act and Regulations and ensure supervisors and workers are trained in the confined space entry program. This shall include training on the CSE permit system, rescue plan, testing, communication equipment and all equipment and safe work procedures conducted in and around the confined space.
 - .1 Ensure that personal protective equipment and emergency rescue equipment appropriate to the nature of the work being performed is provided and used.
- .6 Provide and maintain training of workers through a provider certified by the WHSCC.

- .7 Provide Contract Administrator with a copy of an "Entry Permit" for each entry into the confined space to ensure compliance Provincial Legislation.

1.26 HAZARDOUS MATERIALS

- .1 Should material resembling hazardous materials (e.g. asbestos/mould) not previously identified/documentated be encountered during the execution of work, stop work and notify Contract Administrator. Do not proceed until written instructions have been received from Contract Administrator.
- .2 Unless otherwise noted the services of a recognized Environmental Consultant to provide all air monitoring and testing services required by regulatory requirements for hazardous materials abatement and repair.

1.27 HEAVY EQUIPMENT

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

1.28 TREE AND BRUSH CLEARING

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

- .3 Equip chain saws with a safety chain break.
- .4 A safe work practice (SWP) must be developed, implemented and all workers trained in the SWP prior to undertaking such tasks and utilizing tree and brush clearing equipment.

1.29 WORK STOPPAGE

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

1.30 EQUIPMENT LOCK-OUT/TAG-OUT

- .1 The Contractor shall coordinate and comply with CSA Z460-05 (R2010) "Control of Hazardous Energy – Lockout and Other Methods" for all machines, equipment and process requiring isolation.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Contract Administrator. Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
- .3 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .4 Environmental protection plan shall include:
 - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Names and qualifications of persons responsible for training site personnel.
 - .3 Descriptions of environmental protection personnel training program.
 - .4 Erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
 - .5 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
 - .6 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans

include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.

- .7 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.
- .8 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .9 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .10 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
- .11 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .12 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .13 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
- .14 Pesticide treatment plan: to be included and updated, as required.

1.3 FIRES

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

1.4 DISPOSAL OF WASTES

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

1.5 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

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

1.6 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties where indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by Contract Administrator.

1.7 WORK ADJACENT TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or within 100 m of indicated spawning beds.

1.8 POLLUTION CONTROL

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

1.9 NOTIFICATION

- .1 Contract Administrator will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of environmental protection. Contractor: after receipt of such notice, inform Contract Administrator of proposed corrective action and take such action as approved by Contract Administrator.
- .2 Contract Administrator may issue stop order of work until satisfactory corrective action has been taken.
- .3 No time extensions will be granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTIONS INCLUDE**

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Mock-ups.
- .4 Mill tests.
- .5 Equipment and system adjust and balance.

1.2 **RELATED SECTIONS**

- .1 Section 01 21 00 – Allowances.
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 78 00 – Closeout Submittals

1.3 **INSPECTION**

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

1.4 **INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged by Contract Administrator for purpose of inspecting and/or testing portions of Work.

- .2 Allocated costs: to Section 01 21 00 – Allowances and Section 01 29 83 – Payment Procedures: Testing Laboratory Services.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Contract Administrator at no cost to Contract Administrator. Pay costs for retesting and reinspection.

1.5 ACCESS TO WORK

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

1.6 PROCEDURES

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

1.7 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 Contract Administrator 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 Contract Administrator it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Contract Administrator.

1.8 REPORTS

- .1 Submit 3 copies of inspection and test reports to Contract Administrator, plus electronic copies in PDF format.
- .2 Provide copy to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.
- .3 Include copy of all inspection and test reports in Commissioning Manuals.

1.9 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in all locations acceptable to Contract Administrator as specified in specific Section.
- .3 Prepare mock-ups for Contract Administrator review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups 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.
- .5 Remove mock-up at conclusion of Work or when acceptable to Contract Administrator
- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.
- .7 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.
- .8 Mock-ups may remain as part of Work.

1.10 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Mechanical – coordinate with mechanical division.
- .3 Electrical – Coordinate with electrical division.

1.11 FIRE SEPARATIONS

- .1 Provide fire separation labelling/stenciling as per Sections 07 84 00 Fire Stopping.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 52 00 - Construction Facilities.
- .2 Section 01 56 00 - Temporary Barriers and Enclosures.

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.

1.3 **DEWATERING**

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

1.4 **WATER SUPPLY [Not Applicable]**

1.5 **TEMPORARY HEATING AND VENTILATION**

- .1 Pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel operation, maintenance and removal of equipment. Use of direct, fired heaters discharging waste products into work areas will not be permitted unless prior approval is given by Contract Administrator.
- .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 Maintain temperatures of minimum 10°C and relative humidity less than 60% in areas where construction is in progress. Or as required to achieve the necessary room preparation and curing environment.

- .1 Maintain minimum temperature of 10°C or higher where specified as soon as finished work is commenced. Maintain until acceptance of structure by Contract Administrator.
- .2 Maintain ambient temperature and humidity levels as required for comfort of office personnel.
- .5 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.
- .6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .7 Be responsible for damage to Work due to failure in providing adequate heat, humidity and protection during construction.
- .8 Use of new or existing systems for temporary heating, ventilating or air conditioning will not be permitted.

1.6 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power during constructing for temporary lighting, heating, site construction trailers and operating of power tools in accordance with governing regulations and the Canadian Electrical Code, latest edition.
- .2 Arrange for connection with Utility company. Pay all costs for installation, maintenance and removal of cables, distribution and branch panel boards, poles, lighting, heating and general power receptacles as required.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx. Temporary lighting to

consist of wiring, pig tail sockets and 75 watt shatterproof incandescent lamps to provide a minimum light level of 162 lux.

- .5 Electrical power and lighting systems installed under this contract may be used for construction requirements only with prior approval of Contract Administrator provided that guarantees are not affected. Make good damage to electrical system caused by use under this contract. Replace lamps which have been used for more than 3 months.
- .6 General contractor responsible for payment of all electrical energy charges associated with temporary power up to date of substantial completion.

1.7 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

1.8 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Contract Administrator.

1.9 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary telephone, fax, data hook up, lines and equipment necessary for own use and use of Contract Administrator.

1.10 SITE SIGN AND NOTICES

- .1 Contractor is responsible for the construction of job sign frame and the installation of the plywood job sign. Locate job sign as directed by Contract Administrator so as to ensure good visibility by passing traffic.
- .2 Construct timber job sign frame using two (2) 140 x 140mm timber posts set vertically in concrete to a ground depth of 1000mm or below the frost line, whichever is greater. Install three (3) 38 x 89mm horizontal timber braces. Attach plywood sign to timber frame using galvanized nails. Paint timber frame with two (2) coats of white paint if using untreated timber. Backfill compact and level ground around job sign frame to the satisfaction of the Contract Administrator.

1.11 REMOVAL OF TEMPORARY FACILITIES

- .1 Remove temporary facilities from site when directed by Contract Administrator.
- .2 When project is closed down at end of construction season keep temporary facilities operational until close down or removal is approved by Contract Administrator.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Construction aids.
- .2 Office and sheds.
- .3 Parking.
- .4 Project identification.

1.2 **RELATED SECTIONS**

- .1 Section 01 35 29.06 – Health and Safety Requirements
- .2 Section 01 51 00 - Temporary Utilities.
- .3 Section 01 56 00 - Temporary Barriers and Enclosures.

1.3 **INSTALLATION AND REMOVAL**

- .1 Provide construction facilities in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.4 **SCAFFOLDING**

- .1 Provide and maintain scaffolding in rigid, secure and safe manner.
- .2 Erect scaffolding independent of walls. Remove promptly when no longer required. Refer to Section 01 35 29.06 – Health and Safety Requirements.

1.5 **HOISTING**

- .1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
- .2 Hoists cranes shall be operated by certified operator.

1.6 **SITE STORAGE/LOADING**

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.7 CONSTRUCTION PARKING

- .1 Parking will be permitted on site in the designated areas only and provided it does not disrupt performance of work.
- .2 Provide and maintain adequate access to project site.
- .3 Build and maintain temporary roads where indicated or directed by Contract Administrator and provide snow removal during period of Work.
- .4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.

1.8 CONTRACTOR'S SITE OFFICES

- .1 Provide office heated to 22 °C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table, fax machine, telephone, file cabinet and chair. Provide an accessible washroom within the contractor's site office.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors may provide their own offices as necessary. Direct location of these offices.

1.9 CONTRACT ADMINISTRATOR SITE OFFICE [TBD]

- .1 Provide temporary office for Contract Administrator.
- .2 Inside dimensions minimum 4.8 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 - 50% opening windows and one lockable door.
- .3 Insulate building and provide heating system to maintain 22°C inside temperature at -20°C outside temperature.
- .4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. Finish floor with 19mm thick plywood.
- .5 Install electrical lighting system to provide min 750 lx using surface mounted, shielded commercial fixtures with 10% upward light component.
- .6 Site office to have washroom facility complete with running water and sewage disposal. Maintain supply of washroom supplies.
- .7 Equip office with drawing laydown table, fax machine, file cabinet, two chairs, telephone, phone line for internet.

- .8 Maintain in clean condition.
- .9 To reduce the space on-site, a suitable office space within the Contractors Office may be acceptable depending on the arrangement as confirmed with the Contract Administrator.

1.10 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.11 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.12 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Barriers.
- .2 Environmental Controls.
- .3 Traffic Controls.
- .4 Fire Routes.

1.2 **RELATED SECTIONS**

- .1 Section 01 51 00 – Temporary Utilities.
- .2 Section 01 52 00 – Construction Facilities.

1.3 **INSTALLATION AND REMOVAL**

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.4 **Temporary Fencing**

- .1 Provide temporary gates at the access to the site.

1.5 **GUARD RAILS AND BARRICADES**

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
- .2 Provide as required by governing authorities.

1.6 **WEATHER ENCLOSURES**

- .1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3 Erect enclosures to allow access for installation of materials and working inside enclosure.
- .4 Design enclosures to withstand wind pressure and snow loading.

1.7 DUST TIGHT SCREENS

- .1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.

1.8 ACCESS TO SITE

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.
- .2 Build and maintain temporary roads where indicated or directed and provide snow removal during period on work.
- .3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.

1.9 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

1.10 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.12 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for existing, finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Contract Administrator locations and installation schedule 15 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Product quality, availability, storage, handling, protection, and transportation.
- .2 Manufacturer's instructions.
- .3 Quality of Work, coordination and fastenings.

1.2 **RELATED SECTIONS**

- .1 Section 01 45 00 – Quality Control.
- .2 Section 01 73 00 – Execution.

1.3 **REFERENCES**

- .1 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .2 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.4 **QUALITY**

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Contract Administrator based upon requirements of Contract Documents.
- .4 Within seven (7) working days of written request by Contract Administrator, submit following information for material and equipment proposed for supply:
 - .1 Name and address of manufacturer.
 - .2 trade name, model and catalogue number,
 - .3 performance, descriptive and test data,
 - .4 manufacturer's installation or application instructions,

- .5 evidence of arrangements to procure.
- .5 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified.
- .6 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.

1.5 AVAILABILITY

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

1.6 STORAGE, HANDLING AND PROTECTION

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

- .9 Touch-up damaged factory finished surfaces to Contract Administrator satisfaction. Use touch-up materials to match original. Do not paint over name plates.
- .10 For all mechanical or electrical equipment stored on site, refer to manufacturer's recommendations regarding maintenance required during storage, and prepare maintenance schedule detailing the rotation, lubrication and/or exercise requirements of the equipment while stored. Provide schedule to Contract Administrator, and demonstrate that the schedule is being followed during storage.

1.7 TRANSPORTATION

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

1.8 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that Contract Administrator may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Contract Administrator to require removal and re-installation at no increase in Contract Price or Contract Time.

1.9 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 Contract Administrator if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Contract Administrator reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Contract Administrator, whose decision is final.

1.10 CO-ORDINATION

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

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 Contract Administrator if there is interference. Install as directed by Contract Administrator.

1.12 REMEDIAL WORK

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

1.13 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated 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 Contract Administrator of conflicting installation. Install as directed.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Contract Administrator.

1.14 FASTENINGS GENERAL

- .1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work, unless stainless steel or other material is specifically requested in affected specification section.
- .2 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood plugs are not acceptable.
- .3 Conceal fasteners where indicated. Space evenly and lay out neatly.
- .4 Fastenings which cause Spalding or cracking are not acceptable.

- .5 Obtain Contract Administrator's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166.

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 No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.16 PROTECTION OF WORK IN PROGRESS

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

1.17 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute work at times directed by local governing authorities, with minimum of disturbance to work.
- .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.
- .3 Submit schedule to and obtain approval from Contract Administrator for any shut-down or closure of active services or facility. Adhere to approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise Contract Administrator and confirm findings in writing.
- .5 Remove abandoned services lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Contract Administrator.

1.18 SELECTION OF MATERIAL AND EQUIPMENT

- .1 Material and equipment will be specified in the tender documents, and selected by Contractor, by one or more of the following methods:
 - .1 Specification by reference to a relevant Standard, such as CSA, ASTM, ULC, etc., select any material or equipment that meets or exceeds the specified.

- .2 Specification by reference to an accepted product evaluation publication, such as the CGSB "Qualified Products List", or CCMC Registry of Product Evaluations", - select any manufacturer's product so listed.
 - .3 Specification by Prescriptive or Performance specification – select any material or equipment meeting or exceeding specification.
 - .4 Specification by identification of one or more Manufacturer's specific product(s) as an "Acceptable Product", along with a listing of other manufacturers who may offer equivalent products – select any product so named, or select from equivalent product(s) of other listed manufacturers.
- .2 "Acceptable Product" is deemed to be a complete and working commodity as described by a manufacturer's name, catalogue number, trade name, or any combination thereof, and will constitute the minimum standard of acceptance.
- .3 Contract Administrator will determine acceptability of Contractor's selection of material and equipment at time of Shop Drawing review.
- .4 When material or equipment is specified by a Standard, Prescriptive or Performance specification, upon request of the Contract Administrator, obtain from manufacturer an independent laboratory reporting, showing that material or equipment meets or exceeds the specified requirements.

1.19 SUBSTITUTION OF MATERIAL AND EQUIPMENT

- .1 **Prior to Tender** closing bidders may propose addition of other manufacturer's names to those listed in the tender documents providing requests are made in writing at least 10 days prior to tender closing date or bid depository where bid depository is used. Contract Administrator will inform all prospective bidders of decision by addendum, issued at least 5 days prior to the tender closing date.
- Where no manufacturer's names are listed, the onus is on contractor to provide material and equipment to meet performance specification.
- .2 **After Contract award** substitutions of material or equipment, other than as selected by Contractor from those specified, will be considered by Contract Administrator only if:
- .1 material or equipment selected from those specified are not available
 - .2 delivery date of material or equipment selected from those specified would unduly delay completion of the Contract; or
 - .3 alternative material or equipment to those specified, provided they are determined by the Contract Administrator to be equivalent to or better than those specified, and will result in a credit to the Contract amount.
- .3 Requests for substitutions after Contract award must be accompanied by sufficient information in the form of shop drawings, manufacturer's literature, samples or other data to permit proper investigation of the substitutes used. Requests must also include statements of respective costs of material or equipment originally specified and the proposed substitution.

- .4 Should a proposed substitution be accepted after Contract award either in part or in whole, assume full responsibility and costs when substitution affects other work on Project. Contractor to pay for design or drawing changes required as a result of the substitution.
- .5 Amounts of all credits arising from approval of substitutions after Contract award will be determined by Contract Administrator and the Contract amount will be reduced accordingly.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Field engineering survey services to measure and stake site.
- .2 Survey services to establish and confirm inverts for Work.
- .3 Recording of subsurface conditions found.

1.2 **QUALIFICATIONS OF SURVEYOR**

- .1 Qualified registered land surveyor, licensed to practise in the Province of Ontario.

1.3 **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 Contract Administrator.
- .4 Report to Contract Administrator when reference point is lost or 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.

1.4 **SURVEY REQUIREMENTS**

- .1 Establish permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Stake for grading, fill placement .
- .4 Establish pipe invert elevations.
- .5 Stake batter boards for foundations.
- .6 Establish foundation column locations and floor elevations.
- .7 Establish lines and levels for mechanical and electrical work.

1.5 EXISTING SERVICES

- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.
- .2 Before commencing work, establish location and extent of service lines in area of Work and notify Contract Administrator of findings.
- .3 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Contract Administrator.

1.6 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 Contract Administrator 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 Contract Administrator.

1.7 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 Record locations of maintained, re-routed and abandoned service lines.

1.8 SUBMITTALS

- .1 Submit name and address of Surveyor to Contract Administrator.
- .2 On request of Contract Administrator, 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 and do not conform with Contract Documents.

1.9 SUBSURFACE CONDITIONS

- .1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

- .2 After prompt investigation, should Contract Administrator determine that conditions do differ materially, instructions will be issued for changes in Work.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

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

1.2 **RELATED SECTION**

- .1 Section 01 77 00 - Closeout Procedures.

1.3 **PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Remove waste materials and debris from site at the end of each working day. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Vacuum clean interior of building areas of dirt when ready to receive finishes and continue vacuum cleaning at least daily until building is ready for substantial completion or occupancy. Sweep floors and pavements clean on a daily basis.

- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .12 Areas in which electrical and mechanical equipment area located [ie. the Pump Room], every effort must be made to ensure that dusts and debris are cleaned daily. Areas are to be maintained dust free, filters replaced on a weekly basis, the internal areas of control panels, and equipment filters/fans etc. shall be vacuum cleaned on a weekly basis. If in the opinion of the Owner's Representative, there is excessive amounts of dust being drawn into the building through openings, penetrations or due to ambient construction activities outside the operating areas, the contractor will be responsible to provide additional air filtration to achieve a dust free environment.

1.4 FINAL CLEANING

- .1 Refer to General Conditions.
- .2 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 When the Work is Totally Performed, remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.
- .5 Remove waste materials from the site at regularly scheduled times or dispose of as directed by the Owner's Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Leave the work broom clean before the inspection process commences.
- .8 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.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors and ceilings.
- .10 Clean lighting reflectors, lenses, and other lighting surfaces.
- .11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .12 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

- .13 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .14 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .15 Remove dirt and other disfiguration from exterior surfaces.
- .16 Clean roofs, gutters, downspouts and drainage systems. Clean areaways and sunken wells.
- .17 Sweep and wash clean paved areas.
- .18 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical and electrical equipment.
- .19 Remove snow and ice from access to building.
- .20 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

1.1 GENERAL

1.2 RELATED SECTIONS

- .1 Section 01 74 11 - Cleaning.
- .2 Section 01 78 00 - Closeout Submittals.
- .3 Section 01 91 13 – General Commissioning (Cx) Requirements.

1.3 FINAL INSPECTION AND DECLARATION PROCEDURES

- .1 Contractor's Inspection: The Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects; repair as required. Notify the Contract Administrator in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made. Request an Contract Administrator's Consultant's Inspection.
- .2 Contract Administrator's Inspection: Contract Administrator and the Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The contractor shall correct Work accordingly.
- .3 Completion: submit written certificate that the following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by Fire Commissioner, Utility companies have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Commissioning of building/process/mechanical and electrical systems: completed in accordance with section 01 91 13 – Commissioning (Cx) Requirements and copies of final Commissioning Report submitted to Contract Administrator.
 - .7 Work is complete and ready for Final Inspection.
- .4 Final Inspection: When items noted above are completed, request final inspection of Work by the Contract Administrator(s) and the Contractor. If Work is deemed incomplete by the Contract Administrator, complete outstanding items and request a reinspection.
- .5 Declaration of Substantial Performance: When the Contract Administrator considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance. Refer to General Conditions for specifics to application.

- .6 Commencement of Lien and Warranty Periods: The date of the Owners acceptance of the submitted declaration of Substantial Performance shall be the date for commencement for the warranty period and commencement of the lien period.
- .7 Declaration of Total Performance: When the Contract Administrator considers final deficiencies and defects have been corrected and it appears requirements of the Contract have been totally performed, make application for certificate of Total Performance. Refer to General Conditions for specifics to application. If Work is deemed incomplete by the Contract Administrator, complete the outstanding items and request a reinspection.

1.4 REINSPECTION

- .1 Should status of work require reinspection by Contract Administrator due to failure of work to comply with Contractor's claims for inspection, Owner will deduct amount of compensation for reinspection services from payment to Contractor.

1.5 OCCUPANCY

- .1 Owner reserves the right to occupy and operate portions of work whether partially or entirely completed, or whether completed on schedule or not.
- .2 Partial occupancy shall not imply acceptance of work in whole or in part nor shall it imply acknowledgement that the terms of Agreement are fulfilled.

1.6 SYSTEM DEMONSTRATION

- .1 Prior to Substantial Performance:
 - .1 Demonstrate operation of each system to Contract Administrator(s).
 - .2 Instruct personnel in operation, adjustment and maintenance of equipment and systems, using provided operation and maintenance data as basis for instruction.

1.7 WARRANTIES

- .1 The contractor shall include a minimum one-year warranty and standard factory warranty on all products, materials and workmanship unless noted otherwise. Extended warranties shall be included for various items as defined in the individual specifications.

1.8 SUBMITTALS

- .1 Refer to Section 01 33 00 and Contract General Conditions for submission requirements at project completion.

1.9 FINAL CLEANING

- .1 Refer to Section 01 74 11 for cleaning requirements.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 As-built, samples, and specifications.
- .2 Equipment and systems.
- .3 Product data, materials and finishes, and related information.
- .4 Operation and maintenance data.
- .5 Spare parts, special tools and maintenance materials.
- .6 Warranties and bonds.
- .7 Final site survey.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 45 00- Quality Control.
- .3 Section 01 71 00 – Examination and Preparation.
- .4 Section 01 77 00 - Closeout Procedures.
- .5 Section 01 91 13 – General Commissioning (Cx) Requirements.

1.3 **SUBMISSION**

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Submit one copy of completed volumes in final form 15 days prior to final inspection.
- .3 Copy will be returned after final inspection, with Contract Administrator's comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 Two weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, two final copies of operating and maintenance manuals.

- .6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .7 If requested, furnish evidence as to type, source and quality of products provided.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

1.4 FORMAT

- .1 Organize data in the form of an instructional manual. Coordinate with Submittal Procedures 01 33 00 and coordinate with MCA project managers for Owner approved requirements.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide CAD files in DWG format on digital storage device. Also provide electronic files in PDF format.

1.5 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project; names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

- .3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- .6 Training: Refer to Section 01 91 13 – General Commissioning (Cx) Requirements.

1.6 AS-BUILTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Contract Administrator one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Contract Administrator.

1.7 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of blue line opaque drawings, provided by Contract Administrator.
- .2 Provide felt tip marking pens, maintaining red color pens for recording information.

- .3 Record information concurrently with construction progress. Do not conceal Work until required information is 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 actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: submit manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 At completion of project, provide all recorded information on print drawings. Transfer recorded information to AutoCAD files in DWG format. Submit DWG files, also with electronic files in PDF format as part of the Closeout Submittals.

1.8 FINAL SURVEY

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

1.9 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
- .15 Additional requirements: As specified in individual specification sections.

1.10 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 Additional Requirements: as specified in individual specifications sections.

