Township of Chapleau

Chapleau Emergency Backup Power Modifications
Contract No. 60672834

Issued for Tender

Project No. 60672834
January, 2024

TENDER FOR
TOWNSHIP OF CHAPLEAU
EMERGENCY BACKUP POWER MODIFICATIONS
CONTRACT NO. 60672734

DIGITAL TENDERS, submitted with the Subject Line: **Tender – Electronic Submission – Chapleau Emergency Backup Power Modifications Contract No. 60672734**, will be received until 3:00 p.m. local time on:

Friday, February 2, 2024

Electronic submissions must be sent to the following email address:

nancy.maahs@aecom.com

Refer to the tender documents for detailed submission requirements.

For the supply of all equipment, labour and materials for the Works as specified:
Chapleau is seeking to increase the resilience and reliability of power supply at two of its public facilities – the Civic Centre and the Recreation Centre, as part of the Township's emergency management governance, achieved by modifying the electrical systems in the two facilities to accept backup power from new fixed diesel generators. Provide new generators complete with all necessary electrical modifications as described in the tender documents.

Digital tender documents may be obtained from AECOM Canada Ltd. following the completion of a registration process. To register as a plan taker and for all inquiries related to this tender, please contact Nancy Maahs, via email at nancy.maahs@aecom.com

Tenders must be accompanied with a tender deposit in the form of a bid bond or certified cheque in the amount of $**25,000.00** together with all required documentation. The successful tenderer will be required to provide a 100% Performance Bond and 50% Labour and Material Payment Bond upon execution of the Contract.

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

TENDERER'S CHECK LIST

Before submitting your Bid, check the following points:

1.	Has your Bid been signed, sealed and witnessed?	( )
2.	Have you enclosed the Bid Deposit?	( )
3.	Have you enclosed the Agreement to Bond, signed and sealed by your proposed Surety?	( )
4.	Have you enclosed the Stipulated Price Appendices A through D?	( )
5.	Have you indicated the number of addenda?	( )
6.	Are the documents complete?	( )
7.	Does your electronic submission meet requirements stipulated under the Instructions to Bidders?	( )
8.	Have you attended mandatory site visit?	( )

Note: Your tender will be informal and may be disqualified if ANY of the foregoing points (if applicable) have not been complied with.

SECTION 00100 - INSTRUCTIONS TO BIDDERS

1.1 LOCATION OF SITE

A. The proposed sites are located in the Township of Chapleau at the Civic Centre at 20 Pine Street, and Recreation Centre at 4 Maple Street.

B. The Township of Chapleau owns the sites.

1.2 WORK TO BE DONE

A. The work required to be completed under this Contract includes the supply of labour, material, equipment, site offices, and other requirements as necessary to complete the construction as shown in the Contract Drawings and as specified herein. The following is a general, but not necessarily complete, description of the work to be constructed under the Contract:

.1 Civic Centre

a) Provide a new fixed standby backup power diesel generator to be located as indicated on plans on a housekeeping pad. Provide all necessary earthworks, including retaining barriers, excavation, compaction, etc. required for this installation.

b) Provide modifications to the existing electrical system required to accept generator backup power as detailed herein.

c) Provide all backup power ancillary devices and systems as described herein.

d) Prior to removal of distribution equipment, coordination is required with the Township of Chapleau. This work is to be done after regular working hours which could include afternoon shift, night shift and/or on the weekend. Shutdown duration to be limited to 48 hours maximum. To maintain operations, critical equipment will require temporary feeds. LP-A, SVR panel , RP-B all contain critical circuits. Demand load to be verified. Sequencing to be reviewed prior to the commencement of shutdown work.

.2 Recreation Centre

a) Provide a new fixed standby backup power diesel generator to be located as indicated on plans on a housekeeping pad. Provide all necessary earthworks, including retaining barriers, excavation, compaction, etc. required for this installation.

b) Provide modifications to the existing electrical system required to accept generator backup power as detailed herein.

c) Provide all backup power ancillary devices and systems as described herein.

d) Provide generator testing and commissioning as detailed in drawings and specifications.

1.3 COMMUNICATIONS WITH TOWNSHIP

A. To ensure fair consideration and evaluation of Bids, the Township prohibits ex parte or unsolicited communication initiated by Bidders to or with the Engineer or Township employees during the Bid process, except as provided for in 1.11 of this section.