1.11 SPARE PARTS

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

1.12 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 Deliver to site location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.13 SPECIAL TOOLS

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

1.14 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 Contract Administrator.

1.15 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan to Contract Administrator's approval.
- .3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of 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 submittal.
- .6 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems, process equipment and systems.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.

- .2 Model and serial numbers.
- .3 Location where installed.
- .4 Name and phone numbers of manufacturers or suppliers.
- .5 Names, addresses and telephone numbers of sources of spare parts.
- .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
- .7 Cross-reference to warranty certificates as applicable.
- .8 Starting point and duration of warranty period.
- .9 Summary of maintenance procedures required to continue warranty in force.
- .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.
- .4 Procedure and status of tagging of equipment covered by extended warranties.
- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .7 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .8 Written verification will follow oral instructions. Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.

1.16 PRE-WARRANTY CONFERENCE

- .1 Meet with Contract Administrator to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Contract Administrator.
- .2 Contract Administrator will establish communication procedures for:
 - .1 Notification of construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable time for response.
- .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work.

1.17 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Contract Administrator.
- .2 Leave date of acceptance until project is accepted for occupancy.
- .3 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements for Installation Verification and Performance Verification of components, equipment, sub-systems, systems, and integrated systems.
- .2 Acronyms
 - .2 CxA – Commissioning Authority.
 - .3 Cx – Commissioning.
 - .4 EMCS – Energy Monitoring and Control Systems.
 - .5 O&M – Operation and Maintenance.
 - .6 PV – Performance Verification.
 - .7 TAB – Testing, Adjusting and Balancing.
 - .8 GC – General Contractor
 - .9 TSI – Technical Services Inspector
 - .10 LEED - Leadership in Energy and Environmental Design

1.2 COMMISSIONING INTENT

- .1 Undertake Cx to bring the facility to a fully operational state and free of deficiencies in the most effective and timely manner available, ensuring the design intent is met by all systems. Verifying that a fully operational state has been achieved will include the successful operation of the process system, in accordance with its design requirements, for a period of 14 days, the last 7 of which shall be consecutive.
- .2 Cx incorporates inspection and quality assurance activities as construction progresses, including start up, installation verification, performance verification, fine tuning, and operator training.
- .3 Bear all costs associated with the required personnel and test equipment as outlined in specification sections and Cx Manual and all costs with organizing and managing the activities of the applicable subtrades as identified in this section.
- .4 Fully document all tests and inspections performed during the construction, at start up, installation verification and performance verification and fine tuning. Incorporate into final commissioning documentation.
- .5 Provide direct training to designated staff responsible for the operation and maintenance of the building equipment and systems.

1.3 RELATED SECTIONS

- .1 Section 01 45 00 - Quality Control.
- .2 Section 01 77 00 - Closeout Procedures.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 01 91 33 - Commissioning (Cx) Forms.
- .5 Section 01 91 41 - Commissioning (Cx) Training.
- .6 Section 20 05 01 - Mechanical General Requirements
- .7 Section 26 05 00 - Electrical General Requirements
- .8 Section 44 00 10 - Process General Requirements

1.4 COMMISSIONING OVERVIEW

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished project.
- .2 Cx is an intensive quality assurance process that begins at the beginning of the project and continues through to the first year of occupancy. The process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owners Project Requirements.
- .3 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .4 Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities include transfer of critical knowledge to facility operational personnel.
- .5 Complete inspection and verification activities as required by the specifications and Cx Manual as construction progresses.
- .6 The General Contractor shall take responsibility to:
 - .1 Develop the Cx manual and review with the commissioning team.
 - .2 Complete all items as identified in the Cx manual. This includes work by subcontractors, test agencies, equipment representatives and manufacturer agents.
 - .3 Review Contract Documents and inspect the Work to ensure completeness of the Work and compliance with the Contract Documents.

- .4 Correct deficiencies resulting from installation and performance verifications.
- .5 Test, adjust and balance equipment and systems identified in Divisions 2-44.
- .6 Submit the completed manual and project record documents as specified.
- .7 Update the documentation manuals prior to each project meeting.
- .7 The Substantial Completion Certificate will not be issued until the commissioning process is completed and the final reports and commissioning documentation are received.
- .8 The Cx Manual provides direction for the Cx process during construction, provides resolution for issues such as scheduling, roles and responsibilities, lines of communication and reporting, approvals and coordination.

1.5 COMMISSIONING TEAM

- .1 The commissioning team shall consist of the Contract Administrators, including Engineer, Operator, the General Contractor and sub-contractor and the General Contractors Commissioning Authority, whom shall be selected and paid for by the General Contractor.

1.6 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 During Cx, should equipment, system components, and associated controls be identified as incorrectly installed, malfunctioning or not performing as per specifications, the contractor shall correct deficiencies, re-verify equipment and components within the system, including related systems as deemed necessary by the Contract Administrator, to ensure effective and accurate operation.
- .2 Minor deficiencies may be corrected at the time of identification. For systems requiring major repairs, the Commissioning Team shall move on to the next system to be commissioning. The Contractor shall notify the CM when the work is complete.
- .3 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor.

1.7 CONFLICTS

- .1 Report conflicts between requirements of this section, other sections, and the Cx Manual to the CM to obtain clarification prior to the start of work.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.8 SUBMITTALS

- .1 Prior to starting Cx the Contractor shall provide a set of equipment and system submittals, these should be in the form of the Operation and Maintenance Manuals described throughout the specifications. These submittals are supplemented by the installation and start-up procedures, O&M data, performance data, control drawings and any changes that may affect commissioned systems.

1.9 COMMISSIONING DOCUMENTATION

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms for requirements and instructions for use as well as the Cx Manual.
- .2 Checklists will be provided to the Contractor by the Commissioning Agent during the construction stage.
- .3 Installing subcontractors are to date and initial the checklists as construction and verifications are completed.
- .4 The general contractor is to submit completed checklists to the CxA for review and acceptance.
- .5 Once all documents have been reviewed and accepted the general contractor shall submit final commissioning documents in electronic form (PDF) and original signed copies.

1.10 COMMISSIONING SCHEDULE

- .1 Submit preliminary Cx schedule in Gantt Chart format to CxA no later than four (4) weeks after award of contract. A sample Cx Schedule is provided in the Cx Manual.
- .2 Submit final Cx schedule in Gantt Chart format to CxA for review four (4) weeks prior to performance verification. A sample Cx Schedule is provided in the Cx Manual.
- .3 Provide adequate time for Cx activities prescribed in technical sections, commissioning sections and the Cx manual including all on site activities as well as documentation procedures. Time should be allowed for re-verification should any system be rejected upon completion of initial verification.
- .4 Provide adequate time for training.

1.11 STARTING AND TESTING

- .1 Contractor assumes liabilities and costs for inspections, including disassembly and re-assembly after approval, starting, testing and adjusting, and supply of testing equipment, and all associated costs of installation and performance verification.

1.12 WITNESSING OF STARTING AND TESTING

- .1 Provide twenty eight (28) days' notice prior to commencement.
- .2 Contract Administrator to witness start-up and testing.
- .3 Contractor's Cx Coordinator to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

- .1 The Contractor shall obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems..
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .2 Integrity of warranties:
 - .3 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .4 Verify with manufacturer that testing as specified will not void warranties.
- .3 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 Ability to report results in clear, concise, logical manner.

1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting Performance Verification.
- .2 Conduct Commissioning in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of product information report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Installation Verification: follow accepted start-up procedures.
 - .3 Performance Verification: document equipment performance. Include repetition of tests after correcting deficiencies.
 - .4 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from CxA after distinct phases have been completed and before commencing next phase.

- .4 Document required tests on checklists provided in the Cx Manual as well on any supplied Manufacturer forms.
- .5 Failure to follow accepted Commissioning Processes will result in re-evaluation of equipment by an independent testing agency selected by Contract Administrator. If results reveal that equipment Commissioning Process was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Contract Administrator.
 - .2 Major equipment/systems: If evaluation report concludes that major damage has occurred, Owner's Representative shall reject equipment to be removed from site and replaced with new.
 - .3 Subject new equipment/systems to specified Commissioning Process

1.15 Commissioning DOCUMENTATION

- .1 Assemble Installation Verification documentation and submit to CxA and Contract Administrator for approval before commencement of Performance Verification.
- .2 Installation Verification documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Inspection reports.
 - .3 Signed Installation Verification check lists.
 - .4 Start-up reports.
 - .5 Step-by-step description of complete start-up procedures, to permit the contractor or CxA to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After Performance Verification, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit to CxA for approval before implementation.
- .3 Operate and maintain systems for minimum fourteen (14) days for commissioning to be completed, the final seven (7) days of the commissioning process shall be continuous without interruption.
- .4 After completion of commissioning, operate and maintain systems until issuance of Substantial Completion

1.17 TEST RESULTS

- .1 If start-up, testing and/or performance verification produce unacceptable results, repair, replace or repeat specified starting and/or performance verification procedures until acceptable results are achieved.
- .2 Provide personnel, resources and materials, assume all costs for re-verification.

1.18 INSTRUMENTS / EQUIPMENT

- .1 Submit to CxA for review and approval:
 - .1 Complete list of instruments proposed to be used.
 - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide all required equipment to complete commissioning.
- .3 Provide all Arc Flash Personal Protective Equipment as required. Provide commissioning personnel with the appropriate Arc Flash Protection training.

1.19 PERFORMANCE VERIFICATION

- .1 Notify Commissioning Team at least twenty eight (28) days prior to start of Performance Verifications.
- .2 Start Performance Verification after elements of building affecting start-up and performance verification of systems have been completed.
- .3 Ensure all HVAC systems have been thoroughly cleaned.
- .4 Conduct performance verification once identified pre-requisite activities are completed for a system and approved by the CxA.
- .5 Test all building and process systems including architectural, structural, civil, mechanical and electrical components and operating procedures by challenging these systems to realistic operating conditions and train operational staff.
- .6 Run systems through all sequences of operation and verify response of components.
- .7 Notwithstanding all-inclusive requirements specified in this section, additional separate commissioning may be required at a later date for equipment and systems whose full operation is dependent on seasonal conditions.
- .8 Carry out Cx:
 - .1 Under actual operating conditions, over entire operating range, in all modes.
 - .2 On independent systems and interacting systems.

- .9 Cx procedures to be repeatable and reported results are to be verifiable.
- .10 Follow equipment manufacturer's operating instructions.
- .11 SCADA trending to be available as supporting documentation for performance verification.
- .12 Contractor to obtain all documentation, including updated points list, controls sequences and setpoints, and submit documentation to commissioning authority for review. At completion of commissioning, scan completed manuals to electronic format on digital storage devices in PDF format as required and submit to CxA.

1.20 WITNESSING COMMISSIONING

- .1 CxA along with designated representatives to witness activities and verify results.

1.21 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 If the CxA is not available to witness, the certificates of approval from the Authority Having Jurisdiction will be accepted as adequate.
- .3 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .4 Provide copies to Contract Administrator within five (5) working days of test and with Cx report.

1.22 REPEAT VERIFICATIONS

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

1.23 DEFICIENCIES, FAULTS, DEFECTS

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

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

1.24 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities, complete Cx prior to application for Substantial Completion.
- .3 Cx to be considered complete when all Cx deliverables have been submitted and accepted by Contract Administrator.
- .4 The Contractor is to compile a Final Commissioning Report summarizing all tasks, findings and documentation of the commissioning process. The Final Commissioning Report is to incorporate all test reports by sub-contractors, manufacturer's and controlling authorities including the following list. The Contractor shall turn over all materials per this specification.
 - .1 Evaluation of operating condition of the systems at the time of functional test completion.
 - .2 Deficiencies that were discovered and measures taken to correct them.
 - .3 Functional test procedures and results.
 - .4 Documentation of all commissioning field activities as they progressed.
 - .5 Description and estimated schedule of required deferred testing.
- .5 The Contractor to provide O&M manuals, maintenance materials, warranties and training records.

1.25 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process notify the Commissioning Team. The Contractor will update and provide Cx forms for affected item.

1.26 TRAINING

- .1 In accordance with Section 01 91 41 - Commissioning (Cx) – Training, the Cx Manual and respective technical sections.

1.27 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract. Provide transmittal documenting all materials provided.

1.28 OCCUPANCY

- .1 Cooperate fully with the Commissioning Team during stages of acceptance and occupancy of facility.

1.29 PERFORMANCE VERIFICATION TOLERANCES

- .1 Application tolerances:
 - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria, except for special areas, to be within +/- 5 % of specified values.
- .2 Instrument accuracy tolerances:
 - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
 - .1 Unless otherwise identified, recorded values to be within +/- 2 % of specified values.

1.30 OWNER'S PERFORMANCE TESTING

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

Part 2 PRODUCTS (NOT APPLICABLE)

Part 3 EXECUTION

1.31 SCHEDULE

- .1 Provide a detailed schedule as per this section for on-site verification activities by the commissioning team based on the Cx Manual provided by the Contractor. Be responsible for resource allocation respecting the exact number and duration for personnel required to perform the tasks required.
- .2 This schedule shall be submitted with the general construction schedule monthly. The level of detail shall increase as the construction progresses.

1.32 COMMISSIONING TASKS

- .1 Refer to the Cx Manual for a list of tasks to be conducted for the commissioning process. Further specifics are provided within applicable specification sections.

END OF SECTION

PART 1 **GENERAL**

1.1 **INTENT**

- .1 This section describes general requirements for process, hoisting, mechanical, and electrical equipment relating to supply, installation, testing, and commissioning; and the verification thereof.

1.2 **DEFINITIONS**

- .1 Manufacturer: The Manufacturer is the person, partnership, or corporation responsible for the fabrication of equipment provided to the Contractor for the completion of the Work.
- .2 Manufacturer's Representative: A Manufacturer's Representative is a trained serviceman empowered by the Manufacturer to provide installation, testing, and commissioning assistance to the Contractor in his performance of these functions.

1.3 **EXPERTISE AND RESPONSIBILITY**

- .1 The Owner recognizes the expertise of the Manufacturers.
- .2 Should the Contract Administrator issue an Addendum, Field Order, Change Order, Site Instruction to change the Work which would, in the opinion of the Contractor, compromise the success or safety of the Work, then it shall be incumbent on the Contractor to promptly notify in writing the Contract Administrator and the Owner to this effect within two days.

1.4 **EQUIPMENT DELIVERY**

- .1 The Contractor shall be responsible for receiving, unloading, and storage of all equipment.
- .2 The Contractor shall ensure that he has fully informed himself of precautions to be taken in the unloading of equipment and its subsequent storage.
- .3 The Contractor shall inspect the contents of any equipment delivery to satisfy himself of the contents thereof and damage which may have occurred during transport.
- .4 For equipment being delivered to the site, the Contractor shall advise the Contract Administrator seven days in advance of the arrival of the equipment.
- .5 Where the Contractor identifies damage or deficiencies in the equipment delivered, this damage or deficiency shall be reported to the Contract Administrator and Manufacturer prior to unloading.

1.5 **IDENTIFICATION OF EQUIPMENT**

- .1 Provide a manufacturer's nameplate on each piece of equipment.

- .2 Provide tag numbers on all valves and on each piece of equipment. Include abbreviated descriptions on each piece of equipment. Minimum size 75mm x 35mm x 2.5mm thick laminated plastic with black face and engraved white lettering. Letters to be 6mm high.
- .3 Submit list to Contract Administrator for approval.

1.6 INSTALLATION ASSISTANCE

- .1 Before commencing installation of equipment, the Contractor shall arrange for the attendance of the Manufacturer's Representative to provide instructions in the methods, techniques, precautions, and other information relevant to the successful installation of the equipment.
- .2 The Contractor shall inform the Contract Administrator, in writing, of the attendance at the site of any Manufacturer's Representative for installation training at least fourteen days prior to arrival.
- .3 When the Manufacturer's Representative is satisfied that the Contractor is aware of all installation requirements, he shall so certify by completing Form 101 attached to this specification.
- .4 Installation of the equipment shall not commence until the Contract Administrator has advised that he has received the completed Form 101.

1.7 INSTALLATION

- .1 If necessary, or if so directed by the Contract Administrator during the course of installation, the Contractor shall contact the Manufacturer to receive clarification of installation procedures, direction, or any other additional information necessary to continue or complete the installation in an appropriate manner.
- .2 If it is found necessary, or if so directed by the Contract Administrator, the Contractor shall arrange for the Manufacturer's Representative to visit the site to provide assistance during installation, all at no cost to the Owner.
- .3 Prior to completing installation, the Contractor shall inform the Manufacturer and arrange for the attendance at the site of the Manufacturer's Representative to verify successful installation.
- .4 The Contractor shall advise the Contract Administrator in writing, at least seven days prior, of the Manufacturer's Representative schedule arrival.
- .5 The Manufacturer's Representative shall conduct a detailed inspection of the installation including alignment, electrical connections, belt tensions, rotation direction, running clearances, lubrication, workmanship and all other items as required to ensure successful operation of the equipment.
- .6 The Manufacturer's Representative shall identify any outstanding deficiencies in the installation.

- .7 In the presence of the Manufacturer's Representative, the Contractor, and the Contract Administrator, the equipment shall then be given a minimum of one hour trial run.
- .8 If deficiencies noted by the Manufacturer's Representative or which become evident in the trial run prejudice the successful completion of the trial run the deficiencies will be rectified by the Contractor and the Manufacturer's Representative will be required to re-inspect the installation, at no cost to the Owner.
- .9 On successful completion of the trial run in the second or subsequent attempt, the Manufacturer's Representative will certify successful installation by completing Form 102 attached to this specification.
- .10 The completed Form 102 shall be delivered to the Contract Administrator prior to departure of the Manufacturer's Representative from the site.
- .11 Tag the equipment with a 100mm by 200mm blue card stating "Equipment Checked". "Do Not Run" stenciled in large black letters. The Contractor shall sign and date each card.

1.8 OPERATION AND PERFORMANCE VERIFICATION

- .1 Equipment will be subjected to a demonstration, running test, and performance tests after the installation has been verified and any identified deficiencies have been remedied.
- .2 The Contractor shall inform the Contract Administrator at least fourteen days in advance of conducting the tests and arrange for the attendance of the Manufacturer's Representative. The tests may be concurrent with the inspection of satisfactory installation if mutually agreed by the Contractor and the Contract Administrator. The contractor shall provide the Contract Administrator with a copy of the performance test plan and list parameters to observe with the acceptable range of the parameters."
- .3 The Manufacturer's Representative will conduct all necessary checks to equipment and if necessary, advise the Contractor of any further checking, flushing, cleaning, or other work needed prior to confirming the equipment is ready to run.
- .4 The Contractor shall then operate the equipment for at least one hour to demonstrate to himself the operation of the equipment and any required ancillary services. Any remedial measures required to ensure satisfactory operation shall be promptly undertaken.
- .5 The Contractor shall then notify the Contract Administrator of his readiness to demonstrate the operation of the equipment. The Contract Administrator shall attend, as expeditiously as possible. The Owner's representative, also shall attend if deemed appropriate by the Owner.
- .6 With the assistance of the Manufacturer's Representative, the Contractor will demonstrate that the equipment is properly installed. Alignment, piping,

connections, electrical connections, etc. will be checked and if appropriate, code certifications provided.

- .7 The equipment shall then be run for a minimum of one hour. Detailed equipment specifications may require longer durations than one hour – refer to detailed specifications. Local control shall be satisfactorily verified by cycling the equipment through several start-stop operations, modulating its output, or some combination. Operating parameters such as temperature, pressure, voltage, vibration, etc. will be checked to ensure that they are within the specified Manufacturer's recommended limits, whichever is more stringent.
- .8 On satisfactory completion of the demonstration run, the equipment will be stopped and critical parameters, such as alignment, will be rechecked.
- .9 The equipment will be restarted and run for three days, of which the last twenty-four hours shall be consecutive. During this period, as practical, conditions will be simulated which represent maximum or most severe, average, and minimum or least severe conditions. These conditions will be mutually agreed by the Contractor and Contract Administrator on the basis of the information contained in the technical specifications, as well as the methods utilized to create the simulated conditions and the time periods allotted to each.
- .10 Performance tests will be conducted either concurrent with or subsequent to the running test, as practical and agreed between the Contract Administrator and the Contractor.
- .11 Performance tests shall be dictated in the technical specifications for each item of equipment or as reasonably required by the Contract Administrator to prove adherence to the requirements listed in the specification.
- .12 Results of the performance tests shall be documented and summarized by the Contractor in a format acceptable to the Contract Administrator.
- .13 All water, chemicals (unless otherwise noted), temporary power, heating, or any other ancillary service required to complete the initial demonstration, running test and performance tests shall be the responsibility of the Owner.
- .14 Should the initial demonstration, running test or performance tests reveal any defects, then these defects shall be promptly rectified and the demonstration, running tests, and/or performance tests shall be repeated to the satisfaction of the Contract Administrator. Additional costs incurred by Contractor, the Contract Administrator, or the Owner, due to repeat demonstration, running tests, and/or performance tests shall be the responsibility of the Contractor.
- .15 On successful completion of the demonstration, running test, and performance tests, Form 103 attached to this specification will be signed by the Manufacturer's Representative, Contractor, and the Engineer. The contractor shall affix to form 103 the results of performance test including the data documenting the observed values or characteristics of the performance parameters.

- .16 The Contractor shall affix to the tested equipment a 100mm by 200mm yellow card reading "Operable Condition" – Do not Operate without Contractors Permission" stenciled on in large black letter.

1.9 OPERATOR TRAINING

- .1 For equipment specified to include training, arrange for the attendance of the Manufacturer's Representative to provide classroom training session(s).
- .2 Coordinate the training session(s) with the supplier.

1.10 SECTION INCLUDES

- .1 Commissioning forms to be completed for equipment, systems and integrated systems.

1.11 RELATED SECTIONS

- .1 Section 01 78 00 – Closeout Submittals.
- .2 Section 01 91 13 – Commissioning (Cx) Requirements.
- .3 Section 01 91 41 – Commissioning (Cx) Training.

1.12 INSTALLATION VERIFICATION CHECK LISTS

- .1 Prior to initiation of Performance Verification the Contractor will develop and provide the required project specific Cx Manual which will include the Installation Verification check lists, included with this specification.
- .2 Completed Installation Verification Checklists to be submitted to Contract Administrator for review and approval.
- .3 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and Contract Administrators industry practices deemed appropriate for proper and efficient operation.
- .4 Equipment manufacturer's installation/start-up check lists are acceptable for use in conjunction with installation verification check lists forming part of the Cx manual. Manufacturer's check sheets used must be attached to final document submittals.
- .5 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Completed check lists to be submitted by the contractor at completion of the Commissioning Process.
- .6 Use of check lists will be considered part of commissioning process.