1.4 BID SUBMISSION

A. Submissions for this Tender will be accepted in electronic format until:

Friday, February 2, 2024 at 3:00 p.m. local time

Electronic submissions must be sent to the following email address:

nancy.maahs@aecom.com

with this subject line: **Tender – Electronic Submission – Chapleau Emergency Backup Power Modifications – Contract No. 60672834.**

B. Electronic submissions must be in PDF format (either native or compressed (zipped)) only. Links to drop boxes or other forms of cloud storage are not acceptable. Emails including the tender are limited to **8 MB** or less. Electronic submissions must be complete in every way meeting the requirements of printed submission. The date stamp provided by the AECOM email server will be the official time of receipt. Bidders should recognize that delays may develop during delivery of electronic submissions of a tender and submit their tender well in advance of the time and date set for closing. AECOM accepts no responsibility for these delays. Upon request, AECOM staff will use best efforts to confirm receipt of emailed tender submissions prior to tender close.

C. A digital copy of the Bid Security and Agreement to Bond is acceptable and must be included in the digital bid package; however, original copies of the tender submission shall be delivered to AECOM in an envelope along with the Form of Tender and all filled out tables and Statements A and B within 5 business days from the closing date.

D. In place of a public opening, qualified tender results will be provided to Bidders. The qualified tender results will be subject to confirmation once required hardcopy submissions are received.

1.5 CONTRACT FORM

A. Bids are to be offered on the basis that the Bidder whose bid is accepted shall enter into a written agreement with the Owner pursuant to the provisions of the current edition of CCDC2 - 2008 of the Canadian Construction Documents Committee. The General Conditions are amended by the Supplementary Conditions, Section 00800, which is included as a part of this bid package.

B. Further to Section 1.5A herein, the Bidder whose bid is accepted acknowledges and agrees that:

(a) it shall have the obligations and responsibilities of the "Contractor" as that term is used in this Tender, the Standard Construction Document CCDC2-2008 Agreement between the Owner and the successful Bidder and the Contract Documents; and

(b) it shall further be designated as the "Constructor" as that term is defined in the Occupational Health and Safety Act for the purposes of completing the Work set out in this Tender, the Standard Construction Document CCDC2-2008 Agreement between the Owner and the successful Bidder and the Contract Documents, and shall therefore assume all the responsibilities of the Constructor as set out in the Act and its Regulations in completing same.

1.6 ADDENDA

A. Addenda issued during the Bid period shall be allowed for by the Bidder and receipt of addenda shall be acknowledged in the Bid Form. Failure to acknowledge receipt of all addenda shall result in the rejection of the Bid.

1.7 ACCEPTANCE OR REJECTION OF BIDS

A. The lowest or any bid need not necessarily be accepted by the Owner.

B. The Owner reserves the right to consider unsolicited alternates submitted by a Bidder as a part of the base bid.

C. Subject to the General Conditions, except as provided hereunder, neither the Engineer nor any officer or employee of the Owner has authority to make or accept an offer or to enter into a contract on behalf of the Owner or to create any rights against or to impose any obligations on the Owner. The recommendation of a tender to the Owner for acceptance does not constitute acceptance of the tender by the Owner.

D. A tender is accepted by the Owner when an agreement in the form stated is executed by the Owner and by the tenderer or when the Engineer, with the written authorization of the Owner and within the period stated herein, has issued a written order to commence work to the tenderer and the Owner or anyone acting on its behalf has requested the tenderer to execute the Agreement and to return it to the Owner and the acceptance of the tender and the execution of the Agreement by the Owner are subject to the express condition that the Owner receive a Performance Bond and a Payment Bond in the forms stated and in accordance with the requirements herein, within seven days after notification of the execution of the Agreement by the Owner has been mailed to the tenderer whose tender has been accepted as aforesaid.

E. The Owner shall not be responsible for any liabilities, costs, expenses, loss or damage incurred, sustained or suffered by any tenderer prior or subsequent to or by reason of the acceptance or the non-acceptance by the Owner of any tender or by reason of any delay in the acceptance of a tender save as provided in the Contract. Tenders are subject to a formal contract being prepared and executed. The Owner reserves the right to reject any or all tenders and to waive formalities as the interests of the Owner may require without stating reasons therefore and the lowest or any tender will not necessarily be accepted. If an insufficient number of tenders are received, tenders may be returned unopened.