1.13 PERFORMANCE VERIFICATION CHECK LISTS

- .1 The Contractor will develop and provide to the Commissioning Team the required project specific Cx Manual including the Performance Verification check lists.
- .2 Completed Performance Verification Checklists to be submitted to Contract Administrator for review and approval.
- .3 Strategy for Use:
 - .1 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .2 Confirm operation as per design criteria and intent.
 - .3 Identify variances between design and operation and reasons for variances.
 - .4 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .5 Record analytical and substantiating data.
 - .6 Verify reported results.
 - .7 Form to bear signatures of recording technician and reviewed and signed off by General Contractor, Installing Contractor, Contract Administrator, and the Commissioning Agent.
 - .8 Reported results in true measured SI (metric) unit values.
 - .9 Maintain copy on site during start-up, testing and commissioning period.
 - .10 Forms to be both hard copy and electronic format.
- .4 Upon completion of Performance Verification the contractor shall submit all completed checklists to the Commissioning Team and will include the checklists within the Operation and Maintenance Manuals.
- .5 Final submittal shall include all Installation Verification, Performance Verification check lists, training records, maintenance materials transmittals, written warranties and a list of all Cx activities postponed due to seasonal, climatic, occupancy, or other reasons beyond the contractor's control.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

PART 4 **COMMISSIONING FORMS**

CERTIFICATE OF READINESS TO INSTALL

FORM 101

I have familiarized the installer of the specific installation requirements related to the equipment listed below and am satisfied that he understands the required procedures.

PROJECT:

ITEM OF EQUIPMENT:

TAG NO.:

REFERENCE SPECIFICATION:

COMMENTS:

Print: _____ Signature: _____
MANUFACTURE'S REPRESENTATIVE (DATE)

CERTIFICATE OF SATISFACTORY INSTALLATION

FORM 102

I have completed my check and inspection of the installation listed below and confirm that it is satisfactory and that defects have been remedied to my satisfaction except any as noted below.

PROJECT:

ITEM OF EQUIPMENT:

TAG NO.:

REFERENCE SPECIFICATION:

OUTSTANDING DEFECTS:

Print: _____ Signature: _____
MANUFACTURE'S REPRESENTATIVE (DATE)

CERTIFICATE OF EQUIPMENT SATISFACTORY PERFORMANCE

FORM 103

We certify that the equipment listed below has been operated for at least three days of which the last twenty-four hours were consecutive and that the equipment operates satisfactorily and meets its specified operating criteria. No defects in the equipment were found. The equipment is therefore classed as "conforming".

PROJECT:

ITEM OF EQUIPMENT:

TAG NO.:

REFERENCE SPECIFICATION:

Print: _____ Signature: _____
MANUFACTURE'S REPRESENTATIVE (DATE)

Print: _____ Signature: _____
GENERAL CONTRACTOR'S REPRESENTATIVE (DATE)

Print: _____ Signature: _____
CONTRACT ADMINISTRATOR (DATE)

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Commissioning forms to be completed for equipment, systems and integrated systems.

1.2 **RELATED SECTIONS**

- .1 Section 01 78 00 – Closeout Submittals.
- .2 Section 01 91 13 – Commissioning (Cx) Requirements.
- .3 Section 01 91 41 – Commissioning (Cx) Training.

1.3 **INSTALLATION VERIFICATION CHECK LISTS**

- .1 Prior to initiation of Performance Verification the Contractor will develop and provide the required project specific Cx Manual which will include the Installation Verification check lists, included with this specification.
- .2 Completed Installation Verification Checklists to be submitted to Contract Administrator for review and approval.
- .3 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .4 Equipment manufacturer's installation/start-up check lists are acceptable for use in conjunction with installation verification check lists forming part of the Cx manual. Manufacturer's check sheets used must be attached to final document submittals.
- .5 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Completed check lists to be submitted by the contractor at completion of the Commissioning Process.
- .6 Use of check lists will be considered part of commissioning process.

1.4 **PERFORMANCE VERIFICATION CHECK LISTS**

- .1 The Contractor will develop and provide to the Commissioning Team the required project specific Cx Manual including the Performance Verification check lists.
- .2 Completed Performance Verification Checklists to be submitted to Contract Administrator for review and approval.
- .3 Strategy for Use:

- .1 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .2 Confirm operation as per design criteria and intent.
 - .3 Identify variances between design and operation and reasons for variances.
 - .4 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .5 Record analytical and substantiating data.
 - .6 Verify reported results.
 - .7 Form to bear signatures of recording technician and reviewed and signed off by General Contractor, Installing Contractor, Contract Administrator, and the Commissioning Agent.
 - .8 Reported results in true measured SI (metric) unit values.
 - .9 Maintain copy on site during start-up, testing and commissioning period.
 - .10 Forms to be both hard copy and electronic format.
-
- .4 Upon completion of Performance Verification the contractor shall submit all completed checklists to the Commissioning Team and will include the checklists within the Operation and Maintenance Manuals.
 - .5 Final submittal shall include all Installation Verification, Performance Verification check lists, training records, maintenance materials transmittals, written warranties and a list of all Cx activities postponed due to seasonal, climatic, occupancy, or other reasons beyond the contractor's control.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES:**

- .1 This Section specifies roles and responsibilities of Commissioning Training.

1.2 **RELATED SECTIONS:**

- .1 Section 01 78 00 – Closeout Submittals.
- .2 Section 01 91 13 – Commissioning (Cx) Requirements.
- .3 Section 01 91 33 – Commissioning (Cx) Forms.

1.3 **TRAINEES**

- .1 Trainees: personnel selected for operating and maintaining this facility including, but not limited to, Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees may be available for training during any stage of construction.

1.4 **INSTRUCTORS**

- .1 The Cx Manual will contain:
 - .1 Descriptions of systems.
 - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down and maintenance of equipment, components and systems.
 - .2 Control features and reasons for, results of, implications on associated systems of adjustment of set points of control and safety devices.
 - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
 - .4 Training to be completed after Installation and Performance Verification are completed.

1.5 **TRAINING OBJECTIVES**

- .1 Training to be detailed and of sufficient duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal, automatic and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis, trouble-shooting and maintenance.

- .4 Ability to update documentation.
- .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.6 TRAINING MATERIALS

- .1 Instructors to be responsible for content and quality. Provide copies for all those in attendance.
- .2 Prepare a draft handout taking the form of the relevant sections of the operation and maintenance manual supplemented with any other information needed to fully explain the equipment operation.
- .3 Prepare an agenda, broken into suitable time periods outlining the content of the training sessions. Allow 0.5 hours at the beginning of the first period for the Engineer to provide a summary of the design intent relating to that equipment.
- .4 Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.
 - .4 Testing, adjusting and balancing and performance verification reports where applicable.
- .5 Contract Administrator will review training manuals.
- .6 Training materials to be in a format that permits future training procedures to the same degree of detail with or without the instructor.

1.7 SCHEDULING

- .1 Contractor to include in schedule time for training. All training shall be scheduled with at least 21 days notice to allow owners representatives to adequately schedule staff and shifts to accommodate training. Provide a detailed commissioning schedule indicating all Cx tasks and training.
- .2 Deliver training during regular working hours, training sessions to be determined in Commissioning meetings.
- .3 The final date for the training sessions will be established by the Contract Administrator. The date will not necessarily coincide with testing or installation visits by the Manufacturer's Representatives.
- .4 Training to be completed prior to Substantial Completion, it will be incumbent upon the Contractor to verify that the Trainee's have confirmed that they have received adequate training to operate and maintain the facility. The training is not considered complete, nor with Substantial Completion be awarded, until the Trainee's have verified that they have received adequate training.

1.8 RESPONSIBILITIES

- .1 Contractor shall be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
 - .3 Quality of training, training materials,
- .2 Contract Administrator will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Contract Administrator. Include list of those in attendance. The Cx manual will provide templates for these submittals.

1.9 TRAINING CONTENT

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
 - .1 Review of facility and occupancy profile.
 - .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .7 Maintenance and servicing.
 - .8 Trouble-shooting diagnosis.
 - .9 Inter-Action among systems during integrated operation.
 - .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Cast-In-Place Concrete: Section 03 30 00
- .2 Concrete Reinforcement: Section 03 20 00
- .3 Concrete Walks, Curbs and Gutters: Section 32 16 15

1.2 REFERENCES

- .1 CAN/CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN3-O86.1-14, Engineering Design in Wood (Limit States Design).
- .3 CSA O121-17, Douglas Fir Plywood.
- .4 CSA S269.1-16, Falsework and Formwork.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00.
- .2 Indicate method and schedule of construction, materials, arrangement of joints, ties, shores, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings.
- .3 Each shop drawing submitted to bear the stamp and signature of qualified Professional engineer registered in the province of Ontario.

Part 2 Products

2.1 MATERIALS

- .1 Formwork lumber: plywood and wood formwork materials to CSA-O121 and CAN3-086.1, CAN3-086.1S1. Wood to be FSC certified. Plywood shall contain no urea formaldehyde.
- .2 Falsework materials: to CSA S269.1.
- .3 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia in concrete surface. Ties for exposed locations to be threaded internal disconnecting type fitted with plastic cones 25mmØ x 50mm long. Wire ties not permitted.
- .4 Formwork at exposed concrete: use new factory resin coated medium density overlay Douglas Fir plywood to CSA 0121, exterior grade, square edge, 19mm thick base material with 7 ply Coliform Grade finish. Coated side to be in contact with concrete.
- .5 Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete

from sticking to forms (ensure compatibility with concrete mix and sealer)

- .6 Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 15 to 24 mm²/s at 40°C, flashpoint minimum 150°C, open cup.
- .7 Chamfers: 45°, 19 x 19mm wood or plastic.
- .8 Plug holes left by disconnecting type tie with non-shrink grout and set back uniformly 6mm. Follow manufacturer's directions.

Part 3 Execution

3.1 ERECTION

- .1 Verify lines, levels and column centres before proceeding with formwork and ensure dimensions agree with drawings.
- .2 Use of earth forms is not permitted.
- .3 Construct falsework in accordance with CSA S269.1.
- .4 Construct forms to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1/A23.2.
- .5 Obtain Consultant's acceptance before framing openings not indicated on drawings.
- .6 Align form joints and make watertight. Keep form joints to minimum.
- .7 Use 19 mm chamfer strips on external corners of housekeeping pads.
- .8 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .9 Provide faced formwork as described above for exposed face of exterior foundation walls.
- .10 Clean formwork in accordance with CAN/CSA-A23.1/A23.2, before placing concrete.
- .11 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 3 days for foundation walls and piers.
 - .3 2 days for footings.
- .12 Re-use of formwork and falsework subject to requirements of CAN/CSA-A23.1/A23.2.
- .13 Parging will not be permitted. Any concrete work that does not provide a finish that is acceptable to the Owner will require replacement at no cost to the Owner. Owner is the sole judge of what is acceptable.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- | | | |
|----|------------------------------------|------------------|
| .1 | Cast-In-Place Concrete: | Section 03 30 00 |
| .2 | Concrete Forming and Accessories: | Section 03 10 00 |
| .3 | Concrete Walks, Curbs and Gutters: | Section 32 16 15 |

1.2 REFERENCES

- .1 CAN/CSA-A23.1-A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN3-A23.3-14, Design of Concrete Structures for Buildings.
- .3 ASTM A1064/A1064M-17, Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plan and Deformed, for Concrete.
- .4 ASTM A1022/A1022M-16b, Standard Specification for Deformed and Plain Steel Wire and Welded Wire for Concrete Reinforcement.
5. ASTM A1022/A1022M-16b, Standard Specification for Deformed and Plain Steel Wire and Welded Wire for Concrete Reinforcement.
- .6 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .7 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .8 CSA W186-M1990, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .9 RSIC, Reinforcing Steel Manual of Standard Practice.

1.3 SOURCE QUALITY CONTROL

- .1 Provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 3 weeks prior to commencing reinforcing work.
- .2 Upon request inform Consultant of proposed source of material to be supplied.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00.
- .2 Shop drawings consist of bar bending details, lists and placing drawings.
- .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and mechanical splices, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacing and location of chairs, spacers and hangers. Do drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Ontario.

- .4 Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated. Provide type B tension lap splices unless otherwise indicated.
- .5 Review is for general conformity only. It does not in any way relieve the Contractor from making the work conform to the Contract Documents.
- .6 Work done prior to the receipt of reviewed shop drawings is done at the risk of the Contractor.

1.5 SUBSTITUTES

- .1 Substitution of different size bars permitted only upon written acceptance of the Consultant.

Part 2 Products

2.1 MATERIALS

- .1 Reinforcing steel: billet steel, grade 400, deformed bars to CSA G30.18, unless indicated otherwise.
- .2 Welded steel wire fabric: to ASTM A1064. Provide in flat sheets only, minimum 152 x 152 x MW 18.7 x MW 18.7 unless noted otherwise.
- .3 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1/A23.2.
- .4 Mechanical splices: subject to acceptance of the Consultant.
- .5 Plain round bars: to CAN/CSA-G40.20/G40.21.

2.2 FABRICATION

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

Part 3 Execution

3.1 FIELD BENDING

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

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1/A23.2.
- .2 Provide the Consultant with 48 hrs. notice prior to placement of concrete to allow for rebar inspection.
- .3 Remove all debris from reinforcement prior to placement of concrete.
- .4 Provide reinforcing for concrete surround for electrical duct bank.
- .5 Install concrete brick support chair spaced 900 mm o.c. in both directions to support the welded wire mesh or rebar in slabs on grade. Concrete brick chairs to be cut such that the reinforcing is in the centre of the slab.

3.3 FIELD REVIEW

- .1 Review of construction by the Consultant is for general conformity only. It does not relieve the Contractor from making the work conform to the Contract documents.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Concrete Forming and Accessories: Section 03 10 00
- .2 Concrete Reinforcement: Section 03 20 00
- .3 Concrete Walks, Curbs and Gutters: Section 32 16 15

1.2 REFERENCES

- .1 CAN/CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA-A3000, Cementitious Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3 ASTM C260/C260M-10a(2016), Standard Specification for Air Entraining Admixtures for Concrete.
- .4 CGSB 51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .5 ASTM C309-11, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .6 ASTM D1751-04(2013), Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

1.3 CERTIFICATES

- .1 Prior to starting concrete work submit to the Consultant, manufacturer's test data and certification by qualified independent inspection and testing laboratory that the following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Grout.
 - .3 Admixtures.
 - .4 Aggregates.
 - .5 Water.
- .2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1/A23.2 and that mix design is adjusted to prevent alkali aggregate reactivity problems.
- .3 Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with CAN/CSA-A23.1/A23.2 and that mix design is adjusted to prevent alkali aggregate reactivity problems.
- .4 Aggregate source must be approved on the Structural Concrete Aggregate Source List as published by the Ministry of Transportation of Ontario.

1.4 CONSTRUCTION QUALITY CONTROL

- .1 Submit proposed quality control procedures for the Consultant acceptance for the following:
 - .1 Hot and cold weather protection.

- .2 Curing.
- .3 Uniform finishes.

Part 2 Products

2.1 MATERIALS

- .1 Portland cement: to CAN/CSA-A3000.
- .2 Water: to CAN/CSA-A23.1/A23.2.
- .3 Aggregates: to CAN/CSA-A23.1/A23.2. Coarse aggregates to be normal density.
- .4 Air entraining admixture: to ASTM C260.
- .5 Chemical admixtures: to CAN3-A266.2. Prior to use, obtain Consultant's approval of accelerating or set retarding admixtures during cold and hot weather placing.
 - .1 BASF RHEOCRETE® CNI (or approved equivalent) corrosion-inhibiting admixture as per manufacturer's data sheet and contract drawings.
- .6 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents. WR Meadows CG86, Sika Grout 212 or In-Pakt grout.
- .7 Curing compound: to CAN/CSA-A23.1/A23.2 to ASTM C309, Type 1-chlorinated rubber.
- .8 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
- .9 Concrete curing blankets: Terrafix 240R non-woven geotextile (white) as manufactured by Terratrack or equivalent.
- .10 CPD CIPADAM S-15 ultra sealer (2 coats).
- .11 Contractor to provide cut sheets, Material Safety Data Sheets, signed attestations or other official literature from manufacturers clearly identifying product emission rates. Documentation showing amount (in litres) of each materials used should also be provided.
- .12 WR Meadows Perminator 15mil vapour barrier.

2.2 CONCRETE MIXES

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to provide concrete properties in accordance with the Concrete Type Schedule on the Structural Drawings.

Part 3 Execution

3.1 GENERAL

- .1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1/A23.2.

3.2 WORKMANSHIP

- .1 Obtain the Consultant's acceptance before placing concrete. Provide 48h notice prior to placing of concrete.
- .2 Pumping of concrete is permitted only after acceptance by the Consultant's of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement. Use templates to rigidly hold anchor bolts in place.
- .4 Prior to placing of concrete obtain the Consultant's acceptance of proposed method for protection of concrete during placing and curing.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 Use internal vibrators whenever practicable for consolidating concrete.
- .7 Do not place load upon new concrete until accepted by the Consultant.
- .8 All concrete for slabs on grade must be pumped in place.
- .9 Install WR Meadows Perminator 15mil under all interior slabs. Install per manufacturers recommendations.

3.3 PLACING GROUT

- .1 Grout under structural steel base plates by dry-packing using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

3.4 INSERTS

- .1 Set sleeves, anchor bolts, openings, etc. in concrete walls and floors as required by other trades. Openings, sleeves, etc. not shown on structural drawings to be accepted by the Consultant's.

3.5 SURFACE TOLERANCE

- .1 Concrete tolerance in accordance with CAN/CSA-A23.1/A23.2 straight edge method (5mm in 3m).

3.6 FINISHING

- .1 Finish concrete in accordance with CAN/CSA-A23.1/A23.2.
- .2 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .3 All concrete surfaces not exposed to view, including sides of foundation walls shall be rough form finish.
- .4 All exposed concrete shall be smooth form finish using new factory resin coated medium density overlaid Douglas Fir plywood, 19mm thick base material with 7 ply Cofiform Grade finish. Coated side to be in contact with concrete.
- .5 Floor sawcuts by walk-behind type saw set to required depth only. Portable hand held saws for sawcutting are not permitted.

- .6 Curing of floor slabs, foundation walls, piers, curbs and sidewalks shall commence immediately after concrete hardens and shall consist of a 7 day minimum wet cure using a full covering of Terrafix 270R White geotextile maintained constantly wet.

3.7 JOINT FILLERS

- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise accepted by the Consultant. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

3.8 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a testing laboratory designated by the Consultant in accordance with CAN/CSA-A23.1/A23.2.
- .2 Costs for tests will be paid for by the Owner.
- .3 The inspection and testing firm will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.1/A23.2.
- .5 Inspection or testing by the Owner will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

3.9 HOT WEATHER CONCRETING

- .1 Contractor to comply with CAN/CSA-A23.1/A23.2. When temperature is expected to, or exceeds, +25 degrees Celsius take the necessary precautions. Prior to use, obtain Consultant's approval of hot weather concreting methods procedures and protections.

3.10 COLD WEATHER CONCRETING

- .1 Contractor to comply with CAN/CSA-A23.1/A23.2. Ensure that all surfaces unless noted otherwise that come in contact with fresh concrete are at a minimum of +5 degrees Celsius and are kept at +10 degrees Celsius for 5 days or +15 degrees Celsius for 3 days. Finished slabs and toppings must be placed on surfaces that are at least +13 degrees Celsius. Obtain Consultant's review and approval of cold-weather concreting and protection procedures before proceeding with any cold-weather concreting.
- .2 For concrete slabs ensure permanent heat is maintained inside enclosed area following curing period to prevent heaving of subgrade. Slabs subject to cracking and/or movement shall be removed and replaced at no expense to Owner or Consultant.

3.11 CONCRETE SURROUND FOR ELECTRICAL DUCTBANK

- .1 Where indicated on electrical drawings, provide concrete encasement for electrical ductbank.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 03 30 00 - Cast-in-Place Concrete.
- .3 Section 13 34 23 – Tension Fabric Building

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A 53/A 53M-12, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A 307-14, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16.14, Limit States Design of Steel Structures.
 - .4 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-18, Welded Steel Construction (Metal Arc Welding) (Imperial Version).
- .3 CISC/CPMA 2-75 a quick-drying Primer for Structural Steel.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittals.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittals. Indicate VOC's:
 - .1 For finishes, coatings, primers and paints.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .3 The VOC content of paints and coatings used in the interior of the building envelope must be less than the VOC content limits of GS-11 and GS-03 respectively. The VOC content of interior paints and coatings not already covered by GS-11 and GS-03 must be less than the VOC content limits of SCAQMD Rule#1113.
 - .1 Contractor to provide cut sheets, Material Safety Data Sheets, signed attestations or other official literature form manufacturers clearly identifying product emission rates. Documentation showing amount (in litres) of each materials used should also be provided.
- .3 Samples
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal.
 - .2 Submit duplicate samples of any type of supports, including but not limited to; shelf, bench, vanity, desk, etc. supports for review and comment before fabrication.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading: Deliver, store, handle and protect materials in accordance with Section 01 60 00.

Part 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W
- .2 Steel pipe: to ASTM A 53/A 53M standard weight black finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A 307.
- .6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Shop coat primer: to CISC/CPMA 2-75 quick drying primer, low VOC.

2.4 SHOP PAINTING

- .1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .3 Clean surfaces to be field welded; do not paint.

2.5 ANGLE LINTELS (NOT APPLICABLE)

- .1 Steel angles: hot dip galvanized, sizes indicated for openings. Provide 150 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.

2.6 MILLWORK SUPPORTS (NOT APPLICABLE)

- .1 Construct supports for all millwork items such as vanity supports, valence supports, desk supports, bench and shelf supports, etc. as detailed.

2.7 BOLLARDS

- .1 Fabricate bollards from Schedule 40 – 168mm OD steel pipe, hot dip galvanized, 1200 mm high above ground level, with 1350 mm below grade level. Underside of pier to be at 1500 below grade.

2.8 MISC. ENCLOSURES/STRUCTURE (NOT APPLICABLE)

- .1 Construct structural HSS framing for garbage enclosure all as per Garbage Enclosure details.
- .2 Construct bent steel plate as detailed on drawings for coverage of any exposed mechanical and/or electrical equipment and/or fixtures, piping, courtyard column piping, etc.

Part 3 Execution

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to the Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld. Cut exposed bolts flush with nuts and grind to smooth even appearance before touching up with primer.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

- .8 Touch-up field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 MILLWORK SUPPORTS

- .1 Construct millwork supports for items such as vanity supports, handrail brackets, bench supports, valance supports and similar items from steel angle construction as detailed.

3.3 BOLLARDS

- .1 Construct pipe bollards as indicated.

3.3 MISC. ENCLOSURES/STRUCTURE

- .1 Construct structural HSS framing and/or bent steel plate as indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 03 30 00 - Cast-in-Place Concrete.
- .3 Section 13 34 23 – Tension Fabric Building

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A 53/A 53M-12, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A 307-14, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16.14, Limit States Design of Steel Structures.
 - .4 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-18, Welded Steel Construction (Metal Arc Welding) (Imperial Version).
- .3 CISC/CPMA 2-75 a quick-drying Primer for Structural Steel.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittals.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittals. Indicate VOC's:
 - .1 For finishes, coatings, primers and paints.
- .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .3 The VOC content of paints and coatings used in the interior of the building envelope must be less than the VOC content limits of GS-11 and GS-03 respectively. The VOC content of interior paints and coatings not already covered by GS-11 and GS-03 must be less than the VOC content limits of SCAQMD Rule#1113.
 - .1 Contractor to provide cut sheets, Material Safety Data Sheets, signed attestations or other official literature form manufacturers clearly identifying product emission rates. Documentation showing amount (in litres) of each materials used should also be provided.
- .3 Samples
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal.
 - .2 Submit duplicate samples of any type of supports, including but not limited to; shelf, bench, vanity, desk, etc. supports for review and comment before fabrication.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading: Deliver, store, handle and protect materials in accordance with Section 01 60 00.

Part 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W
- .2 Steel pipe: to ASTM A 53/A 53M standard weight black finish.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A 307.
- .6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Shop coat primer: to CISC/CPMA 2-75 quick drying primer, low VOC.

2.4 SHOP PAINTING

- .1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

- .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.
- .3 Clean surfaces to be field welded; do not paint.

2.5 ANGLE LINTELS (NOT APPLICABLE)

- .1 Steel angles: hot dip galvanized, sizes indicated for openings. Provide 150 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.

2.6 MILLWORK SUPPORTS (NOT APPLICABLE)

- .1 Construct supports for all millwork items such as vanity supports, valence supports, desk supports, bench and shelf supports, etc. as detailed.

2.7 BOLLARDS

- .1 Fabricate bollards from Schedule 40 – 168mm OD steel pipe, hot dip galvanized, 1200 mm high above ground level, with 1350 mm below grade level. Underside of pier to be at 1500 below grade.

2.8 MISC. ENCLOSURES/STRUCTURE (NOT APPLICABLE)

- .1 Construct structural HSS framing for garbage enclosure all as per Garbage Enclosure details.
- .2 Construct bent steel plate as detailed on drawings for coverage of any exposed mechanical and/or electrical equipment and/or fixtures, piping, courtyard column piping, etc.

Part 3 Execution

3.1 ERECTION

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to the Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld. Cut exposed bolts flush with nuts and grind to smooth even appearance before touching up with primer.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

- .8 Touch-up field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 MILLWORK SUPPORTS

- .1 Construct millwork supports for items such as vanity supports, handrail brackets, bench supports, valance supports and similar items from steel angle construction as detailed.

3.3 BOLLARDS

- .1 Construct pipe bollards as indicated.

3.3 MISC. ENCLOSURES/STRUCTURE

- .1 Construct structural HSS framing and/or bent steel plate as indicated.

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Materials and installation of a tension fabric-covered building for the purpose of road salt storage.
- .2 Note that this specification is general in nature and scope and shall not be construed as to limit the work.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 03 33 00 – Cast-in-Place Concrete.
- .3 Section 20 05 01 – Mechanical General Requirements
- .4 Section 26 05 00 – Common Work Results for Electrical

1.3 **REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - .2 ASTM A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A153, Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
 - .4 ASTM D5034, Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
 - .5 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .6 ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - .7 ASTM E547, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
 - .8 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .9 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

- .3 Canadian Standards Association (CSA)
 - .1 CSA A660-10, Certification of Manufacturers of Steel Building Systems.
 - .2 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
 - .3 CSA W59, Welded Steel Construction (Metal Arc Welding)
 - .4 CAN/CSA-S16, Design of Steel Structures
 - .5 CAN/CSA G40.20/G40.21, General Requirements for Roller or Welded Structural Quality Steel / Structural Quality Steel
 - .6 CSA G146M Hot-Dip Galvanizing of Irregularly Shaped Articles
 - .7 CSA S367, Air-, Cable-, and Frame-Supported Membrane Structures
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies.

1.4 SUBMITTALS

- .1 Submit building design and supporting data at least 10 working days prior to commencing work.
- .2 Building is to be designed and stamped by a qualified professional engineer who is registered or licensed in the Province of Ontario to design and inspect structural work.
- .3 Confirm dimensions and details shown on foundation plan to suit proposed building.
- .4 Provide base reactions for review along with a copy of the anchoring requirements, the anchor bolt plan, truss and leg truss line locations. Anchor bolt diameters and quantities shown on the supplied drawings are the minimum required for the sole purpose of determining the hole's diameter in the base plates. Any changes required to anchor bolt diameters and quantities must be approved prior to manufacturing.

1.5 QUALITY ASSURANCE

- .1 All materials used shall be new and of the types and grades specified.
- .2 Building manufacture shall be performed under factory conditions in a plant specifically arranged for this type of work.
- .3 Manufacturer shall provide all necessary operations for packing and shipping, and provide technical information to the contractor for adequate space planning, equipment and personnel for the assembly and installation of all major components of the building.
- .4 The structure supplier shall have direct experience in the design, manufacture and installation of structures of the type specified herein.
- .5 The structure supplier shall operate according to a comprehensive quality system, with operations meeting the standards of CSA A660 requirements.

- .6 Three references with structures in use for at least five years which are clear span and of comparable size shall be supplied by the manufacturer.
- .7 The structure manufacturer shall have a valid, up-to-date, BMEC certification and a copy of the manufacturer's certificate, valid for the duration of the work, must be supplied with the contract.
- .8 All individual parts or bundles and packages of identical parts are to be clearly marked for identification. The shipping document shall list the description, quantity and piece mark of the various parts, components and elements.

1.6 WARRANTY

- .1 Steel structure: notwithstanding the standard warranty offered by the supplier of the structural steel truss products, the Owner requires that a warranty against corrosion be provided, which incorporates the following:

- .1 A Certificate of Acceptance issued by the supplier stating that the structural steel trusses and all other steel components used in the assembly of the building have been inspected and have been installed in accordance with the manufacturer's specifications and installation instructions;
- .2 Acknowledgement that the steel trusses are located within a building used to store sodium chloride (road salt) and such use does not void or limit the warranty for the structural steel in any way provided that bulk salt is not permitted to be in regular contact with the steel truss;
- .3 A warranty period of 15 years commencing upon substantial completion of the works at each site;
- .4 The warranty to include all materials, all shipping and all installation costs including labour based upon the following schedule of pro-rating:

- .1 Schedule of Pro-rating

Defect occurring in:	% of cost paid by supplier
1 st Year to 11 th Year (Inclusive)	100
12 th Year	80
13 th Year	60
14 th Year	40
15 th Year	20

- .5 A defect due to corrosion shall have been confirmed when more than 5% of the surface area of a structural steel truss main chord members exhibits red rust and the truss shall be replaced or repaired to the satisfaction of the Owner.
- .2 Fabric: notwithstanding the standard warranty offered by the supplier for its fabric material, the Owner requires that a warranty against defects be provided, which incorporates the following:
 - .1 A Certificate of Acceptance issued by the supplier stating that the fabric material and all related connecting components used in the assembly of the

building have been inspected and have been installed in accordance with the manufacturer's specifications and installation instructions;

- .2 Acknowledgement that the membrane is located within a building used to store sodium chloride (road salt) and such use does not void or limit the warranty for the fabric material in any way provided that bulk salt is not permitted to be in regular contact with the fabric;
- .3 A warranty period of 10 years commencing upon substantial completion of the works;
- .4 The warranty shall include all materials, all shipping and all installation costs including labour based upon the following schedule of pro-rating:

.1 Schedule of Pro-rating

Defect occurring in:	% of cost paid by supplier
1 st Year to 6 th Year (Inclusive)	100
7 th Year	80
8 th Year	60
9 th Year	40
10 th Year	20

- .5 A defect shall have been confirmed when any structural defect occurs and/or when any damage occurs due to snow, wind or ice events. The fabric shall be replaced or repaired to the satisfaction of the Owner.
- .3 Overhead doors and personnel doors:
- .1 The door panels and all hardware shall carry a ten (10) year warranty against perforation due to rusting and a five (5) year warranty against delamination.
 - .2 The warranty shall include an explicit acknowledgement of the salt storage building environment and a statement that it does not void the warranties.

PART 2 **PRODUCTS**

2.1 **TENSION FABRIC BUILDING DESIGN**

- .1 Tension fabric building shall meet the following requirements:
 - .1 Nominal width: 21.34 m (70.01 feet)
 - .2 Nominal length: 39.79 m (130.51 feet)
 - .3 Minimum clear height at center, not including height of concrete wall 8.725m (28.625 feet), and shall be free of any structural support members. Refer to structural drawings for additional clearances.
 - .4 Maximum arch spacing: 3.65 m (12 feet)
 - .5 No exterior purlins, guy ropes or cables
 - .6 Structure maximum deflection/span ratio of 1:300 (in tension)

Acceptable suppliers Britespan Building Systems Inc., Calhoun Superstructure Ltd., MegaDome Buildings, or approved equivalent.

- .2 At a minimum, the structure shall be capable of supporting the loads shown on drawing S0.1 and shall be designed in accordance with appropriate standards using methodology from PART 4 of the National Building Code of Canada 2025 or OBC 2024; using load cases as per Article 4.1.3. Limit States design.
- .3 The structure shall be designed to withstand the building components dead load and a collateral load (mechanical, electrical, etc.) of 0.15 kPa.
- .4 The structure shall be designed to withstand the additional dead load of the two (2) exhaust fans, estimated at 181 kilograms (400 pounds) each and the two louvres – verify weight with mechanical.
- .5 The GC shall coordinate rough opening dimensions for the exhaust fans and louvres. Fabric Building supplier to provide framed openings to receive these items.

2.2 STRUCTURAL FRAME

- .1 Purlin Bracing: the main structural trusses shall be laterally braced by tubular purlins at intervals required by the truss design to provide for structural stability and to provide for installation of accessory items.
- .2 Wind and Frame Bracing: the structure shall be appropriately stabilized with wind bracing cables so as to efficiently transfer wind and snow induced stresses to the foundation/anchoring system. Cable diameter for main wind bracing shall be a minimum 3/8" diameter and larger if so required. The arches on each end of the structure shall be designed to be "V" braced to the rest of the structure, or using brace purlins or double purlins.
- .3 Connecting Joints - Main structure components shall be locked with minimum 5/8" diameter hot dip galvanized bolts according to ASTM A-153 standards. Connection of truss frame to foundation shall be designed as a pinned type connection.
- .4 Ancillary Systems - The structure shall be designed such that it can be readily retrofitted with ancillary systems such as lighting, HVAC, etc.
- .5 Welding shall be employed only when specified in the original design. The truss fabricator must be certified by CWB to CSA Standard W47.1 Division 2.
- .6 Welding shall be in accordance with CSA W59 and CAN/CSA-S16. A copy of the manufacturer's CWB certificate, valid for the duration of the work, must be supplied with the contract.

2.3 TRUSS STEEL

- .1 All components of the structure fabricated from raw, untreated structural steel. All steel tubing used in the structure is to be new and of minimum Grade 300W in accordance with CAN/CSA G40.20 and CAN/CSA G40.21 or approved equivalent.
- .2 The main structure shall consist of a welded truss, minimum 24 inches deep. Truss chords shall consist in round or oval tubes as per building manufacturer's design.

2.4 CORROSION PROTECTION

- .1 All steel tube components, trusses, purlins, wind bracing, gable end framing and fastening tubes shall be fabricated and welded before being fully hot dipped galvanized according to the CSA G164M-92/ASTM A-123 (main structure) and ASTM A-153 (connecting elements) standards, providing a minimum of 2.2 oz/sq.ft of zinc coating.
- .2 Finished hot dipped galvanized surfaces shall be smooth and free from bumps and rough edges.
- .3 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas.
 - .1 Pre-treat damaged surfaces according to manufacturer's instructions for zinc-rich paint.

2.5 MEMBRANE

- .1 Fire retardant UV stabilized waterproof membrane, free of defects, manufactured by the building manufacturer with demonstrated long-term performance.
- .2 Colour to be selected by Owner from the manufacturer's standard colors.
- .3 The membrane shall consist of woven HDPE, coated with a minimum of 95 g/m²/side of colored HDPE coating, for a total coated weight of 12 oz/square yard +/- 5%.
- .4 Grab tensile strength of 350 lbs as tested per ASTM D-5034-95, and meet the following UV and flame resistance standards: NFPA 701-1989 (large scale) and 1996 (tests 1 & 2), CAN/ULC S109-M87 (small and large scale), CAN/ULC S102-03, ASTM E84-00a(Class 1) and UBC31-1, California Fire Marshall (FA-51403).
- .5 The structure membrane shall form a continuous uninterrupted weather tight shell over the framework and perimeter wall.
- .6 To provide for a good finished appearance and to insure weather tightness, the membrane shall be assembled and tensioned in a manner to minimize wrinkles in hot and cold temperatures.
- .7 Horizontal stretch (warp direction) shall be maintained with horizontal purlins. Vertical stretch (fill direction) shall be maintained with a belt and winch lock system.
- .8 Gable end membranes shall be vertically stretched and retained to uprights to create a smooth, wrinkle-free finish.
- .9 All membrane welded seams shall attain a minimum strength equal to the membrane material. Seamed joint shall be as per CSA S367-12, section 5.
- .10 The membrane cladding will be provided with a mechanical tensioning system that allows the membrane to be fully tensioned around the structure perimeter. The

system will be designed such that the membrane can be neatly secured over the structural frame and the systems have a remaining range for adjustment.

- .11 The building design will make allowance for the design tension and seal of the membrane material around door, ventilation and other openings as well as around the structure perimeter below the main tensioning system. This seal shall provide a neat finished appearance and eliminate any loose membrane cladding that could otherwise be damaged by flapping or abrasion.
- .12 When a membrane base skirt is required, this shall be supplied and attached at the base perimeter to allow a reasonable seal against air and water intrusion. The membrane shall not be designed to function as a structural member such that, should any damage to or penetrations of the membrane occur, the integrity of the structural framework would be affected.

2.6 HARDWARE

- .1 Bolts: shall be hot dip galvanized according to ASTM A-153 standards. All bolts shall be installed and securely pretensioned so as to prevent change in tightness. Those subject to removal or adjustment shall not be swaged, pinned, staked or otherwise installed.
- .2 Membrane Tensioning Hardware: The membrane shall be tensioned with load rated hardware. A load tested ratchet and proper instructions on adequate maintenance to be done to the building shall be included in the contract.
- .3 Membrane Tensioning Webbing: The membrane shall be tensioned with load-tested tie-down belts.
- .4 Cable assemblies: Main and wind bracing cable assemblies shall be stainless steel and manufactured to the required length sized with appropriate safety factors.
- .5 Other fasteners: Non-structural fasteners shall be corrosion resistant, either hot-dipped galvanized, stainless steel or zinc/nickel alloy plated.

2.7 OVERHEAD DOORS – SUPPLIED BY TENSION BUILDING FABRIC SUPPLIER

- .1 Building to be equipped with one (1) overhead door to the following requirements:
 - .1 Minimum width : 6.1 m (20 feet)
 - .2 Minimum height: 6.1 m high (20 feet)
 - .3 Insulation: 35mm thick polyurethane core
 - .4 20 gauge hot dipped galvanized skins, with two coat baked-on polyester finish (white interior and exterior)
 - .5 Electric door opener to CAN/UL 325: 1 horsepower, 230 V, with photo beams, operated by interior push buttons and 8 remotes.
 - .6 Manual chain override.

- .7 Door tracks to extend vertically to minimum 4.5 m above top of door frame then horizontal, to maximize clearance inside building (verify with selected tension fabric building supplier).
- .8 Door tracks (min 0.075"), cables and all hardware to be stainless steel due to the salt environment.
- .9 Door Speed: Minimum 152mm per second
- .10 Spring Counterbalance: Sized to weight of the door, with helically wound, oil tempered torsion spring mounted on steel shaft, aircraft cable sized with minimum 5 to 1 safety factor design for 50,000 cycles.
- .11 Acceptable product Wayne Dalton TS150, Clopay Model 3720, Richard Wilco Model T150 or approved equivalent.
- .2 Designed to withstand wind load of 21 psf (velocity of 90.5 miles per hour) with a maximum horizontal deflection of 1/120 of the opening width.
- .3 Comply with ASTM E-283 (air leakage): less than 0.130 cfm/ft² at 25 miles per hour.
- .4 Comply with ASTM E-547 (water penetration): absolutely no leakage
- .5 Doors and all related hardware to be designed for a minimum of 10,000 operating cycles.
- .6 Test for proper operation and adjust as necessary to provide proper operation without binding or distortion. Adjust hardware and operating assemblies for smooth noiseless operation.
- .7 See Section 1.6 Warranty above.

2.8 PERSONNEL DOOR – SUPPLIED BY TENSION FABRIC BUILDING SUPPLIER

- .1 Building to be equipped with two (2) personnel doors to the following specifications:
 - .1 Minimum width: 914mm (36").
 - .2 Minimum height: 2,133mm (84").
 - .3 FRP door (45mm)
 - .4 Stainless steel hardware
 - .5 Rim exit device – night latch with interior panic bar, closer, kickplate, weatherstripping, door sweep, threshold, standard weight hinge.
 - .6 Vision Panel – Clear Tempered Glass
 - .7 See Section 1.6 Warranty above.

2.9 VENTS

- .1 Refer to mechanical drawings.

PART 3 **EXECUTION**

3.1 **DELIVERY AND HANDLING**

- .1 The building system materials shall be delivered to the project site during normal working hours.
- .2 Provide adequate workmen and equipment to unload and accept material delivery.
- .3 Do not drop, throw or drag materials over the transport equipment or the ground.

3.2 **ERECTION**

- .1 The building is to be erected and assembled at the work site and in accordance with Plans and Specifications as approved by the Owner's Representative and in accordance with the manufacturer's recommendations.
- .2 The building manufacturer shall inspect the completed building installation and provide professional engineer sealed letter indicating the building installation has been completed in accordance with the manufacturer's design.

3.3 **CLEANING**

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

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1, Division 23, Division 25, Division 28, Division 33 and Division 44.

1.2 CODES AND STANDARDS

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.1, Canadian Electrical Code, Part1, Safety Standard for Electrical Installations.
 - .2 CSA-22.3 No.1, Overhead Systems.
 - .3 CSA-22.3 No.7, Underground Systems.
 - .4 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Perform complete installation in accordance with the latest edition of the Ontario Electrical Safety Code, including amendments and bulletins in addition to the requirements indicated here.
- .3 Abbreviations for electrical terms: to CSA Z85-1983.
- .4 In addition to the codes and standards listed above, do complete installation in accordance with the following:
 - .1 Ontario Building Code (OBC).
 - .2 Electrical Safety Authority (ESA) inspection permits.
 - .3 Local code of governing authorities.

1.3 CARE, OPERATION AND START-UP

- .1 Instruct Contract Administrator and operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

- .3 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 with all aspects of its care and operation.

1.4 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. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 SUBMITTALS

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .2 Submit for approval: wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, proposed conduit routing, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.
- .3 Submit list of lamicon labels for approval.
- .4 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
- .5 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .6 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide CSA certified, or certified by recognized organizations as detailed in ESA Bulletin 2-7-27. equipment and material. Where CSA certified, or ESA recognized approval equipment and material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Submit, upon completion of Work, load balance report as described in sentence 3.8.5.
 - .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Contract Administrator.
- .7 Manufacturer's Field Reports: submit to Contract Administrator within seven (7) working days of review, verifying compliance of Work and electrical system and

instrumentation testing, as described in paragraph 3.6- FIELD QUALITY CONTROL.

.8 Single Line Electrical Diagrams

.1 Provide single line electrical diagrams in glazed frames as follows:

.1 Electrical distribution system: locate in main electrical room.

.2 Drawings: 600 x 600 mm minimum size.

1.6 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Division and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Notify Contract Administrator of changes required by Electrical Inspection Division prior to making changes.

.4 Furnish Certificates of Acceptance from Electrical Inspection Division or authorities having jurisdiction on completion of work to Contract Administrator.

1.7 SEISMIC RESTRAINTS

.1 The contractor shall retain a specialty Engineer to develop seismic restraints and perform seismic calculations in accordance with Ontario Building Code. Calculations, restraint selections and installation details shall be done by a professional engineer experienced in seismic restraint design and installation and licensed in the Province of Ontario.

.2 The seismic restraint calculations, selections and installation details shall be submitted as a shop drawing submittal. This submittal shall be signed and sealed by a professional engineer as stated above.

.3 The Design Criteria in accordance with Ontario Building Code for a post disaster building. The seismic restraints design to cover all electrical equipment and cable tray/supports.

.4 At the completion of the installation, the seismic specialist shall visit the site and review the installation is done in accordance with their design. Once complete the specialist shall provide written certification that the equipment and components have been correctly restrained. This report to forwarded to the Engineer.

.5 At the completion of the installation the seismic specialist shall visit the site and review the installation of the seismic restraints. The specialist shall provide written certification that the systems have been correctly restrained.

1.8 CO-ORDINATION

.1 Co-ordinate work with work of other divisions to avoid conflict.

- .2 Locate distribution systems, equipment, and materials to provide minimum interference and maximum usable space.
- .3 Locate all existing underground services and make all parties aware of their existence and location.
- .4 Where interference occurs, Contract Administrator must approve relocation of equipment and materials regardless of installation order.
- .5 Notwithstanding the review of shop drawings, this division may be required to relocate electrical equipment which interferes with the equipment of other trades, due to lack of co-ordination by this Division. The cost of this relocation shall be the responsibility of this Division. The Contract Administrator shall decide the extent of relocation required.

1.9 CUTTING AND PATCHING

- .1 Inform all other divisions in time, concerning required openings. Where this requirement is not met, bear the cost of all cutting. Openings of 200 mm or smaller shall be the responsibility of Division 26. Openings larger than 200 mm shall be the responsibility of Division 1. Obtain written approval of Structural engineer before drilling any beams or floors.

1.10 PROTECTION

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark all live parts "LIVE 120 VOLTS", or with appropriate voltage in English.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

1.11 RECORD DRAWINGS

- .1 Obtain and pay for three sets of white prints. As the job progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each job meeting.
- .2 Show on the record drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run-in relation to the structure and building.
- .3 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.
- .4 Submit record drawings within 30 days prior to start of commissioning.

1.12 INSPECTION OF WORK

- .1 The Contract Administrator will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

1.13 SCHEDULING OF WORK

- .1 Work shall be scheduled in phases as per other divisions of the architectural specifications.
- .2 Become familiar with the phasing requirements for the work and comply with these conditions.
- .3 No additional monies will be paid for contractor's requirement to comply with work phasing conditions.

1.14 FIRE RATING OF PENETRATIONS

- .1 Maintain fire ratings around conduits passing through floors, ceilings and fire rated walls.
- .2 When cables or conduits penetrate or pass through fire rated assemblies such as walls, floor/ceiling, roof/ceiling or columns protection, do fire stopping and smoke sealing in accordance with an approved system specified in Section 07 84 00 to match the rating of the assembly being penetrated. Refer to architectural drawings to ascertain locations and degree of the fire rated assemblies. Refer to detail ULC System No. SP341 for fire-stopping cable tray floor and wall partitions.

PART 2 PRODUCTS

2.1 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings, where applicable.
- .2 Control wiring and conduit is specified in Division 26 for all conduit, wiring and connections related to control systems specified in Division 25 and shown on mechanical, process and civil drawings. Division 26 is responsible for all conduit, wiring and connections below 50V which are related to control systems in Division 25 and shall comply with the requirements of Division 26 for standard of quality.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.

- .2 Equipment and material to be CSA certified or ESA recognized certifications, as detailed above. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from CSA Electrical Inspection Division.
- .3 Factory assemble control panels and component assemblies.

2.3 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1.
 - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

2.4 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department and Contract Administrator.
- .2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, black white face, black white core, mechanically attached with self tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels:
 - .1 Embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Contract Administrator prior to manufacture.