1.8 DISQUALIFICATION OF BID

A. A bid may not be considered:

(a) if it is received by the Owner, after the official closing time and date for bids; or,

(b) if the required Bid Security, in the form and amount specified, does not accompany the bid, or

(c) if bids are incomplete, unsigned, improperly signed or sealed, conditional, illegible, or contain additions not called for, or mathematical errors, reservations, erasures, alterations or irregularities, or

(d) if bids appear to be unbalanced so as to adversely affect the Owner's interests.

1.9 INFORMAL TENDERS

A. Tenders which are incomplete, unbalanced, conditional, or obscure, or which contain additions not called for, erasures, alterations, or irregularities of any kind, may be rejected as informal. All blanks must be legibly and properly filled in, otherwise the tender may be declared informal. Persons tendering are required to fill in all blanks as specified. Should any uncertainty arise as to the proper manner of doing so, instruction on proper procedure will, upon request, be given by the Engineer.

1.10 SUBSEQUENT WITHDRAWAL OR QUALIFYING OF A BID

A. A Bidder who has already submitted a bid may submit a further bid at any time before the official closing time. The last bid received shall supersede and invalidate all bids previously submitted by the Bidder.

B. A Bidder may withdraw or qualify its bid at any time before the official closing time by submitting a letter bearing the same signature and seal as in the initial bid to the Owner, or its authorized representative. Such withdrawal or qualification shall be delivered to the office of the Owner, or its authorized representative, who will mark thereon the time and date of receipt and will place the letter in the bid box. The Bidder shall show its name and the project and contract number on the envelope containing such letter. No electronic communications will be accepted.

1.11 DISCREPANCIES

A. If a Bidder finds discrepancies in, or omissions from the bid documents, or if it is in doubt as to their meaning, it shall notify the Engineer, who may issue a written addendum. Neither the Owner nor the Engineer will make oral interpretations of the meaning of the bid documents.

B. Should the Bidder not agree that the products and methods specified, or designated on the Drawings, will provide an installation to meet the intent and requirements of the project, it shall notify the Engineer in writing stating its reason for disagreement and may submit a suggested alternative. In such an event, the Engineer may choose to issue an addendum.

1.12 EXAMINATION OF SITE

A. The Bidder shall by personal examination satisfy itself as to the local conditions that may be encountered during construction of the Work, including any operational conditions that may impact the completion of the work. The Bidder shall make its own estimate of the facilities & difficulties that may be encountered.

B. **Mandatory site visit shall be completed during the tender period and to be coordinated with the Town's representative:**

Rejean Raymond
Operations Director
rraymond@chapleau.ca
Ph. 1-705-864-1334

C. The Bidder is not entitled to claim at any time after the submission of its Bid that there was any misunderstanding of the terms and conditions of the Contract relating to site conditions.

1.13 TAXES AND DUTIES

A. All Bid prices submitted shall be expressed in Canadian currency and include the Harmonized Sales Tax, Excise Taxes and Government Duties, Customs Duties, or any applicable taxes that are in force at the time of bidding.

B. The Bidder shall satisfy itself of the Products included in the Contract that are eligible for tax refund and shall contact the taxing authorities and determine the procedures for the obtaining of tax refunds.

C. Administrative costs related to taxes and duties and the refund of taxes and duties shall be deemed to be included in the Bid Price.

1.14 PROOF OF ABILITY

A. The Bidder shall be competent and capable of performing the various items of Work and must have a minimum of 5 years of current experience in similar work.

B. The Bidder may be required to furnish additional statements covering other matters, including financial resources.

1.15 BID SECURITY

A. The bid shall be accompanied by bid security in the form of a certified cheque or bid bond.

B. The bid security shall be payable to the Owner in the amount of $25,000.

C. The Bidder shall keep its bid open for acceptance for 60 days after the closing date. In the event the Bidder withdraws its bid during the 60-day period, such withdrawal shall result in the forfeiture of the bid security furnished with this bid and shall not relieve the Bidder from such other consequences of the said purported withdrawal.

D. Upon being notified that its bid has been accepted, the Bidder shall execute copies of the Contract Form, supply the specified bonds and insurance documents and start Work as directed.

E. If the Bidder fails to deliver the executed copies of the Contract Form, or to supply the specified bonds and insurance documents, within 2 weeks of the date of acceptance of the bid, or to start the Work when directed, such failure shall result in the forfeiture of the bid security furnished with this bid and shall not relieve the Bidder from such other consequences of the said failure.