- .4 Allow for average of twenty-five (25) letters per nameplate and label.
- .5 Identification to be English (and French where applicable).
- .6 Nameplates for terminal cabinets and junction boxes to indicate system name and voltage characteristics.
- .7 Disconnects, starters and contactors: indicate equipment being controlled, voltage and circuit fed from.
- .8 Instrumentation: label include tag name and circuit fed from.
- .9 Terminal cabinets and pull boxes: indicate system name and voltage.
- .10 Transformers: indicate capacity, primary and secondary voltages, circuit fed from and transformer number.

2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or 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 code: to CSA C22.1, Canadian Electrical Code.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

<u>Conduit System</u>	<u>Prime Color</u>	<u>Auxiliary Color</u>
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

PART 3 EXECUTION

3.1 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.2 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 27 26 – Wiring Devices.
- .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. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.3 SLEEVES

- .1 Install Conduit sleeves: at points where conduit pass through masonry, concrete or fire rated assemblies and as indicated.
- .2 Schedule 40 galvanized steel pipe.
- .3 Sizes: maximum 6mm clearance all around, between sleeve and conduit.
- .4 Terminate sleeves flush with surface of concrete and masonry walls.
- .5 Fill voids around conduit:
 - .1 Caulk between sleeve and conduit in foundation walls with waterproof fire retardant non-hardening mastic.
 - .2 Where sleeves pass through walls, provide space for fire-stopping. Where conduit passes through fire rated walls, maintain fire rating integrity.
 - .3 Ensure no contact between copper conductor and ferrous sleeve.
 - .4 Fill future-use sleeves with lime plaster or other easily removable filler.
 - .5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt.
- .6 This Division shall prepare sleeving drawings indicating the size and locations of openings required in concrete walls for conduit. In case of failure to provide information in time (i.e. before the concrete is poured) any extras incurred shall be at the expense of this Division.

3.4 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 at following heights unless indicated otherwise.
 - .1 Local switches: 1200 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300 mm.
 - .5 Wall mounted telephone and interphone outlets: 1400 mm.
 - .6 Fire alarm stations: 1200 mm.
 - .7 Fire alarm bells: 2400 mm.
 - .8 Television outlets: 300 mm.
 - .9 Wall mounted speakers: 2400 mm.
 - .10 Clocks: 2400 mm.
 - .11 Door bell pushbuttons: 1200 mm.
 - .12 Exit lights: 2400 mm.
 - .13 Emergency lighting heads: 2400 mm.

3.5 POWER SHUTDOWNS

- .1 Power shutdowns shall be kept to a minimum. Schedule shutdowns well in advance with Contract Administrator stating time(s) and duration(s). Maintain all electrical services to the occupied areas of the buildings. Power shutdowns will be allowed during normal working hours and must be approved by the Owner. Shutdowns to be 4 hours maximum.
- .2 Provide temporary services, equipment and wiring as necessary to maintain continuity of services throughout, during construction of this project.
- .3 Ensure all services, i.e. security, fire alarm, telephone, LAN, normal and essential power, etc. remain operational during construction.
- .4 Refer to construction phasing Section 00 13 14 and perform work as required to meet the multiple phases of completion steps to ensure the plant services are maintained.

3.6 REMOVALS

- .1 Remove existing electrical equipment, wiring, conduit and other devices.

- .2 Where existing walls and partitions are to be removed, remove existing outlets, devices and wiring located therein and make safe. Remove existing equipment, devices and outlets as necessary. Relocate or reinstall these items as indicated and as required. Co-ordinate with applicable trades.
- .3 Maintain continuity of power, lighting, fire alarm and communication circuits as required.
- .4 Remove all existing redundant wiring associated with all devices. Co-ordinate and arrange for telephone company to remove redundant telephone cables.
- .5 Any material the Contract Administrator does not want, shall be removed from the site by this contractor.

3.7 FIELD QUALITY CONTROL

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices. Employees registered in a provincial apprentice's program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks – the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 The work of this division to be carried out by a contractor who holds a valid Master Electrical Contractor License as issued by the Province.
- .3 Conduct and pay for following tests:
 - .1 Distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 VFD configuration, testing, commissioning and training by manufacturer's factory trained and certified technician.
 - .5 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .6 Systems: fire alarm system, security and communications.
- .4 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .5 Load Balance:
 - .1 Measure phase current to panel-board 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 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating

under normal load. State hour and date on which each load was measured, and voltage at time of test.

- .6 Insulation resistance testing.
 - .1 Megger and record circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger and record 350 – 600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing and record value.
- .7 Carry out tests in presence of Contract Administrator.
- .8 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.
- .9 Submit test results for Contract Administrator's review and include in Commissioning Manuals specified in Section 01 91 13 – Commissioning (Cx) Requirements.

3.8 CLEANING

- .1 Do final cleaning in accordance with Section 01 61 00.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
- .4 Remove construction materials from wiring devices, cover plates, outlets, cabinets, enclosures, tubs, etc.

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Material and installation specifications for wire and box connectors for low voltage (LV) systems operating between 0-1000 Volts.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittals
- .2 Section 01 78 00 – Closeout Submittals
- .3 Section 01 91 13 – Commissioning Requirements
- .4 Section 26 05 00 – Common Work Requirements Electrical.

1.3 **REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65, 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, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.4 **SUBMITTALS**

- .1 Provide submittals 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.

1.5 **CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data:
 - .1 Submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less unless noted otherwise.
- .3 Compression lugs/splices required for all terminations 10 AWG and larger.
- .4 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for copper bar.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper bar.
 - .5 Sized for conductors and bars as indicated.
- .5 Clamps or connectors for armoured 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:
 - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
 - .2 Install fixture type connectors and tighten. Replace insulating cap.
 - .3 Install compression lugs with lug manufacturer's compression tool and corresponding dies appropriate to wire size.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.

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

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Material and installation requirements for wire and cables operating between 0-1000 Volts.
- .2 This section does not include HV wiring in excess of 1000 Volts. Refer to 26 05 14 for hv wiring and cable requirements.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittals
- .2 Section 01 78 00 – Closeout Submittals
- .3 Section 01 91 13 – Commissioning Requirements
- .4 Section 26 05 00 – Common Work Requirements Electrical
- .5 Section 26 05 34 – Conduits, Fastenings and Fittings

1.3 **REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No. 0.3-09, Test Methods for Electrical Wires and Cables
 - .2 CSA C22.2 No. 38-14, Thermoset-insulated Wires and Cables
 - .3 CSA C22.2 No. 51-14, Armoured Cables
 - .4 CSA C22.2 No. 131-14, Type TECK 90 Cable
 - .5 CSA C22.2 No. 174, Cables and Cable Glands for Use in Hazardous Locations
 - .6 CSA C22.2 No. 214-17, Communications Cables
 - .7 CSA C22.2 No. 239-17, Control and Instrumentation Cables

1.4 **SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Provide manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 **DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:

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

PART 2 PRODUCTS

2.1 BUILDING WIRES FOR 0 - 1000 V POWER WIRING IN CONDUIT

- .1 Installed in conduit to 26 05 34 – Conduits, Fastenings and Fittings.
- .2 Conductors: stranded for 12 AWG and larger. Minimum size: 12 AWG.
- .3 Copper conductors: size as indicated, with 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RWU90 XLPE for wet or damp locations.
- .4 Copper conductors: size as indicated, with 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 XLPE for dry locations only.

2.2 TECK 90 CABLE FOR 0 – 1000 V POWER WIRING IN CABLE TRAY

- .1 TECK 90 cable to CAN/CSA-C22.2 No.131.
- .2 Conductors:
 - .1 Grounding conductor: stranded copper.
 - .2 Circuit conductors: stranded copper, number and size as indicated. Minimum #12 AWG.
- .3 Insulation:
 - .1 Chemically cross-linked thermosetting polyethylene rated type RW90, XLPE 1000 V.
 - .2 Hazardous location rating.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum.
- .6 Overall covering: polyvinyl chloride material with LFS/LGE (low fire spread/low gas evolution) FT4 rating.
- .7 Fastenings:
 - .1 Mount in cable tray to 26 05 36 – Cable Trays for Electrical Systems and per contract drawings.
 - .2 As per Section 26 05 29 - Hangers and Supports.
- .8 Connectors:
 - .1 Explosion-proof approved for TECK cable in classified areas.
 - .2 Teck connectors c/w sealing ring in non-classified areas.

2.3 CONTROL & INSTRUMENTATION WIRING

- .1 Analog 4-20mA signals (installed in conduit):
 - .1 CSA, 300V control and instrumentation cable (CIC) to CAN/CSA C22. No. 239
 - .2 Twisted shielded pair #16, stranded tinned copper cable assembly. Shield consisting of 100% aluminum/polyester foil with #18 AWG drain wire.
 - .3 100% overall foil shield and drain wire for multi-pair cables.
 - .4 Standard of Acceptance: Belden 22646 or multi-pair equivalent with individually shielded pairs and overall shield.
- .2 Analog 4-20mA signals (installed in cable tray):
 - .1 CSA, 600V armored control and instrumentation cable (ACIC) to CAN/CSA C22. No. 239
 - .2 Twisted shielded pair #16, stranded tinned copper cable assembly (installed in conduit). Shield consisting of 100% aluminum/polyester foil with #18 AWG drain wire insulated with 600V rated chemically cross linked thermosetting polyethylene material rated RW90 XLPE c/w hazardous location rating, inner jacket of polyvinyl chloride material, armor of interlocking aluminum and over all covering of polyvinyl chloride material with LES/LGE (low fire spread, low gas evolution) rating.
 - .3 Standard of Acceptance: Belden 24500 or multi-pair equivalent with individually shielded pairs and overall shield.
 - .4 Connectors:
 - .1 Explosion-proof approved for TECK cable in classified areas.
 - .2 Teck connectors c/w sealing rings
- .3 24V to 120V control wiring in conduit:
 - .1 Stranded copper #14 AWG, insulation rated 600V of chemically cross-linked thermosetting polyethylene material rated RW90 XLPE.
 - .2 Installed in conduit to 26 05 34 – Conduits, Fastenings and Fittings.
- .4 24V to 120V multiconductor TECK control wiring:
 - .1 CSA TECK 90 cable to CAN/CSA-C22.2 No.131.
 - .2 Stranded copper #14 AWG insulated with 600V rated chemically cross-linked thermosetting polyethylene material rated RW90 XLPE c/w hazardous location rating, inner jacket of polyvinyl chloride material, armor of interlocking aluminum and over all covering of polyvinyl chloride material with LES/LGE (low fire spread, low gas evolution) rating.
 - .3 Standard of Acceptance: Belden C5500 or multi-conductor equivalent as indicated.
 - .4 Connectors:
 - .1 Explosion-proof approved for TECK cable in classified areas.
 - .2 Teck connectors c/w sealing rings.
- .5 Modbus TSIPC.

- .1 Low capacitance single pair, twisted shielded, #24 AWG - Belden 9841.
- .6 RS485 cables:
 - .1 2 pair, 18 AWG stranded copper, separately twisted pairs, overall 100% aluminum-polyester shield, tinned copper stranded drain wire by Belden Wire and Cable.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

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

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittals
- .2 Section 01 91 13 – Commissioning Requirements
- .3 Section 26 05 00 – Common Work Requirements Electrical.

1.2 **REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.41-13 Grounding and Bonding Equipment
- .2 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

1.3 **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.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 **PRODUCTS**

2.1 **EQUIPMENT**

- .1 Clamps for grounding of conductor: size as indicated to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.
- .3 Rod electrodes: copper clad steel 19 mm diameter by 3 m long.
- .4 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

- .5 Insulated grounding conductors: green, type RW90, rated 1kV, stranded copper conductor.
- .6 Ground bus: copper, 50mm x 6mm, complete with 25mm 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 Thermit welded type conductor connectors, as indicated.
 - .4 Bonding jumpers, straps.
 - .5 Burndy Hyground compression connectors.

PART 3 **EXECUTION**

3.1 **INSTALLATION - GENERAL**

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run insulated copper ground wire in conduit and bond EMT at both ends.
- .2 Install connectors in accordance with manufacturer's instructions. Use manufacturer's crimping tool for compression connectors.
- .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 both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Install separate ground conductor to outdoor lighting standards.
- .10 Connect building structural steel and metal siding to ground by welding copper to steel.

- .11 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 load end.
- .13 Ground secondary service pedestals.

3.2 MANHOLES

- .1 Install conveniently located grounding electrode and size 3/0 stranded copper conductor in each manhole.
- .2 Install ground rod in each manhole so that top projects through bottom of manhole. Provide with lug to which grounding connection can be made.

3.3 ELECTRODES

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.
- .3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
- .4 Install rod electrodes and make grounding connections – either cad-weld or compression type.
- .5 Bond separate, multiple electrodes together.
- .6 Use size 2/0 AWG copper conductors for connections to electrodes.
- .7 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.4 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of secondary 208 V system as required.

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 and cable trays.

3.6 GROUNDING BUS

- .1 Install copper grounding bus 50mm x 6mm around the perimeter of electrical room mounted on 25mm insulated supports on wall.
3. Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size as indicted on drawings, where not indicted use #6 AWG stranded copper.

3.7 COMMUNICATION SYSTEMS

- .1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
 - .2 Sound, fire alarm, intercommunication systems as indicated.

3.8 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 19 13 – Commissioning (Cx) Requirements.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Contract Administrator and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 **GENERAL (NOT APPLICABLE)**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittals
- .2 Section 26 05 00 – Common Work Requirements Electrical.
- .3 Section 26 05 21 – Wires and Cables 0-1000V.
- .4 Section 26 05 34 – Conduits, Fastenings and Fittings.

PART 2 **PRODUCTS**

2.1 **SUPPORT CHANNELS**

- .1 U shape aluminum channel, size 41 x 41mm, 2.5 thick, suspended or surface mounted. For use with Teck Cable, PVC conduit and rigid aluminum conduit in corrosive areas.
- .2 U shape galvanized steel channel, size 41 x 41mm, 2.5 thick, suspended or surface mounted, for use with EMT conduit, rigid galvanized steel conduit and supports for junction boxes, wall mounted VFD's and disconnects in non-corrosive areas. On cut ends of the channel apply cold enriched zinc compound until the cut has been covered.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Secure equipment to 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 with toggle bolts.
- .4 Secure surface mounted equipment to T bar ceilings with twist clip fasteners. 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 Suspended support systems.
 - .1 Provide suspended support systems where direct fastening to building structure is impractical.

- .2 Support individual cable or conduit runs with 6 mm (1/4") diameter threaded rods and spring clips.
- .3 Support 2 or more cables or conduits on channels supported by 10 mm (3/8") diameter threaded rod hangers.
- .4 Support suspended cable tray on channels supported by 10 mm (3/8") diameter threaded rod hangers.
- .5 On cut ends of the rod, apply cold enriched zinc compound until the cut end has been covered.
- .7 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support. Provide bolted baseplates for vertical supports mounted with stainless steel anchors and leveling nuts. Fill void between underside of baseplate and slab below with non-shrink grout.
- .10 Do not use wire lashing, wood blocking, plastic strap or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Contract Administrator.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .13 Deburr all ends of U channel and threaded rods. Provide rubber caps for the ends of all U channels.

END OF SECTION

PART 1 **GENERAL**

1.1 **REALTED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 26 05 00 – Common Work Results – Electrical.

1.2 **SUBMITTALS**

- .1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 – Submittal Procedures.
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 **PRODUCTS**

2.1 **BUS SPLITTERS**

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch drilled for NEMA compression lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 Bus style splitters only.

2.2 **JUNCTION AND PULL BOXES**

- .1 Welded steel construction. NEMA 12 for indoor dry locations. NEMA 4X for outdoor locations.
- .2 Hinged covers for surface mounting with quarter-turn latch.
 - .1 Screw-on covers for boxes with largest dimension less than of 200mm.
- .3 Screw-on covers with 25 mm minimum extension all around, for flush mounting.
- .4 Cast feraloy bodies c/w cast aluminum threaded covers and threaded hubs suitable for installation in Class 1, Div. 1 and Div. 2, Group 'D' locations.

2.3 **TERMINAL BOXES**

- .1 Welded steel construction. NEMA 12 for indoor dry locations. NEMA 4X for outdoor locations.
- .2 Hinged covers with quarter-turn latch and removable back plane.

- .3 Install screw-type terminal blocks on back plane.

2.4 CABINETS

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

- .1 Install splitters and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.
- .3 Provide air space with wall if mounted on exterior walls.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.
- .3 Provide air space with wall if mounted on exterior walls.
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.3 IDENTIFICATION

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

END OF SECTION

PART 1 **GENERAL**

1.1 **REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-02 Canadian Electrical Code, Part 1

1.2 **DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 **PRODUCTS**

2.1 **OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1-02.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gangboxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 **SHEET STEEL OUTLET BOXES**

- .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .3 102 mm square outlet boxes with 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 CONDUIT BOXES

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles. Suitable for installation in Class I, Div.I and Div.II Group D locations.

2.6 FITTINGS-GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 EXECUTION

3.1 INSTALLATION

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

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Specifications for the supply and installation of electrical conduits, fastenings and fittings.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittals
- .2 Section 26 05 00 – Common Work Requirements Electrical.
- .3 Section 26 05 29 – Hangers and Supports

1.3 **REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 18.3-12 Conduit, Tubing, and Cable Fittings
 - .2 CSA C22.2 No. 18.4-15 Hardware for the Support of Conduit, Tubing, and Cable
 - .3 CSA C22.2 No. 45.1-07 Electrical Rigid Metal Conduit – Steel
 - .4 CSA C22.2 No. 45.2-08 Electrical Rigid Metal Conduit – Aluminum, Red Brass, and Stainless Steel
 - .5 CSA C22.2 No. 56-13 Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .6 CSA C22.2 No. 83-M1985 Electrical Metallic Tubing
 - .7 CSA C22.2 No. 83.1-07 Electrical Metallic Tubing – Steel
 - .8 CSA C22.2 No. 85-14 Rigid PVC Boxes and Fittings
 - .9 CSA C22.2 No. 211.1-06 Rigid Types EB1 and DB2/ES2 PVC Conduit
 - .10 CSA C22.2 No. 211.2-06 Rigid PVC (Unplasticized) Conduit.
 - .11 CSA C22.2 No. 227.2.2-14 Liquid-Tight Flexible Nonmetallic Conduit
 - .12 CSA C22.2 No. 227.3-15 Mechanical Protection Tubing (MPT) and Fittings

1.4 **SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawing submittals:
 - .1 Submit manufacturer's printed product literature, specifications and datasheets.
 - .2 Submit conduit routing plans per section 3 of this specification.
- .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 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45.1, hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45.1, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2., schedule 40
- .5 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.
- .6 FRE conduit: to CSA C22.2.
- .7 Flexible braided explosion proof conduit.

2.2 CONDUIT FASTENINGS

- .1 Fasten surface mounted conduit to building construction using straps.
 - .1 One-hole straps to secure conduits 50 mm and smaller.
 - .2 Two-hole straps for conduits larger than 50 mm.
 - .3 Two-hole PVC straps for PVC conduit
 - .4 Straps shall be hot dipped galvanized for galvanized when used with rigid galvanized conduit and EMT conduit.
 - .5 Straps shall be aluminum when used with ridged aluminum conduit.
- .2 Provide galvanized steel beam clamps to secure conduit to exposed steel work.
- .3 Provide channel type supports for two or more conduits at 1.5m on center to Section 26 05 29 – Hangers and Supports.
- .4 Provide suspend channel supports as required to Section 26 05 29 – Hangers and Supports.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
 - .1 Factory "ells" where 90°, 45 ° or 22.5 ° bends are required for 25 mm and larger conduits.

- .2 Ensure conduit bends other than factory “ells” are made with an approved bender. Making offsets and other bends by cutting and rejoining 90-degree bends are not permitted.
- .3 Connectors and couplings for EMT. Steel set-screw type, size as required.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Polypropylene.

PART 3 EXECUTION

3.1 CONDUIT LAYOUT

- .1 Contract drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.
- .2 Prior to conduit installation, indicate on a set of drawings proposed conduit type, routing, and grouping. Review drawings with General Contractor and other trades to eliminate interferences. Review drawings with Engineer before proceeding with installation.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 CONDUIT KEY PLAN

- .1 Use rigid hot dipped galvanized steel threaded conduit in hazardous areas and for exposed work below 2.4m above finished floor or where otherwise subject to mechanical injury in dry locations.
- .2 Use epoxy coated threaded conduit for exposed work below 2.4m above finished floor or where otherwise subject to mechanical injury in damp, wet or corrosive locations.

- .3 Use electrical metallic tubing (EMT), except in cast concrete, for exposed work above 2.4m and not subject to mechanical injury in dry locations, as well as concealed work in hollow masonry construction.
- .4 Use Schedule 40 rigid PVC conduit in cast concrete, underground ductbanks and under concrete slab on grade unless otherwise noted on contract drawings. Also use rigid PVC for exposed work above 2.4m and not subject to mechanical injury in damp, wet or corrosive locations.
- .5 Use flexible metal conduit for connection to motors in dry areas, connection to recessed and surface mount light fixtures without a prewired outlet box.
- .6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .7 Use explosion proof flexible conduit for connection to explosion proof motors.

3.4 INSTALLATION - GENERAL

- .1 Install all conduit, conduit fittings and accessories in accordance with the Ontario Electrical Safety Code (OESC) in a manner that does not alter, change or violate any part of the installed system components or the CSA/UL certification of these components.
- .2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .3 Conceal conduits unless otherwise noted.
- .4 Surface mounted conduit in unfinished areas, electrical and mechanical service rooms, industrial process areas, service garages or otherwise noted on contract drawings.
- .5 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .6 Minimum conduit size for lighting and power circuits: 19mm. 12mm conduit is acceptable for switch leg drops only where one two-wire circuit and ground is required.
- .7 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .8 Mechanically bend steel conduit over 19mm diameter.
- .9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .10 Install fish cord in empty conduits.
- .11 Run 2 - 25mm spare conduits up to ceiling space and 2 - 25mm spare conduits down to ceiling space from each flush mounted panel. Terminate these conduits

in 152 x 152 x 102mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete type box.

- .12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.

3.5 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters within 1.5m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on surface mount or suspended channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75mm parallel to steam or hot water lines. Cross at right angles with minimum of 25mm clearance at crossovers.
- .7 Do not enter conduit at tops of disconnect switches, terminal boxes, junction boxes, splice boxes or control panels. Boxes with penetrations placed in the top shall be replaced at no cost to the contract.

3.6 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.

3.7 CONDUITS IN CAST IN PLACE CONCRETE SLABS ON GRADE.

- .1 Do not run conduit horizontally within concrete slabs, except as otherwise detailed in drawings.
- .2 Horizontal conduit to run beneath slab with minimum 75mm cover between top of conduit and underside of concrete slab.
- .3 Conduit to stub up vertically and perpendicular to concrete slab. Protect conduits from damage where they stub out of concrete slab.
- .4 Install conduit prior to slab installation. Locate to suit reinforcing steel.

3.8 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.

- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.9 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On Completion and verification of performance of installation, remove surplus materials, excess materials rubbish, tools and equipment.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .2 Section 26 05 00 – Common Work Requirements Electrical.

PART 2 **PRODUCTS**

2.1 **MARKER TAPE**

- .1 Red warning tape with “Caution Buried Electric Line Below” or equivalent caution message.
- .2 Aluminum foil backed. Detectable with non-ferrous metal detector.

PART 3 **EXECUTION**

3.1 **DIRECT BURIAL OF CABLES**

- .1 Direct burial of cables is not permitted unless specifically detailed in contract drawings.
- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run maintaining minimum cable separation and bending radius requirements.
- .3 Leave minimum 0.6m of surplus cable in each direction at terminations and splices.
- .4 Direct buried cable shall not be spliced unless specifically detailed in contract drawings.
 - .1 Underground Splices shall be made within approved underground handhole/pedestals to allow for future access suitable mechanical protection.
 - .2 Make splices and terminations in accordance with manufacturer’s instructions using approved splicing kits.
- .5 Maintain minimum bending radius per OESC and manufacturer requirements.
- .6 Cable separation:
 - .1 Refer to contract drawings for minimum separations between cables installed in a common trench.
 - .2 Maintain minimum 75 mm separation between cables of different circuits.
 - .3 Maintain 300 mm separation between low and high voltage cables.

- .4 When low voltage cable cross high voltage cables, maintain 300 mm vertical separation with low voltage cables in upper position.
- .5 Maintain 75 mm vertical separation where low voltage cables cross each other.
- .6 Maintain 150 mm vertical separation where high voltage cables cross each other.
- .7 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 the upper position.

3.2 CABLE INSTALLATION IN UNDERGROUND DUCTS

- .1 Install underground duct bank per contract drawings. Underground duct bank shall be completely installed between end points prior to pulling in cables.
- .2 Do not pull spliced cables inside of ducts.
- .3 Install multiple cables simultaneously.
- .4 Use CSA approved lubricants with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor 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 cable with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with sealing compound.

3.3 MARKING

- .1 Install continuous marking tape along the length of the buried conduit/cable installation.
- .2 Marker tape to be buried approximately half-way between top of conduit and final grade along the centerline of the underground duct bank.

3.4 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.

- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests:
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests:
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour and conductors not under test.
 - .1 High Potential (Hipot) Testing.
 - .1 Conduct hipot testing of original factory test voltage in accordance with manufacturer's recommendations.
 - .2 Leakage Current Testing.
 - .1 Raise voltage in steps from zero to maximum values as specified by ICEA manufacturer for type of cable being tested.
 - .2 Hold maximum voltage for specified time period by ICEA manufacturer.
 - .3 Record leakage current at each step.
- .7 Provide Engineer 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.

END OF SECTION

PART 1 **General**

1.1 **SECTION INCLUDES**

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .3 Section 06 10 00 - Rough Carpentry.
- .4 Section 26 05 00 – Common Work Results - Electrical.
- .5 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.3 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 **SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittals.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

PART 2 **Products**

2.1 **PANELBOARDS**

- .1 Panelboards: to CSA C22.2 No.29 and product of one 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 10,000 and 25,000 A (symmetrical) minimum interrupting capacity respectively or as indicated on electrical drawings.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Tin plated copper bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked grey enamel.

2.2 CUSTOM BUILT PANELBOARD ASSEMBLIES

- .1 125 mm relay section on one or both sides of panels as indicated for installation of low voltage remote control switching components.
- .2 Double stack panels as indicated.
- .3 Contactors in mains as indicated.
- .4 Feed through lugs as indicated.

2.3 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 installed as indicated. Turn over unused lock-on devices to Departmental Representative.
- .5 Lock-on devices for receptacles, fire alarm clock outlet, emergency, door supervisory, intercom, stairway, exit and night light circuits as indicated.

2.4 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.5 ACCEPTABLE MANUFACTURERS

- .1 Square D (Schneider).
- .2 Cutler Hammer (Eaton).
- .3 Siemens.

PART 3 Execution

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 – Common Work Results - Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 91 13 - General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 - Common Work Results – Electrical.
- .4 Section 26 24 02 – Service Entrance Board
- .5 Section 26 24 17 – Panelboards Breaker Type

1.2 **SUBMITTALS**

- .1 Submit product data in accordance with Section 01 33 00 – Submittals.
- .2 Include time-current characteristic curves for all breakers.

PART 2 **PRODUCTS**

2.1 **BREAKERS GENERAL**

- .1 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 Provide electronic trip units for all breakers sized 100 amps and upwards.

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:
 - .1 inverse time current tripping under overload condition, and
 - .2 instantaneous tripping for short circuit protection.

2.3 **SOLID STATE TRIP BREAKERS DESIGN C**

- .1 Moulded case circuit breaker to operate by means of a solid-state trip unit with associated current monitors and self-powered shunt trip to provide:

- .1 inverse time current trip under overload condition, and
- .2 long-time, short-time, and instantaneous tripping for phase and ground fault short circuit protection.

2.4 OPTIONAL FEATURES

- .1 Include:
 - .1 on-off locking device.
 - .2 handle mechanism.
 - .3 shunt trip as indicated.
 - .4 auxiliary switch as indicated.
 - .5 motor-operated mechanism c/w time delay unit as indicated.
 - .6 under-voltage release as indicated.

2.5 ENCLOSURE

- .1 Mounted in NEMA 1A type enclosure, sprinkler proof as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install circuit breakers as indicated.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 – Common Work Results for Electrical.
- .4 Section 26 28 13 – Fuses – Low Voltage.

1.2 **REFERENCE STANDARDS**

- .1 CSA-C22.2 No.4, Enclosed and Dead-Front Switches.
- .2 CSA C22.2 No.39, Fuseholder Assemblies.

1.3 **SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data and dimensions.

PART 2 **PRODUCTS**

2.1 **DISCONNECT SWITCHES**

- .1 Fusible and non-fusible disconnect switches shall be sized as indicated on drawings and enclosed in:
 - .1 NEMA 12 enclosures in indoor, non-hazardous, dry locations.
 - .2 NEMA 7 enclosures in hazardous areas, or
 - .3 NEMA 4X enclosures unless indicated otherwise.
- .2 Service entrance type where required.
- .3 Flange mounted, visible blade c/w viewing window.
- .4 Provision for padlocking in on-off switch position by three locks.
- .5 Mechanically interlocked door to prevent opening when handle in ON position.
- .6 Fuses: type and size as indicated, to Section 26 28 13.01 - Fuses - Low Voltage.
- .7 Fuse-holders: suitable without adaptors, for type and size of fuse indicated.
- .8 Quick-make, quick-break action.

- .9 ON-OFF switch position indication on switch enclosure cover.
- .10 Manufacturer:
 - .1 Use products of a single manufacturer throughout project.
 - .2 Acceptable Manufacturers:
 - .1 Square 'D' Heavy Duty
 - .2 Siemens Heavy Duty
 - .3 Eaton / Cutler Hammer Heavy Duty.

2.2 PLUG/RECEPTACLE SWITCHES

- .1 Decontactor series, HP rated to suit load.
- .2 Padlockable in OFF position.
- .3 Decontactor to include 3 pilot contacts for motor temperature and moisture protection wiring. Also required for pumps with motor leads and pump protection wiring in same cable.
- .4 Manufacturer: Meltric "Decontactor" series switch rated plugs and receptacles.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses as indicated.
- .2 Ensure all wiring enters/exits the sides or bottom. (Do not enter top of unit).
- .3 Ensure line and load conductors enter/exit the disconnect switch in separate conduits.
- .4 Ensure line and load side conductors do not come into contact with or cross each other inside the disconnect switch.
- .5 Install SS drip hoods over all disconnects installed in sprinklered areas and outdoors.

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Materials and installation for industrial control devices including pushbutton stations, local control panels, and relay panels.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 26 05 00 – Common Work Results - Electrical

1.3 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.14, Industrial Control Equipment.
- .2 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA ICS 1, Industrial Control and Systems: General Requirements.

1.4 **SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittals Procedures.
 - .1 Include schematic, wiring, and interconnection diagrams.

1.5 **QUALITY ASSURANCE**

- .1 Submit to Owner's Representative one copy of test results.

PART 2 **PRODUCTS**

2.1 **AC CONTROL RELAYS**

- .1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.
- .2 Sealed contact type: electrically held with 2 DDT contacts and indicating light.
 - .1 Coil rating: 120Vac, 5VA.
 - .2 Contact rating: 120V, 10A.
- .3 Socket bases and DIN rail mounting.

2.2 **RELAY ACCESSORIES**

- .1 Standard contact cartridges: normally-open, convertible to normally-closed in field.

2.3 OILTIGHT LIMIT SWITCHES

- .1 Snap action type: roller rod or fork lever, top, side, push or wobble stick actuator, CSA type 1 enclosure. Contact rating as indicated.
- .2 Surface mounted.
- .3 Standard contact block.

2.4 SEALED CONTACT OILTIGHT LIMIT SWITCHES

- .1 Lever type switches: roller fork or rod operated, single or double pole, double throw. Contact rating: as indicated.
- .2 Push type switches: actuated by rod or plunger located on side of operating head, spring return single pole, throw. Contact rating: as indicated.
- .3 Wobble stick cat whisker type switches: actuated by rod or stick extending from tip of operating head. Moving rod in any direction operates contacts. Single pole, double throw. Contact rating: as indicated.
- .4 Lever operated: time delay switch: adjustable time delay from 1/2s to 15s plus 25%. Contact rating: as indicated.
- .5 Plug-in construction switches: CSA Type 4, two or four circuit, lever push or wobble stick type, contact rating: as indicated.

2.5 SOLID STATE TIMING RELAYS

- .1 Construction: AC operated electronic timing relay with solid-state timing circuit to operate output contact. Timing circuit and output contact completely encapsulated to protect against vibration, humidity and atmospheric contaminants.
- .2 Operation: on-delay or off-delay.
- .3 Potentiometer: self contained to provide time interval adjustment.
- .4 Supply voltage: 120VAC or 24 VAC, 60 Hz, as indicated.
- .5 Temperature range: -20 degrees C to +60 degrees C.
- .6 Output contact rating: maximum voltage 300 V AC or DC. Current: NEMA ICS 1 as indicated.
- .7 Timing ranges: minimum 0.5 maximum 60s.

2.6 INSTANTANEOUS TRIP CURRENT RELAYS

- .1 Enclosure: CSA Type 1.
- .2 Contacts: NO, NC automatic reset with adjustable tripping point.

- .3 Control: 3 wire, with provision for shorting contacts during accelerating period of motor.

- .4 Contact rating: NEMA ICS 1 as indicated.

2.7 OPERATOR CONTROL STATIONS

- .1 Enclosure: CSA Type 12 enclosure, surface mounting.
- .2 Wiring: tin-plated copper stranded conductors, 19 strands minimum, thermosetting type insulation.

2.8 PUSHBUTTONS

- .1 Momentary contact type: Heavy duty – oil tight, operator flush type, 30mm diameter, colour as indicated, 1-NO and 1-NC contacts rated 10A at 120VAC, labels as indicated.
- .2 Push-pull contact type: Heavy duty – oil tight, operator mushroom head type, 30mm diameter, red colour, provision for padlocking in “OFF” position, 2-NO and 2-NC contacts rated 10A at 120VAC, labels as indicated.

2.9 SELECTOR SWITCHES

- .1 Maintained contact type: 2 or 3 positions (as indicated), heavy duty – oil tight, operator’s standard knob, 30mm diameter, contact arrangement as indicated rated 10A at 120V AC, labels as indicated.
- .2 Rotary potentiometer type: heavy duty, oil tight, operator’s standard knob, 30mm diameter, label as indicated.
 - .1 Coordinate power requirements with device being wired to.

2.10 INDICATING LIGHTS

- .1 Heavy duty – oil tight, LED cluster Push-To-Test type, 30mm diameter, lens colour: as indicated, supply voltage: 120VAC, labels as indicated.

2.11 LOCAL CONTROL AND RELAY PANELS

- .1 NEMA 4X stainless steel enclosure. Surface mount with hinged padlockable access door, accommodating relays, timers, labels, as indicated.
- .2 Provide identified terminals for field wiring termination.
- .3 Wiring: tin-plated copper stranded conductors, 19 strands minimum, thermosetting type insulation.
 - .1 Crimped ferrules on all wires terminating on terminal blocks
 - .2 Digital control wiring: type REW wire, irradiated (cross-linked) PVC insulation.

- .3 Analog control wire: type CIC wire, XLPE insulation, twisted-shielded pair/triad as required.
- .4 Anti-condensation heater c/w thermostat control and insulated enclosure for outdoor locations.
- .5 Factory assembled by CSA certified panel shop.

2.12 CONTROL CIRCUIT TRANSFORMERS

- .1 Single phase, dry type.
- .2 Primary: 208, 240 or 600 V, 60 Hz ac.
- .3 Secondary: 120 V, or 24V ac.
- .4 Rating: 50, 150, 250, 350 or 500 VA, as indicated, oversized by 100VA.
- .5 Secondary fuse: size as required.
- .6 Close voltage regulation as required by magnet coils and solenoid valves.

2.13 THERMOSTAT (LINE VOLTAGE)

- .1 Wall mounted, for exhaust fan control.
- .2 Full load rating: Amps as indicated at 120 V.
- .3 Temperature setting range: 10 degrees C to 30 degrees C.
- .4 Thermometer Range: 10 degrees C to 30 degrees C.
- .5 Markings in 5 degrees increments.
- .6 Differential temperature fixed at 20 degrees C.
- .7 Standard of Acceptance: Crouse-Hinds Eaton HRC Thermostat with Honeywell Control Model HRC85.

2.14 MOTION DETECTOR (HMS-1)

- .1 CSA Approved, Explosion Proof
- .2 Motion Detection
- .3 Tilt Angles: -90° to +30° in elevation
- .4 Output Hold Time: 0.5 s to 15 min (Adjustable)
- .5 Standard of Acceptance: Larson Electronics Part # EXP-MS-N4X-AT-HV

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Install pushbutton stations, control and relay panels, control devices as indicated.

3.2 **FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Electrical General Requirements.
- .2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at a time and check out operation of section.
- .3 Upon completion of sectional test, undertake group testing.
- .4 Check out complete system for operational sequencing.
- .5 Submit to Engineer one copy of test results.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 – Common Work Results - Electrical.
- .4 Section 26 24 19 – Motor Control Center
- .5 Section 26 29 03 – Control Devices.

1.2 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C22.2 No.14, Industrial Control Equipment
- .2 National Electrical Manufacturer's Association (NEMA)
 - .1 NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors and Overload Relays Rated 600 Volts

1.3 **SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawing Submittals:
 - .1 Submit to engineer for approval for each type of starter provided.
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout of identified internal and front panel components.
 - .4 Enclosure types.
 - .5 Wiring diagram for each starter.
 - .6 Interconnection diagrams.
 - .2 For factory manufactured motor starters, submit shop drawings from a manufacturer certified by CSA, IEC or CUL.
 - .3 For custom/built assembled motor starters/control panels, submit shop drawings and control diagrams from a CSA certified Control Panel Supplier.

1.4 **CLOSEOUT SUBMITTALS**

- .1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Include operation and maintenance data for each type and style of starter.

1.5 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 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.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Starters to NEMA/EEMAC 1CS2 and CSA C22.2 No.14.
- .2 Minimum starter size: Size 1.

2.2 MANUAL MOTOR STARTERS

- .1 Single and Three phase manual motor starters with components as follows:
 - .1 Switching mechanism, quick make and break.
 - .2 One and Three overload heaters, as indicated, manual reset, trip indicating handle.
- .2 Accessories:
 - .1 Toggle switch or pushbutton: heavy duty labelled as indicated.
 - .2 Indicating light: heavy duty type and colour as indicated.
 - .3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE NON-REVERSING 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 electronic 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 oil resistant permanent number marking identical to diagram.

- .2 Combination type starters to include motor circuit protector with flange mounted operating lever on outside of enclosure to control motor circuit protector, 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.

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 Electronic overload relays, manually reset on door.
- .2 Accessories:
 - .1 Pushbuttons and selector switches: heavy duty, oil tight, labelled as indicated.
 - .2 Indicating lights: heavy duty, oil tight type, LED 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 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 reconnectable winding for consequent pole type motors.
 - .3 Electronic overload relays and manual reset for each speed on door.
- .2 Accessories:
 - .1 Pushbuttons and 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 Automatic sequence 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 Electronic overload protection of auto-transformers.
- .2 Accessories:
 - .1 Pushbuttons and selector switches: heavy duty, oil tight, labelled as indicated.
 - .2 Indicating lights: heavy duty, oil tight type, LED type and color as indicated.
 - .3 Auxiliary control devices as indicated.

2.7 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 reset electronic overload relays.
 - .6 Reduced voltage star-delta closed transition starter, of size, type, rating and enclosure type as indicated, with components as follows:
 - .7 Two-3 pole delta contactors with auxiliary relays and interlocks.
 - .8 One-3 pole star contactor with auxiliary relay and interlocks.
 - .9 One-3 pole transition contactor.
 - .10 One set of transition resistors.
 - .11 Mechanical interlock, to interlock one delta contactor and the star contactor.
 - .12 One timing relay.
 - .13 Three pole manual reset electronic overload relays.
- .2 Accessories:
 - .1 Pushbuttons and selector switches: heavy duty, oil tight, labelled as indicated.
 - .2 Indicating lights: heavy duty, oil tight type, LED 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 reset electronic overload relays.

- .4 Three step reduced voltage part winding starter of size, type, rating and enclosure type as indicated, with components as follows:
 - .5 Three-3 pole contactors.
 - .6 One set starting resistors.
 - .7 Six manual reset electronic overload relays.
- .2 Accessories:
 - .1 Pushbuttons and selector switches: heavy duty, oil tight, labelled as indicated.
 - .2 Indicating lights: heavy duty, oil tight type, LED 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 and selector switches: heavy duty, oil tight, labelled as indicated.
 - .2 Indicating lights: heavy duty, oil tight type and color 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 and selector switches: heavy duty, oil tight, labelled as indicated.
 - .2 Indicating lights: heavy duty, oil tight type and color 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 as required.
 - .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 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 Pushbuttons and 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.

2.13 CONTROL TRANSFORMER

- .1 Single phase, dry type, control transformer with primary voltage as indicated and 24 or 120 V secondary, complete with secondary fuse, installed in with starter as indicated.
- .2 Size control transformer for control circuit load plus 100VA spare capacity.

2.14 ENCLOSURE

- .1 Welded steel enclosure with hinged front cover suitable for surface mounting.
 - .1 NEMA 12 enclosures in indoor, non-hazardous, dry locations.
 - .2 NEMA 7 enclosures in hazardous areas, or
 - .3 NEMA 4X stainless steel enclosures unless indicated otherwise.
- .2 Oversized enclosure with DIN rail space and unused terminal blocks where pump protection relays or additional control relays are required as indicated on contract drawings.
- .3 Apply finishes to enclosure in accordance with Section 26 05 00 – Common Work Results - Electrical.

2.15 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - 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 2 engraved as indicated.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Install starters, connect power and control as indicated.
- .2 Ensure correct fuses and electronic overload devices set correctly.
- .3 Confirm motor nameplate and adjust overload device settings to suit.
- .4 Ensure all wiring enters/exits the sides or bottom of starter. (Do not enter top of unit.).
- .5 Ensure line and load conductors enter/exit the disconnect switch in separate conduits.
- .6 Ensure line and load side conductors do not come into contact with or cross each other inside the starter enclosure.

3.2 **FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical, manufacturer's instructions and Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Operate switches, 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.

END OF SECTION

PART 1 **GENERAL**

1.1 **SCOPE OF WORK**

- .1 Testing and commissioning are called for throughout the individual specifications. This does not relieve this trade from providing all testing and commissioning necessary to ensure that systems and equipment operate as required and that they interface with other systems and equipment as required.

1.2 **SECTION INCLUDES**

- .1 Commissioning of all building electrical systems and component including:
 - .1 Testing and adjustment.
 - .2 Demonstrations and Training.
 - .3 Instructions of all procedures for Owner's personnel.
 - .4 Updating as-built data.
 - .5 Co-ordination of Operation and Maintenance material.

1.3 **RELATED SECTION**

- .1 Section 01 77 00 – Closeout Procedures.
- .2 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 – Common Work Results - Electrical.

1.4 **REFERENCES**

- .1 CSA (Canadian Standards Association).
- .2 Underwriters Laboratories of Canada.

1.5 **QUALITY ASSURANCE**

- .1 Provide qualified trades persons, certified testing agencies, factory trained and approved by the Commissioning Team Leader.
- .2 Submit the names of all personnel to be used during the Commissioning activities for Owner Approval.

1.6 **COMMISSIONING**

- .1 The purpose of the commissioning process is to fully test all building systems including architectural, mechanical and electrical components and operating procedures by challenging these systems to realistic operation conditions.
- .2 The Commissioning activities shall be coordinated by the General Contractor.

- .3 Commissioning activities for the electrical systems must have available up to date as-built drawing information and accurate Operations and Maintenance Manuals. These documents shall be a major part of this activity.
- .4 Contractor shall be responsible to update all documentation with information and any changes noted during the Commissioning exercise.
- .5 Contractor shall arrange for all outside suppliers, equipment manufacturers, test agencies and others as identified in the commissioning sections of this specification. The cost associated with this requirement shall be included as part of the tender price.

1.7 SUBMITTALS

- .1 A commissioning document shall be prepared by the Owner's Representative prior to conducting these activities for use by the Commissioning Team.
- .2 The electrical sub-contractor shall be responsible for ensuring all activities are properly documented in this manual and coordinated through the General Contractor.
- .3 As-built drawings and data books must be available two weeks prior to commissioning for review and use by the consultant and Commissioning Team prior to the start of the commissioning activities.

1.8 PREPARATION

- .1 Provide test instruments required for all activities as defined in the commissioning documents.
- .2 Verify all systems are in compliance with the requirements of the commissioning documents prior to the pre-commissioning check out operation.
- .3 Confirm all scheduled activities have identified personnel available.
- .4 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.9 SYSTEM DESCRIPTION

- .1 Perform all start-up operations, control adjustment, trouble shooting, servicing and maintenance of each item of equipment as defined in the commissioning documentation.
- .2 Owner will provide list of personnel to receive instructions and will co-ordinate their attendance at agreed upon times.
- .3 Prepare and insert additional data in the operations and maintenance manuals and update as-built drawings when need for additional data becomes apparent during the commissioning exercise.

- .4 Where instruction is specified in the commissioning manual, instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .5 Conduct presentation on Owner's premises. Owner will provide space.

1.10 FINAL REPORT

- .1 This trade shall assemble all testing data and commissioning reports and submit them to the Owner.
- .2 Each form shall bear signature of recorder, and that of supervisor of reporting organizer.

1.11 SCHEDULE OF ACTIVITIES

- .1 Commissioning activities shall be conducted based on pre-established schedule with all members of the commissioning team, refer to Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 In addition, there will be two meetings held through the contract duration to introduce the parties of the commissioning team, establish the schedules and deadlines for the various activities and review the Commissioning Manual.
- .3 Adhering to the established schedule is very important as the co-ordination and scheduling of the participants will be difficult to alter once this is established. Close co-ordination of this schedule is important.
- .4 In the event project cannot be commissioned in the allotted time slot, the contractor shall pay for all costs associated with assembling the Commissioning Team at a later date. If the contractor has not performed his duties to reach commissioning stage as outlined earlier, he will incur all expenses of other trades and the Commissioning Team due to his non-compliance.