F. Bid deposits of unsuccessful Bidders will be returned not later than 2 weeks following Contract award.

G. The bid deposit of the successful Bidder will be returned with the first progress certificate.

1.16 AGREEMENT TO BOND

A. Every bid shall include an 'Agreement to Bond' in an acceptable form and shall be completed by a surety company authorized by law to carry on business in the Province of the Place of Work.

1.17 BONDS

A. An Undertaking to Bond is required to be submitted with the Bid. The Undertaking to Bond is to be from a recognized guarantee or surety company acceptable to the Township, authorized by law to do business in the Province of Ontario. The Bidder will supply:

(a) a Performance Bond, in the Form 32 under Section 85.1 of the Construction Act, in the amount of 100% of the Contract Price,

(b) and a Labour and Material Payment Bond, in the Form 31 under Section 85.1 of the Construction Act, in the amount of 50% of the Contract Price.

B. Such bonds must be approved by and acceptable to the Township and must be furnished when the contract is signed by the Contractor.

1.18 LIQUIDATED DAMAGES

A. Liquidated Damages are stipulated by Clause 1.29 in Section 00800 of the Contract Documents.

1.19 WORKPLACE SAFETY AND INSURANCE BOARD

A. The Contractor shall, at the time of entering into any Contract with the Owner, make a statutory declaration or furnish a satisfactory clearance letter from the Workplace Safety and Insurance Board stating that all assessments or compensation payable to the Workplace Safety and Insurance Board have been paid.

1.20 STATUTORY DECLARATION OF PAYMENTS, LIENS & LIABILITIES

A. Prior to the release of any holdback payment, the Contractor shall be required to complete a “Statutory Declaration of Payments, Liens and Liabilities” form, as stipulated in Section 00800.

1.21 SUBCONTRACTORS

A. The Bidder shall submit with its bid the names and addresses of Subcontractors it proposes to use and the value for the subtrades listed in Appendix "B" of the Stipulated Price Bid 'List of Subcontractors'.

1.22 EQUIVALENTS

A. When a Product is specified by its trade or other name (whether such name is followed by the phrase 'or approved equal' or not), the Bidder shall base its bid price on the supply of one of the named Manufacturer's Product and no other.

B. The design of the Works has been based on Acceptable Manufacturers, Suppliers and First Named Manufacturers. Bidders wishing to use Alternative Named Products shall supply such products and provide all materials and labour necessary to complete the Works at no additional cost to the Owner. The Contractor shall reimburse the Owner for any additional costs to review and modify the design of the Works to accommodate such products.

C. The Bidder may submit with its bid suggested equivalents to those Products specified by trade or other names. Such submissions shall be made on Appendix "C" of the Stipulated Price Bid attached and shall show the name of the Product specified, the name and description of the suggested equivalent, and the total revision to the Bid Price that would result if the equivalent were accepted.

D. Substitution of Products may be made only on written acceptance of the Consultant.

1.23 LUMP SUM FOR MOBILIZATION AND DEMOBILIZATION

A. The mobilization and demobilization item in the Stipulated Price breakdown is to cover the Bidder's cost of mobilization at the beginning of the construction period and demobilization at the close of the construction period. The price entered for this item shall be consistent with the costs involved but shall not, in any event, exceed 5 per cent of the Bid Price.

B. If the Bidder has entered against this item in its bid a price in excess of 5 per cent of the bid price, in preparing Contract Documents based upon the bid, the price for the said item shall be reduced to an amount not exceeding 5 per cent of the Bid Price and the amount of the reduction shall be added to other items in the Stipulated Price breakdown as is deemed to be fair and reasonable so the Bid Price shall not be affected.

C. Sixty per cent of the price for mobilization and demobilization item shall be considered as relating to mobilization and the balance to demobilization.

D. The payment for mobilization shall be included in the first payment certificate issued for the Contract subject to total mobilization being performed. Otherwise, it shall be paid in part over a number of payments until totally performed.

E. The payment for demobilization shall become due following substantial performance of the Work and subject to the Consultant being satisfied that full demobilization has been performed. The Consultant may, at its discretion, allow part payment for demobilization before total demobilization has been affected.

1.24 TENDER INQUIRIES

A. Inquiries may be addressed to AECOM by email only to:

Attention: Nancy Maahs
Email: nancy.maahs@aecom.com

Deadline for questions regarding the Tender is Friday, January 26, 2024.

END OF SECTION

SECTION 00200 – SUPPLEMENTARY DEFINITIONS

DEFINITIONS

Add the following definitions:

27. **Alternate**: has the meanings set out in 1.2 2 of the Instructions to Bidders.