END OF SECTION

PART 1 **GENERAL**

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END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 31 23 33 – Excavating, Trenching and Backfilling.
- .3 Section 32 11 16 – Granular Sub-Base
- .4 Section 32 11 23 – Aggregate Base Courses.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International).
 - .1 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .2 Ontario Provincial Standard Specifications (OPSS):
 - .1 OPSS MUNI 1002 – Material Specification for Aggregates – Concrete
 - .2 OPSS MUNI 1004 – Material Specification for Aggregates – Miscellaneous
 - .3 OPSS MUNI 1010 – Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material

1.3 SOURCE QUALITY CONTROL

- .1 Source of materials to be incorporated into work or stockpiles requires approval.
- .2 Inform Contract Administrator and Owner of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.
- .3 If, in opinion of Contract Administrator and Owner, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .4 Should a change of material source be proposed, advise Contract Administrator and Owner 4 weeks in advance of proposed change to allow sampling and testing.
- .5 Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if its field performance is found to be satisfactory.

1.4 SAMPLES

- .1 Aggregate will be subject to continual sampling by Contract Administrator and Owner during production.
- .2 Provide Contract Administrator and Owner with access to source and processed material for sampling and testing.
- .3 Bear the cost of sampling and testing of aggregates which fail to meet specified requirements.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed five times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Natural sand.
 - .2 Manufactured sand.
 - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock or slag.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
- .5 Granular 'A' to OPSS MUNI 1010.
- .6 Granular 'B' top OPSS MUNI 1010.
- .7 19mm Clear Stone and Rip Rap to OPSS MUNI 1004.

PART 3 EXECUTION

3.1 DEVELOPMENT OF AGGREGATE SOURCE

- .1 Contractor to produce aggregates off site.
- .2 Contractor to develop aggregate source to prevent contamination of aggregates stockpiled.

3.2 PROCESSING

- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Contract Administrator and Owner.
- .3 Wash aggregates, if required to meet specifications. Use only equipment approved by Contract Administrator and Owner.
- .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

3.3 HANDLING

- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

3.4 STOCKPILING

- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Contract Administrator and Owner. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Contract Administrator and Owner within two (2) working days of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Max 1.0 m for coarse aggregate and base course materials.
 - .2 Max 2.0 m for fine aggregate and sub-base materials.
 - .3 Max 1.5 m for other materials.
- .8 Complete each layer over entire stockpile area before beginning next layer.
- .9 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .10 Do not cone piles or spill material over edges of piles.
- .11 Do not use conveying stackers.
- .12 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.5 CLEANING

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Contract Administrator and Owner.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 31 05 16 – Aggregate Materials.

1.2 **REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB).
 - .1 CA/CGSB-8.2, Sieves, Testing, Woven Wire, Metric
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4 Ontario Provincial Standard Specifications (OPSS) and Drawings (OPSD)
- .5 Geotechnical Investigation, prepared by St. Lawrence Testing & Inspection Co. Ltd., and dated December 31, 2022.

1.3 **DEFINITIONS**

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 2 m³. Frozen material not classified as rock. There shall be no compensation for boulder removal for boulders which can be removed by mechanical means with a 1.95 m³ bucket.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

- .2 Unclassified excavation: excavation of deposits of whatever character encountered in work.
- .3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .6 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

<u>Sieve Designation</u>	<u>%Passing</u>
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45
 - .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
- .7 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum Portland cement content of 25 kg/m³.
 - .3 Minimum strength of 0.07 MPa at 24 h.
 - .4 Concrete aggregates: to CSA-A23.1/A23.2,
 - .5 Cement: to CSA A3000, Type GU.
 - .6 Slump: 160 to 200 mm.

1.4 SUBMITTALS

- .1 Inform Contract Administrator and Owner at least 4 weeks prior to commencing work, of proposed source of fill materials and provide access for sampling.
- .2 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
- .3 Ship samples as directed by Contract Administrator and Owner in tightly closed containers to prevent contamination.

1.5 QUALITY ASSURANCE

- .1 Submit design and supporting data at least 2 weeks prior to commencing work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the Province of Ontario.

- .3 Keep design and supporting data on site.
- .4 Do not use soil material until written report of soil test results are reviewed and approved by Contract Administrator and Owner.

1.6 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to commencing excavation work, notify applicable Owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
 - .6 Confirm locations of buried utilities by careful test excavations.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of Contract Administrator and Owner before removing or re-routing.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
 - .1 Conduct, with Contract Administrator and Owner condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.
 - .2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Contract Administrator and Owner.
 - .3 Where required for excavation, cut roots or branches as approved by Contract Administrator and Owner.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Type 1 fill: Granular 'A' as per OPSS 1010 and Section 31 05 16 - Aggregate Materials.
- .2 Type 2 fill: Granular 'B' Type II as per OPSS.MUNI 1010 and Section 31 05 16 – Aggregate Materials.
- .3 Type 3 fill: select subgrade material as per OPSS.MUNI 1010 from excavation or other sources, approved by Contract Administrator and Owner for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

- .4 Geotextile: Type II Non-woven as per OPSS 1860.
- .5 Clear stone and Rip Rap per OPSS.MUNI 1004.
- .6 Sand: Mortar sand or uniformly graded sand as per OPSS 1004.

PART 3 **EXECUTION**

3.1 **SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 **PREPARATION/PROTECTION**

- .1 Keep excavations clean, free of standing water, and loose soil.
- .2 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Contract Administrator and Owner's approval.
- .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage. Protect buried services that are required to remain undisturbed.
- .4 Protect buried services that are required to remain undisturbed.

3.3 **EROSION AND SEDIMENT CONTROL**

- .1 As per the requirements of Specification 31 32 25.

3.4 **STRIPPING OF TOPSOIL**

- .1 Commence topsoil stripping of areas as indicated by Contract Administrator and Owner after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as indicated by Contract Administrator and Owner. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Contract Administrator and Owner. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil off-site or as directed by Contract Administrator and Owner.

3.5 **STOCKPILING**

- .1 Stockpile fill materials in areas designated by Contract Administrator and Owner. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

3.6 **COFFERDAMS, SHORING, BRACING AND UNDERPINNING**

- .1 Maintain side and slopes of excavations in safe condition by appropriate methods and in accordance with Occupational Health and Safety Act for the Province of Ontario.

- .2 Design and construct temporary works to depths, heights and locations as required for new work.
- .3 During backfill operation:
 - .1 Unless otherwise as indicated or as directed by Contract Administrator and Owner remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.
- .4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .5 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site as indicated and as directed from Contract Administrator and Owner.

3.7 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while work is in progress.
- .2 Submit for Contract Administrator and Owner's review details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or any portion of work completed or under construction.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas. Maximum allowable concentration of suspended solids in discharge shall be 25 mg/L TSS.

3.8 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated by Contract Administrator and Owner.
- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation. Dispose of material off site.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

- .5 For trench excavation, unless otherwise authorized by Contract Administrator and Owner in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .6 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Contract Administrator and Owner.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify Contract Administrator and Owner when bottom of excavation is reached.
- .12 Obtain Contract Administrator and Owner approval of completed excavation.
- .13 Remove unsuitable material from trench bottom to extent and depth as directed by Contract Administrator and Owner.
- .14 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected maximum dry density.
- .15 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Contract Administrator and Owner.
- .16 Division 31 will complete all required trenching and backfilling required for work of Division 20, 26 and 44.
- .17 Remove a minimum of 150mm of existing granulars in the existing parking lot, and backfill with granular 'B' compacted to 100% SPMDD, or greater as required to achieve design subgrade elevation.

3.9 FILL TYPES AND COMPACTION

- .1 Use fill of types as indicated or specified below. Compaction densities are percentages of Standard Proctor Maximum Dry Densities (SPMDD) obtained from ASTM D698.
 - .1 Slabs-on-grade:
 - .1 Type 2 fill, thickness as required to raise the floor subgrade, compacted to minimum 98% SPMDD, in maximum 300 mm thick lifts.
 - .2 Type 1 fill to underside of slab, minimum compacted thickness of 150 mm, compacted to minimum 98% SPMDD, in maximum 300 mm thick lifts.
 - .2 Footings founded on structural fill:
 - .1 Type 2 fill placed over undisturbed native soil, thickness as required to achieve design footing subgrade elevation (minimum compacted

- thickness of 200 mm), compacted to minimum 100% SPMDD, in maximum 300 mm thick lifts.
- .2 Type 1 fill to underside of footing, minimum compacted thickness of 150 mm, compacted to minimum of 100% SPMDD, in maximum 300 mm thick lifts.
- .3 Exterior side of perimeter walls:
 - .1 Type 2 fill for 1.0m beyond face of foundation wall, thickness as required to reach subgrade level, compacted to 95% SPMDD.
 - .2 Type 3 fill for other areas, thickness as required to reach subgrade level, compacted to 95% SPMDD.
- .4 Subgrade:
 - .1 Compact existing subgrade under walkways, paving, and sidewalks to same compaction as fill above.
- .5 Under grassed areas:
 - .1 Type 3 fill, thickness as required to reach underside of topsoil, compacted to 95% SPMDD.
- .6 To correct over excavation in trenches:
 - .1 Type 2 fill to underside of Granular "A" bedding, compacted to 95% SPMDD.

3.10 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

3.11 BACKFILLING

- .1 Vibratory compaction equipment: approved by Contract Administrator and Owner.
- .2 Do not proceed with backfilling operations until Contract Administrator and Owner has inspected and approved installations.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfill around installations.
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 600 mm.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures.
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure, and approval obtained from Contract Administrator and Owner, or

- .2 If approved by Contract Administrator and Owner, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Contract Administrator and Owner.
- .7 Division 31 will perform required excavation, trenching and backfilling required for all Divisions. General Contractor to coordinate details of all Divisions to determine the extent of work to be provided.

3.12 RESTORATION

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Contract Administrator and Owner.
- .2 Replace topsoil as indicated by Contract Administrator and Owner.
- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavement and sidewalks distributed by excavation to thickness, structure, and elevation which existed before excavation.
- .5 Clean and reinstall areas affected by work as directed by Contract Administrator and Owner.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 h.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash and debris.
- .8 Dispose of surplus material and material unsuitable for fill grading or landscaping off site.

3.13 FIELD QUALITY CONTROL

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Owner.
- .2 Do not begin backfilling or filling operations until material has been approved for use by Contract Administrator and Owner.
- .3 Not later than 48 hours before backfilling or filling with approved material, notify Contract Administrator and Owner to allow compaction tests to be carried out by testing agency designated by Owner.

END OF SECTION

PART 1 **GENERAL**

1.1 **OBJECTIVES**

- .1 Prevent the loss of soil from construction site resulting from storm water runoff, wind erosion and construction activities.
- .2 Prevent the sedimentation of storm sewers and receiving waters.
- .3 Prevent air pollution caused by dust and particulate matter.

1.2 **DESCRIPTION OF WORK**

- .1 Implement the Erosion and Sedimentation Control (ESC) measures shown on the project drawings and described in these specifications.
- .2 Install ESC products in accordance with contract drawings.
- .3 Inspect ESC measures on a weekly basis and following all significant storm events. If deficiencies are found, make repairs within 24 hours of detection.
- .4 Maintain an ESC inspection log to document observations, deficiencies and corrective actions.

1.3 **REFERENCES**

- .1 U.S. Environmental Protection Agency, Office of Water. "Chapter 3: Sediment and Erosion Control" and Chapter 4: Other Controls". Document No. EPA 832-R-92-005 Storm Water Management for Construction Activities.

1.4 **SUBMITTALS**

- .1 Inspection Checklist – Schedule A
 - .1 Prepare the checklist to include all measures shown on the drawings and described in the specifications.
 - .2 Complete a new checklist with each inspection and keep completed checklists with the weekly inspection log documentation.
- .2 Weekly Inspection Log – Schedule B
 - .1 Complete the log on a weekly basis and keep all documentation on-site and available for review by the Contract Administrator and Owner.
 - .2 The inspection log shall be completed for each inspection, and must document deficiencies for all measures indicated as "Not OK" on the inspection ckecklist.
 - .3 Each deficiency must be initialled and each log signed, only after all corrective measures have been completed and documented.
 - .4 Submit all ESC documentation (e.g.: inspection checklists and inspection log) to the Contract Administrator and Owner after final landscaping is completely installed.
- .3 Photographs:

- .1 A minimum of three (3) digital photographs shall be taken (from various viewpoints) of each ESC measure implemented on-site immediately following installation.
- .2 A minimum of three (3) digital photographs shall be taken (from various viewpoints) of ESC measure implemented on-site at the end of construction or prior to dismantling, whichever comes first.
- .3 Submit all digital photographs to Contract Administrator and Owner for documentation within seven (7) days of being taken.

PART 2 PRODUCTS**2.1 MATERIALS**

- .1 Geotextile: Type II Non-woven as per OPSS 1860
- .2 Straw Bales and Silt Fencing as per OPSD 219.180 and 219.130.

PART 3 EXECUTION**3.1 INSPECTIONS AND MAINTENANCE**

- .1 Inspection procedures specified below summarize the EPA document and shall be followed in conjunction with details, drawings and manufacturer requirements.
- .2 Inspect all control measures at least once each week (unless otherwise noted) and following any significant storm (13 mm of precipitation or greater). Complete the inspection log for each inspection, and keep in an accessible location on site until all corrective measures have been documented. Submit each completed log to the Contract Administrator and Owner for review.
- .3 Maintain all measures in good working order. If a repair is necessary, initiate within 24 hours of report.
- .4 Stabilized Construction Entrance: Apply additional gravel as required, remove sediments and other materials from all areas to minimize clogging. Keep adjacent public roadway(s) free from sediment.
- .5 Site Arrangement: Verify that movement of construction equipment to appropriate area occurs at the same time as movement of construction activities.
- .6 Material Stockpile: Inspect for effective prevention of runoff and erosion. Remove built-up sediment from silt fence when it has reached 1/3 the height of the filter fabric.
- .7 Preservation of Natural Vegetation: Routine maintenance shall include mowing, fertilizing, liming, irrigating, pruning and weed and pest control, depending on the specific species and environmental conditions. Remove any debris and ensure area is protected from traffic.
- .8 Buffer Zones: Routine maintenance shall include mowing, fertilizing, liming, irrigating, pruning and weed and pest control, depending on the specific species and environmental conditions. Remove any debris and ensure area is protected from traffic.
- .9 Soil Retaining Measures: Inspect for structural damage and repair as required.

- .10 Permanent Seeding: Inspect for sufficient growth and water conditions. Replant areas if cover does not provide erosion control.
- .11 Silt Fence: Silt fence to be inspected for depth of sediment, tears, loose fabric attachment at fence posts, channel erosion beneath fence, sagging or collapse, and to ensure the fence posts are firmly in the ground. Built-up sediment is to be removed from silt fence when it has reached 1/3 the height of the fence. Repair such that fence is in original installation condition.
- .12 Outlet Protection: Inspect for erosion and pooling of water. Necessary repairs to be made as required to reduce exit velocity of runoff. If a riprap apron is used, inspect for riprap displacement and damage to filter fabric.
- .13 Check Dams: Inspect for sediment and debris accumulation and erosion of sides. Sediment should be removed when it reaches ½ the original dam height. Repair dam as required.
- .14 Drainage Swale: Inspect for dips or low points along the swale where water is pooling and ensure that runoff is being directed to sediment-trapping measure used onsite.
- .15 Subsurface Drains: Inspect pipe for breaks or clogging by sediment or debris. Remove blockage immediately, replace any broken sections and restabilize the surface. Check inlets and outlets for sediment or debris, and remove and dispose of these materials properly.

3.2 REMOVAL OF PRODUCTS

- .1 ESC measures shall not be removed and shall be fully inspected and maintained until final landscaping is complete.

Inspection Checklist – Schedule A

Project Name: _____

Completed By: _____

Date: _____

During Construction: Contractor to complete this Inspection Checklist **once a week** as per the ESC Specification. For each measure, check the “OK” box if there are no repairs or maintenance required; check the “Not OK” box if attention is required as per the inspection/maintenance procedures in the ESC specification.

For all measures marked as “Not OK”, the Inspection Log must be completed. List the measures that are deficient in the “Deficiencies” column on the Inspection Log, and record the maintenance performed. Submit both the Inspection Checklist and Inspection Log to the Contract Administrator and Owner after all maintenance activities have been completed and recorded.

OK	Not OK	Location on Site	Measure

Inspection Log – Schedule B

Erosion & Sedimentation Control Weekly Inspection Log

Log Start Date: _____

Log End Date: _____

Log Completed By: _____

Company: _____

Telephone No.: _____

Inspection Date	General Observations (ie: seasonal conditions)	Location & Deficiency of ESC Measure	Corrective Measures	Initials

I hereby certify that the information provided is complete, correct and complies with the requirements of EPA Best Management Practices.

Signature	Title	Date

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 31 05 16 - Aggregate Materials.
- .2 Section 31 23 33 - Excavating, Trenching and Backfilling.
- .3 Section 32 11 23 - Aggregate Base Courses.

1.2 **REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .4 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .5 ASTM D4318, Standard Test Methods for Liquid Unit, Plastic Unit and Plasticity Index of Soils.
 - .6 Ontario Provincial Standard Specification (OPSS) Division 10.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS MUNI 1010 – Material Specifications for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material

PART 2 **PRODUCTS**

2.1 **MATERIALS**

- .1 Granular sub-base material to Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Granular 'B', Type II as per OPSS.MUNI 1010, maximum aggregate size 65 mm.

PART 3 **EXECUTION**

3.1 **EXAMINATION**

- .1 Verify conditions of subgrade are acceptable for granular sub-base installation.

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

3.2 PLACING

- .1 Place granular sub-base after subgrade is inspected and approved by Contract Administrator and Owner.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Contract Administrator and Owner may authorize thicker lifts (layers) if specified compaction can be achieved.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .8 Remove and replace portion of layer in which material has become segregated during spreading.
- .9 Place material to minimum compacted thickness as shown on drawings, or thicker as required to achieve design base elevation.
- .10 Transition between new and existing pavement structures with a 5 horizontal to 1 vertical taper to match the depths of the granular material exposed in the existing pavement.

3.3 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to density of not less than 100% of Standard Proctor Maximum Dry Density (SPMDD) to ASTM D698.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Contract Administrator and Owner.

- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.4 PROOF ROLLING

- .1 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .2 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove sub-base and subgrade material to depth and extent as directed by the Contract Administrator and Owner.
 - .2 Backfill excavated subgrade with Type 3 fill as per Section 31 23 33 – Excavating, Trenching and Backfilling and compact in accordance with this section.
 - .3 Replace sub-base material and compact in accordance with this section.

3.5 SITE TOLERANCES

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.
- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.6 PROTECTION

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Contract Administrator and Owner.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 31 05 16 - Aggregate Materials.
- .2 Section 32 11 16 – Granular Sub-Base

1.2 **REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM D136, Standard Test Method for Sieve Analysis of Fine and Course Aggregated.
 - .4 ASTM D698, Stand Test Methods for Laboratory Compaction Characteristics of Soil Using standard Effort (12,400 ft-lbf/ft³)(600 N m/m³).
 - .5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318, Standard Test Methods for Liquid Unit, Plastic Unit and Plasticity Index of Soils.
 - .7 Ontario Provincial Standard Specifications (OPSS) Division 10.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-, Sieves, Testing, Woven Wire, Metric.
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS MUNI 1010 – Material Specifications for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material

1.3 **DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver and stockpile aggregates in accordance with Section 31 05 16 – Aggregate Materials.

PART 2 PRODUCTS

2.1 **MATERIALS**

- .1 Granular base: material to Section 31 05 16- Aggregate Materials and the following requirements:
 - .1 Granular 'A' to OPSS.MUNI 1010

2.2 **SEQUENCE OF OPERATION**

- .1 Place granular base after granular sub base surface is inspected and approved by Contract Administrator an Owner.
 - .1 Construct granular base to depth and grade in areas indicated.
 - .2 Ensure no frozen material is placed.

- .3 Place material only on clean unfrozen surface, free from snow and ice.
- .4 Place material using methods which do not lead to segregation or degradation of aggregate.
- .5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
- .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .2 **Compaction Equipment**
 - .1 Compaction equipment to be capable of obtaining required material densities.
- .3 **Compacting**
 - .1 Compact to no less than 100% of standard proctor maximum dry density (SPMDD).
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Contract Administrator and Owner.
 - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

2.3 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

2.4 PROTECTION

- .1 Maintain finished base in condition conforming to this section until succeeding material is applied or until acceptance by Contract Administrator and Owner.

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Materials and installation for asphalt pavement for areas identified.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 31 05 16 – Aggregate Materials.
- .3 Section 31 23 33 – Excavating, Trenching and Backfilling.
- .4 Section 32 11 23 – Aggregate Base Course.
- .5 Section 32 16 00 – Concrete Walks, Curbs and Gutters.
- .6 Section 32 17 23 – Pavement Marking.

1.3 **REFERENCES**

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.
 - .2 CAN/CGSB-16.1, Cutback Asphalts for Road Purposes.
- .2 American Association of State Highway and Transportation Officials (AASHTO)
 - .1 AASHTO M320 - Standard Specification for Performance Grade Asphalt Binder.
- .3 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C123, Standard Test Method for Lightweight Particles in Aggregate.
 - .4 ASTM C127, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
 - .5 ASTM C128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
 - .6 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .9 ASTM D977 – Standard Specification for Emulsified Asphalt.
 - .10 ASTM D995, Standard Specification for Requirements Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

- .11 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- .12 ASTM D3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
- .4 Asphalt Institute (AI)
 - .1 Asphalt Institute MS-2-1993 Sixth Edition, Mix Design Methods for Asphalt Concrete.
- .5 Ontario Provincial Standard Specifications (OPSS).

1.4 SUBMITTALS

- .1 Submit asphalt concrete mix design to Contract Administrator and Owner for approval.
- .2 Materials to be tested by testing laboratory approved by Contract Administrator and Owner.
- .3 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.
- .4 Inform Contract Administrator and Owner of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing work.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Granular base and sub-base material to Section 31 05 16 – Aggregate Materials, Section 32 11 16 Granular Sub-Base and Section 31 11 23 Aggregate Base Courses.
- .2 HL-3 and HL-8 hot mix asphalt, compacted thickness as indicated on drawings, PGAC 58-34, per OPSS 1001, 1003, 1101 and 1150.
- .3 Asphalt cement: to AASHTO M320.
- .4 Aggregates per Section 31 05 16 – Aggregate Materials; gradation per OPSS 1003.
- .5 Asphalt tack coat: to SS-1 or RS-1 as per OPSS 1103, depending on weather at the time of asphalt paving operations.

2.2 MIX DESIGN

- .1 Job mix formula to be approved by Contract Administrator and Owner.
- .2 Do not change job-mix without prior approval of Contract Administrator and Owner. When change in material source proposed, new job-mix formula to be approved by Contract Administrator and Owner.
- .3 Return plant dust collected during processing to mix in quantities acceptable to Contract Administrator and Owner.