28. **Alternative Price**: The amount to be added to or deducted from the Bid Price for an Alternate.

29. **Bid Closing**: is the time and date as specified in Instruction to Bidders, Section 1.4.

30. **Bid Deposit**: means the documents set out in Instructions to Bidders Section 1.15.

31. **Bid Documents**: means the documents set out in Article A-3 of the Agreement between Owner and Contractor (CCDC2).

32. **Bid Price**: is the amount as provided by the Bidder in the Stipulated Price Bid Form.

33. **Certificate of Substantial Performance:** means a certificate issued by the Consultant indicating that Substantial Performance of the Work has been achieved.

34. **Contemplated Change Order**: a written description of a proposed change in the Work. issued after the award of the Contract and does not constitute a Change Order or Change Directive, but rather is a notice of a proposed change only.

35. **Contingency** or **Contingency Allowance**: means an allowance to cover the costs of possible Work, such as Concealed or Unknown Conditions, or Changes, that is not identified at the Bid Closing but which may, pursuant to provisions of the Contract Documents, become part of the Work.

36. **Labour and Materials Payment Bond**: means a bond to be supplied by the Successful Bidder, which bond will guarantee that all suppliers of labour or materials will be paid for labour and materials furnished to the Contractor, for use on the project.

37. **Non-Bid Information**: means any information, plans, drawings, shop drawings of existing equipment or facilities, geotechnical reports or record drawings, photos, reports or other documents which are not included or are not referred to in the Bid Documents.

38. **Notice of Award**: a written notice delivered by the Owner to the Bidder accepting a Bid.

39. **Notice to Proceed**: a written notice delivered by the Owner instructing the Contractor to commence the Work.

40. **Optional Work**: means Work which will/may be described in the Stipulated Price Bid Form that will be undertaken and included in the Work at the election of the Owner.

41. **Performance Bond**: means a bond to be supplied by the Successful Bidder, which bond will guarantee the faithful performance of the Contract, and in default thereof, shall protect the Owner against any losses or damage arising by reason of failure of the Successful Bidder to faithfully perform the Contract.

42. **Successful Bidder**: means the Bidder to whom a Notice of Award is sent.

43. **Total Completion of the Work** means the completion of the Contract, with the exception of warranty obligations, including the rectification of all deficiencies identified at the time of Substantial Performance of the Work

SECTION 00300 - STIPULATED PRICE BID

PROJECT TITLE: Chapleau Emergency Backup Power Modifications

LOCATION: Township of Chapleau, Ontario

SUBMITTED TO: The Township of Chapleau

LEGAL NAME OF BIDDER: _____

ADDRESS: _____

CITY: _____ PROVINCE:_____ POSTAL CODE: _____

SPB.01 BID PRICE

A. I, (We), the undersigned, having fully examined the locality and Place of the Work, having fully investigated the conditions of the Work, having read and understood the Bid Documents as listed in Appendix "A" and having secured all of the information necessary to enable me (us) to submit this Bid, hereby agree and offer to enter into a Contract in the form of CCD2-2008 to perform the totality of the Work outlined by the Bid Documents for the Total Stipulated Price of:

_____

_____ Dollars ($_____)
in Canadian funds, which price includes any specified cash allowances and contingency allowances, **excluding HST**.

SPB.02 INTEREST

A. Should either party fail to make payments as they become due under the terms of the Contract or in an award by arbitration or court, interest at Zero per cent (0%) per annum above the bank rate on such unpaid amounts shall also become due and payable until payment. Such interest shall be compounded on a monthly basis. The bank rate shall be the rate established by the Bank of Canada as the minimum rate at which the Bank of Canada makes short term advances to the chartered banks.

SPB.03 ADDITIONS AND DEDUCTIONS

A. The Bidder agrees that, if this Bid is accepted by the Owner:

1. it will carry out additional or extra work (including the supplying of any additional Products pertaining thereto) or will delete any work as may be required by the Engineer in accordance with the Contract; and,

2. the carrying 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 by the Bidder of such Contract Change order shall not, except as expressly stated in such Contract Change order, waive, affect or vary 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 Owner or of the Engineer under the Contract.

B. The Bidder agrees that, if this Bid is accepted by the Owner the prices shall be determined in accordance with the General Conditions as amended by the Supplementary Conditions.