2.3 EQUIPMENT

- .1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Rollers: sufficient number of rollers of type and weight to obtain specified density of compacted mix. Roller combination shall be as per OPSS 310 for a production rate of 120 t/hr.
- .3 Vibratory rollers for parking lots and driveway:
 - .1 Minimum drum diameter: 750mm.
 - .2 Maximum amplitude of vibration (machine setting): 0.5mm for lifts less than 40mm thick.
- .4 Haul trucks: of sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
 - .1 Boxes with tight metal bottoms.
 - .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
 - .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
- .5 Suitable hand tools

PART 3 EXECUTION

3.1 PREPARATION

- .1 Fine grade aggregate base course, add/remove aggregate as required.
- .2 Re-compact aggregate base course to achieve 100% Standard Proctor Maximum Dry Density (SPMDD) as required.
- .3 Install tack coat on all milled surfaces and on all vertical surfaces abutting new asphalt.

3.2 ASPHALT PAVING

- .1 Obtain approval of primer from Contract Administrator and Owner before placing asphalt mix.
- .2 Place asphalt mix only when base or previous course is dry and air temperature is above 7°C and rising.
- .3 When temperature of surface on which the material is to be placed falls below 10° C, provide extra rollers as necessary to obtain required compaction before cooling.
- .4 Place asphalt concrete in compacted layers as indicated on construction drawings but not exceeding 50 mm.
- .5 Minimum 120°C mix temperature required when spreading.
- .6 Maximum 160°C mix temperature permitted at any time.
- .7 Compact each course with roller as soon as it can support roller weight without undue cracking or displacement.

- .8 Compact asphalt concrete to density not less than 92 % of Maximum Relative Density (MRD) obtained with Marshall specimens prepared in accordance with ASTM D1559, from samples of mix being used. Roll until roller marks are eliminated.
- .9 Keep roller speed slow enough to avoid mix displacement and do not stop roller on fresh pavement.
- .10 Carefully use vibratory equipment near existing building foundations.
- .11 Moisten roller wheels with water to prevent pick up of material.
- .12 Compact mix with hot tampers or other equipment approved by Contract Administrator and Owner in areas inaccessible to roller.
- .13 Finish surface to be within 5 mm of design elevation and with no irregularities greater than 10 mm in 4.5 m.
- .14 Repair areas showing checking, rippling or segregation as directed by Contract Administrator and Owner.

3.3 JOINTS

- .1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip. Complete joints to existing asphalt as indicated on contract drawings.
- .2 Paint contact surfaces of existing structures such as manholes, curbs or gutters with tack coat prior to placing adjacent pavement.
- .3 For cold joints, cut back to full depth vertical face and tack face with tack coat.
- .4 For longitudinal joints, overlap previously laid strip with spreader by 150 mm.
- .5 Carefully place and compact hot asphaltic material against joints.
- .6 Mill existing asphalt and step connect to existing asphalt as per Contract Drawings where existing asphalt thickness is equal to or greater than 80 mm. Tack coat vertical and horizontal surfaces.

3.4 PROTECTION

- .1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38°C. Do not permit stationary loads on pavement until 24 hours after placement.
- .2 Provide access to buildings as required. Arrange paving schedule so as not to interfere with normal use of premises.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 31 23 33 – Excavating, Trenching and Backfilling

1.2 **REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A90/A90M, Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - .3 ASTM A116, Standard Specification for Metallic-Coated, Steel-Woven Wire Fence Fabric.
 - .4 ASTM A123/A123M, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel.
 - .5 ASTM A641/A641M, Standard Specification for Zinc-coated (Galvanized) Carbon Steel Wire.
 - .6 A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
 - .7 ASTM F2200, Standard Specification for Automate Vehicular Gates.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-138.1, Fabric for Chain Link Fence.
 - .2 CAN/CGSB-138.2, Steel Framework for Chain Link Fence.
 - .3 CAN/CGSB-138.3, Installation of Chain Link Fence.
 - .4 CAN/CGSB-138.4, Gates for Chain Link Fence.
 - .5 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA).
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-A3000, Cementitious Materials Compendium. Includes:
- .4 Standards Council of Canada (SCC)
 - .1 ANSI/CAN/UL 325. Standard for Safety Door, Drapery, Gate, Louver, and Window Operators and Systems

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittals.
- .2 Submit manufacturer's data sheets including:
 - .1 Fence fabric gauge and finish.
 - .2 Post and rail dimension and finish.
 - .3 Gate frame dimension and finish.
 - .4 Required fittings and hardware.
 - .5 Gate Operator specifications, dimensions, installation, wiring diagrams, and relationship to adjacent construction.
- .3 Shop Drawings:
 - .1 Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Concrete mixes and materials:
 - .1 Nominal coarse aggregate size: 20 mm.
 - .2 Compressive strength: 30 MPa minimum at 28 days.
 - .3 Air entrainment: 5-8%
- .2 Chain-link fence fabric: to CAN/CGSB-138.1.
 - .1 Type 1, Class A, medium style, 9 gauge.
 - .2 Height of fabric: as indicated on Contract Drawings.
 - .3 Double knuckled selvedge at bottom and top.
- .3 Posts, braces and rails: to CAN/CGSB-138.2, Schedule 40 galvanized steel pipe. Dimensions:
 - .1 End posts: 89mm diameter, 3.0m long
 - .2 Gate posts, single 3.0m or double 6.0m wide: 89mm diameter, 3.0m long
 - .3 Gate posts, single 4.5m or double 9.0m wide: 89mm diameter, 3.0m long
 - .4 Line posts: 60mm diameter, 3.0m long
 - .5 Top rail: 42mm diameter
- .4 Bottom tension wire: to CAN/CGSB-138.1, Table 2 single strand, galvanized steel wire, 9 gauge.
- .5 Tie wire fasteners: to CAN/CGSB-138.1, Table 2 (steel wire), single strand, galvanized steel wire conforming to requirements of fence fabric, 5 mm diameter.
- .6 Tension bar: to A653/A653M, 5 x 20 mm minimum galvanized steel.

- .7 Tension bar brands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum.
- .8 Gates: Arma Gate EC 290 or approved equivalent. All gate components supplied by single supplier. Two (2) required.
- .9 Standard Gates (not applicable): to ASTM F2200.
- .10 Gate frames: to ASTM A53/A53M, galvanized steel pipe, standard weight 45 mm outside diameter pipe for outside frame, 35mm outside diameter pipe for interior bracing.
 - .1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized after welding.
 - .2 Fasten fence fabric to gate with twisted selvage at top.
 - .3 Furnish gates with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.
 - .4 Furnish double gates with chain hook to hold gates open and centre rest with drop bolt for closed position.
- .11 Fittings and hardware: to CAN/CGSB-138.2, cast aluminum alloy, galvanized steel or malleable or ductile cast iron.
 - .1 Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum.
 - .2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.
 - .3 Overhang tops to provide waterproof fit.
 - .4 Turnbuckles to be drop forged.
- .12 Organic zinc rich coating: to CAN/CGSB-1.181.
- .13 Grounding rod: 16 mm diameter copper well rod, 3 m long.
- .14 Sonotube:
 - .1 250mm diameter, 1.5m long for 60mm diameter posts
 - .2 350mm diameter, 1.5m long for 89mm diameter posts
 - .3 450mm diameter, 1.5m long for 114mm diameter posts
- .15 Sliding Gate Operator and Entrapment Protection to ANSI/CAN/UL 325 and ASTM F2200.
 - .1 Nema 3R Steel Cabinet
 - .2 Operator: Gear Driven
 - .3 Rated duty cycle: Continuous Duty
 - .4 PowerSupply: 120/240VAC
 - .5 Travelling Speed: 6-12 inches per second with soft-start / soft-stop technology.
 - .6 Motor: 24VDC, continuous duty, sized to gate conditions

- .7 Battery backup: minimum 20 cycles, 105 day standby time
- .8 Suitable for Class II, III, IV gate construction.
- .9 Temperature Rating: -40°C to 60°C with integral heater as required.
- .10 Entrapment Protection to CAN/UL 325 including Interrupting loop, edge sensors and photoeyes.
- .11 Access control: Wireless keypad access mounted on support post and 8 remotes for installation in fleet vehicles.
- .12 Manual disconnect to allow manual operation of unlocked gate.

2.2 FINISHES

- .1 Galvanizing:
 - .1 For chain link fabric: to CAN/CGSB-138.1, Grade2.
 - .2 For pipe: 550 g/m² minimum to ASTM A90.
 - .3 For other fittings: to CAN/CSA-G164.

PART 3 EXECUTION

3.1 GRADING

- .1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts.
 - .1 Provide clearance between bottom of fence and ground surface of 0mm to 10 mm.

3.2 ERECTION OF FENCE

- .1 Erect fence along lines as indicated and as directed by Contract Administrator and in accordance with CAN/CGSB-138.3.
- .2 Excavate post holes 1350 mm depth x 300 mm diameter, to suit sonotube, by methods approved by Contract Administrator.
- .3 Space line posts 3 m apart, measured parallel to ground surface.
- .4 Space straining posts at equal intervals not exceeding 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade is greater than 150 m.
- .5 Install additional straining posts at sharp changes in grade and where directed by Contract Administrator.
- .6 Install corner post where change in alignment exceeds 10°.
- .7 Install end posts at end of fence and at buildings. Install 114mm diameter gate posts on both sides of gate openings.
- .8 Place concrete in Sonotube forms for all posts (including line posts) and embed posts into concrete to minimum 1200 mm depth.

- .1 Extend concrete 50 mm above ground level and slope to drain away from posts.
- .2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.
- .3 Centre post to centre of Sonotube.
- .9 Do not install fence fabric until concrete has cured minimum of 5 days.
- .10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface.
 - .1 Install braces on both sides of corner and straining posts in similar manner.
- .11 Install overhang tops and caps.
- .12 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.
- .13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.
- .14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.
 - .1 Double knuckled selvedge at bottom and top.
- .15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 350 mm intervals.
 - .1 Give tie wires minimum two twists.
- .16 Install grounding rods as indicated.

3.3 INSTALLATION OF GATES

- .1 All gate components by single supplier. Install, calibrate and commission in strict accordance with manufacturer's instructions.
- .2 Install gates in locations as indicated.
- .3 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.
- .4 Determine position of centre gate rest for double gate.
 - .1 Cast gate rest in concrete as directed.
 - .2 Dome concrete above ground level to shed water.
- .5 Install gate stops where indicated.

3.4 INSTALLATION OF GATE OPERATOR

- .1 Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.
- .2 Excavation for Support Posts: Excavate holes for sonotubes below frost line, in firm, undisturbed or compacted soil to dimensions and depths and at locations as required by gate operator component manufacturer's written instructions and as indicated on Drawings.
- .3 Vehicle Loop Detector System: Cut grooves in pavement as required and bury and seal wire loop according to manufacturer's written instructions. Connect to equipment operated by detector. Comply with Ontario Electrical Safety Code (OESC) and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.
- .4 120/240Vac power supply by Division 26.
- .5 Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, and limit switches.
- .6 Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Test controls and safeties. Remove damaged and malfunctioning units, replace with new units, and retest.
- .7 Engage a factory-authorized service representative to train Owner's personnel to operate and maintain gates including:
 - .1 Operating the gate and integrated safety features.
 - .2 Manual disconnect and operation of gate.
 - .3 Review data in service manuals and maintenance requirements.

3.5 TOUCH UP

- .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas
- .2 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.6 CLEANING

- .1 Clean and trim areas disturbed by operations. Dispose of surplus material as directed by Contract Administrator.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 31 23 33 – Excavating, Trenching, and Backfilling
- .2 Section 32 92 19 – Hydraulic Seeding

1.2 **QUALITY ASSURANCE**

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.3 **SOURCE QUALITY CONTROL**

- .1 Advise Contract Administrator and Owner of sources of topsoil to be utilized seven (7) working days in advance of stating time.
- .2 Contractor is responsible for soil analysis and requirements for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.

PART 2 **PRODUCTS**

2.1 **TOPSOIL**

- .1 Topsoil for sodded areas: imported, screened, topsoil with a mixture of mineral particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.
 - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 20% to 70% sand, minimum 7% clay, and contain 2 to 10 % organic matter by weight.
 - .2 Contain no toxic elements or growth inhibiting materials.
 - .3 Free from:
 - .1 Debris and stones over 25 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .4 Consistence: friable when moist.

2.2 **SOIL AMENDMENTS**

- .1 Fertilizer:
 - .1 Fertility: major soil nutrients present in following amounts:
 - .2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 - .4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 - .5 Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

- .6 Ph value: 6.5 to 8.0.
- .2 Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: 5 mm.
- .3 Sand: washed coarse silica sand, medium to coarse textured.
- .4 Limestone:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .5 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

PART 3 **EXECUTION**

3.1 **STRIPPING OF TOPSOIL**

- .1 As per Section 31 23 33 – Excavating, Trenching and Backfilling.

3.2 **PREPARATION OF EXISTING GRADE**

- .1 Verify that grades are correct. If discrepancies occur, notify Contract Administrator and Owner and do not commence work until instructed by Contract Administrator and Owner.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
 - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
 - .2 Remove debris which protrudes more than 50 mm above surface.
 - .3 Dispose of removed material off site.
- .4 Course cultivate entire area which is to receive topsoil to minimum depth of 100 mm. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.3 **PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Place topsoil after Contract Administrator and Owner has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.
- .3 For sodded areas keep topsoil below finished grade.
- .4 Spread topsoil as indicated to following minimum depths after settlement and 80% compaction:

.1 100 mm for sodded areas.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.4 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.

.2 Consolidate topsoil to required bulk density using equipment approved by Contract Administrator and Owner. Leave surfaces smooth, uniform and firm against deep footprinting.

3.5 ACCEPTANCE

.1 Contract Administrator and Owner will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading. Approval of topsoil material subject to soil testing and analysis.

.2 Testing of topsoil will be carried out by testing laboratory designated by Contract Administrator and Owner. Soil sampling, testing and analysis to be in accordance with Provincial regulations and standards. Contract Administrator and Owner will pay for cost of tests as specified in Section 01 45 00 – Quality Control.

3.6 SURPLUS MATERIAL

.1 Dispose of surplus or unsuitable material off site or as directed by Contract Administrator and Owner.

3.7 CLEANING

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

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 32 91 19 - Topsoil.

1.2 **SUBMITTALS**

- .1 Provide product data for:
 - .1 Seed
 - .2 Mulch
 - .3 Tackifier
 - .4 Fertilizer
- .2 Submit in writing to Contract Administrator seven (7) working days prior to commencing work:
 - .1 Volume capacity of hydraulic seeder in litres.
 - .2 Amount of material to be used per tank based on volume.
 - .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

1.3 **QUALITY ASSURANCE**

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements.

1.4 **SCHEDULING**

- .1 Schedule hydraulic seeding to coincide with preparation of soil surface.

1.5 **WARRANTY**

- .1 All areas hydroseeded under this contract shall have a warranty period of one (1) year from the date of Certificate of Substantial Performance shall cover any defects in materials and workmanship or damages caused by the elements of weather. All defects shall be repaired to the satisfaction of the Contract Administrator at no cost to the Owner.

PART 2 **PRODUCTS**

2.1 **MATERIALS**

- .1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.
 - .1 Grass mixture: "Certified", "Canada No. 1 Lawn Grass Mixture" in accordance with Government of Canada "Seeds Act" and "Seeds Regulations".
 - .1 Contractor to submit mixture composition to Contract Administrator for approval.
 - .2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:
 - .1 Type I mulch:
 - .1 Made from wood cellulose fibre.
 - .2 Organic matter content: 95% plus or minus 0.5%.
 - .3 Value of pH: 6.0.
 - .4 Potential water absorption: 800-900%.
 - .2 Type II mulch:
 - .1 Made from newsprint, raw cotton fibre and straw, processed to produce fibre lengths of 15 mm minimum and 25 mm maximum. Greater proportions of ingredients to be straw.
- .3 Tackifier: water dilutable, liquid dispersion.
- .4 Water: free of impurities that would inhibit germination and growth.
- .5 Fertilizer:
 - .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
 - .2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.

PART 3 **EXECUTION**

3.1 **WORKMANSHIP**

- .1 Do not spray onto structures, signs, guide rails, fences, plant material, utilities and other than surfaces intended.
- .2 Clean-up immediately, any material sprayed where not intended, to satisfaction of Contract Administrator.
- .3 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.
- .4 Protect seeded areas from trespass until plants are established.

3.2 PREPARATION OF SURFACES

- .1 Fine grade areas to be seeded free of humps and hollows. Ensure areas are free of deleterious and refuse materials.
- .2 Cultivated areas identified as requiring cultivation to depth of 25 mm.
- .3 Ensure areas to be seeded are moist to depth of 150 mm before seeding.
- .4 Obtain Contract Administrator approval of grade and topsoil depth before starting to seed.

3.3 FERTILIZING PROGRAM

- .1 Fertilize prior to fine grading incorporating fertilizer equally distributed in accordance with an agreed program between Contractor and Contract Administrator.
- .2 Fertilize during establishment and warranty periods to an agreed program between Contractor and Contract Administrator.

3.4 PREPARATION OF SLURRY

- .1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Contract Administrator. Supply equipment required for this work.
- .2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.
- .3 After all materials are in the seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.5 SLURRY APPLICATION

- .1 Hydraulic seeding equipment:
 - .1 Slurry tank.
 - .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and or mechanical agitation method.
 - .3 Pumps capable of maintaining continuous non-fluctuating flow of solution.
 - .4 Supplied with not less than 6 spray pattern nozzles.
 - .5 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.
 - .6 Tank volume to be certified by certifying authority and identified by authorities "Volume Certification Plate".
- .2 Slurry mixture applied per hectare.
 - .1 Seed: Grass mixture 150 kg.

- .2 Mulch: Type I 1250 kg.
- .3 Tackifier: 20 kg.
- .4 Water: Minimum 30,000 L.
- .5 Fertilizer: 600 kg, ratio 5-20-20.
- .3 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
 - .1 Using correct nozzle for application.
 - .2 Using hoses for surfaces difficult to reach and to control application.
- .4 Blend application 300 mm into adjacent grass areas or sodded areas to form uniform surfaces.
- .5 Re-apply where application is not uniform.
- .6 Remove slurry from items and areas not designated to be sprayed.
- .7 Protect seeded areas from trespass satisfactory to Contract Administrator.
- .8 Remove protection devices as directed by Contract Administrator.

3.6 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Perform following operations from time of seed application until acceptance by Contract Administrator.
- .2 Grass Mixture:
 - .1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
 - .2 Mow grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass as directed by Contract Administrator.
 - .3 Fertilize seeded areas 10 weeks after germination provided plants have mature true leafs in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles; water in well.
 - .4 Control weeds by manual, mechanical or chemical means. Utilizing acceptable integrated pest management practices.
 - .5 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

3.7 ACCEPTANCE

- .1 Seeded areas will be accepted by Contract Administrator provided that:
 - .1 Plants are uniformly established. Seeded areas are free of rutted, eroded, bare or dead spots.
 - .2 Areas have been mown at least twice.
 - .3 Areas have been fertilized.

- .2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.8 MAINTENANCE DURING WARRANTY PERIOD

- .1 Perform following operations until acceptance of Certificate of Total Performance.
 - .1 Water seeded area to maintain optimum soil moisture level for continued growth. Control watering to prevent washouts.
 - .2 Repair and reseed dead or bare spots to satisfaction of Contract Administrator.
 - .3 Mow areas seeded, remove clippings, as directed by Contract Administrator.
 - .4 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
 - .5 Eliminate weeds by mechanical or chemical means.
 - .6 At the end of the warranty period repeat items 2-5.

3.9 CLEANING

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

END OF SECTION



**St. Lawrence Testing
& Inspection Co. Ltd.**

P.O. Box 997, Cornwall, ON, Canada K6H 5V1
814 Second Street W., Phone (613) 938-2521
E-mail: slt@ontarioeast.net Fax (613) 938-7395

December 31, 2022

Ms. Leslie Papineau
Mohawk Council of Akwesasne
101 Tewesateni Rd.
Akwesasne, ON
K6H 0G5

**RE: New Salt Dome, Cornwall Island, ON
Geotechnical Subsurface Investigation
Report No. 22C378**

Dear Ms. Papineau:

In accordance with discussions held with you, this report is submitted, outlining the results of a geotechnical subsurface investigation carried out on Cornwall Island adjacent to the existing MCA Roads Garage at 14 Ford Lane.

A) DESCRIPTION OF FIELD WORK & STRATIGRAPHY

Prior to digging the test pits, we requested locates for any buried services. Once it was confirmed that there were no services in the area of the proposed salt dome, we contacted the roads department for a backhoe. The agreed date to carry out the field work was December 15, 2022.

We dug 2 test pits off the North East and South West corners of the proposed salt dome. Following is the stratigraphy at the test pits.

Test Pit #1: North East

- | | |
|------------------------|---|
| 0 – 3.0 ft (0.91 m): | Black, moist, topsoil, cobbles and boulders. |
| 3.0 – 5.0 ft (1.52 m): | Brown, moist, compact to dense silty gravelly sand
till with cobbles and boulders. |

Test Pit #2: South West

- | | |
|------------------------|---|
| 0 – 1.0 ft (0.30 m): | Black, moist, topsoil, gravel and cobbles. |
| 1.0 – 4.0 ft (1.22 m): | Brown, moist, compact to dense silty gravelly sand
till with cobbles and boulders. |

A plan is attached showing the location of the test pits.

B) GEOTECHNICAL DISCUSSION

The salt dome footings can be designed in the compact to dense silty gravelly sand till using a bearing capacity of 200 KPa S.L.S. and 300 KPa U.L.S. The site seismic factor is Site Class C. The design frost depth is 4.5 ft (1.37 m) below the final exterior grade.

For the interior slab, all of the topsoil and topsoil mixed with cobbles and gravel should be removed, down to the brown, moist, native silty gravelly sand till.

The slab fill should consist of 8 inches (200 mm) of Granular "A" compacted to 100% Standard Proctor Density. If additional fill is required, this should be

Granular "B" Type 2 and compacted to 100% Standard Proctor Density. The Granular "B" Type 2 should be compacted in maximum 300 mm lifts.

For any roadways around the salt dome and South of the salt dome, the topsoil and the topsoil mixed with gravel, cobbles and boulders should be removed down to the brown, moist, native silty gravelly sand till. The roadways should be constructed with 12 inches (300 mm) of Granular "B" Type 2 subbase and 6 inches (150 mm) of Granular "A" base. Each lift should be compacted to 100% Standard Proctor Density.

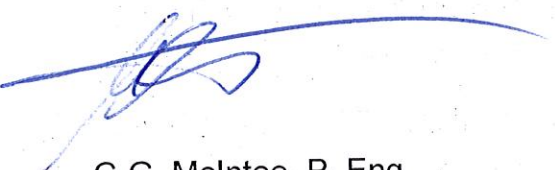
The asphalt should consist of 40 mm of HL4 base and 40 mm of HL3 surface course, each compacted to 96% Marshall Density.

C) CONSTRUCTION CONTROL

In order to ensure that the recommendations of this report are adhered to, it is recommended that our firm be retained to inspect and approve the footings and to monitor the compaction and quality of the fill materials.

Respectfully submitted,

ST. LAWRENCE TESTING & INSPECTION CO. LTD.


G.G. McIntee, P. Eng.

GGM:mm

Attachment

c.c. EVB Engineering – Greg Esdale