C. The Bidder agrees that it is not entitled to payment of the Cash and Contingency Allowances except for additional work carried out in accordance with the Contract and only to the extent of such additional work, as authorized by the Engineer in writing.

SBP.04 ADDENDA

A. I, (We) agree that we have received Addenda ___ to ___ inclusive, and the Bid price includes for the provisions set out in such Addenda.

SPB.05 CONTRACT TIME

A. I, (We) agree to commence the Work as specified, to proceed continuously to completion and to be **Substantially Performed by November 8, 2024** (including commissioning).

B. I, (We) agree to commence the Work as specified, to proceed continuously to completion and to have all work completed by **Final Completion by November 22, 2024** (including final resotoration and clean-up).

SBP.06 DECLARATIONS OF BIDDER

A. The Bidder declares that no person, firm or corporation other than the Bidder has any interest in this Bid or in the proposed Contract for which this Bid is made.

B. The Bidder declares that this Bid is made without any connection, comparison of figures or arrangements with, or knowledge of, any other corporation, firm or person making a Bid for the same Work and is in all respects fair and without collusion or fraud.

SPB.07 CONDITIONS OF BID

A. This Bid is irrevocable from the official closing time and is unconditionally open for acceptance for sixty (60) days after the official closing time, whether any other Bid has been previously accepted or not.

SPB.08 DISCLAIMER

A. The Bidder agrees and acknowledges there is no representation, warranty, collateral agreement or condition, whether direct or collateral, or expressed or implied, which induced the Bidder to submit this Bid, or on which reliance is placed by the Bidder, or which affects this Bid.

SPB.09 ALTERNATIVE PRICE(S)

A. The Bidder may submit alternative prices for work as indicated in Section 00300 – Appendix C.

SPB.10 SIGNING OF BIDS

Dated at _____ this _____day of _____ , 20_____

_____
Name of Company (PRINT)

_____
Address (PRINT)

_____
Telephone

_____
Signature of Signing Officer

_____
Name & Title of Signing Officer (PRINT)

H.S.T. Registration # _____

NOTE:

If the Bid 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 Bid is submitted by or on 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 shall be witnessed.

SECTION 00300 - STIPULATED PRICE BID

APPENDIX "A": LIST OF BID DOCUMENTS

Project Title: Chapleau Emergency Backup Power Modifications

Legal Name of Bidder: _____

The following is a list of Bid Documents for the above-named project:

	Pages
Addendum Numbered ____ to ____	
Tender Ad	1
Tenderer's Check List	1
Section 00100 – Instructions To Bidders	9
Section 00200 – Supplementary Definitions	2
Section 00300 – Stipulated Price Bid	3
Section 00300 – Appendix A - List of Bid Documents	2
Section 00300 – Appendix B - List of Subcontractors and Suppliers	1
Section 00300 – Appendix C - Alternative Prices	1
Section 00300 – Appendix D - Breakdown of Total Tender Price	2
Section 00800 – Supplementary Conditions	12
General Conditions (CCDC #2) - Not Included in Tender Package	

DIVISION 1 - GENERAL REQUIREMENTS

01000	General Requirements
01135	Coordination
01150	Project Meetings
01200	Alternatives and Substitutions
01290	Measurement and Payment
01330	Submittals
01510	Temporary Facilities
01600	Materials and Equipment
01700	Contract Closeout
01762	Commissioning
01764	Training

DIVISION 16 - ELECTRICAL

16010	Electrical General Requirements
16050	Basic Electrical Materials Methods
16060	Grounding
16120	Wire and Cables 0-1000V
16130	Raceways
16460.05	Dry Type Autotransformer

CONTRACT DRAWINGS

E0.1	Cover Sheet and Drawing Index
E0.2	Legend and General Notes
E0.3	Typical Details

Civic Centre

E-1.1	Electrical Site Plan and Scope of Work
E-1.2	Floor Plan
E-1.3	Single Line Diagram

Recreation Centre

E-2.1	Electrical Site Plan and Scope of Work
E-2.2	Floor Plan
E-2.3	Single Line Diagram

SECTION 00300 - STIPULATED PRICE BID

APPENDIX "B": LIST OF SUBCONTRACTORS & SUPPLIERS

Project Title: Chapleau Emergency Backup Power Modifications

Legal Name of Bidder: _____

1. The following are the subcontractors proposed for the listed portions of the work.
2. For items followed by "(Supply)", the proposed supplier of the equipment must be identified. The Contractor cannot change the named supplier unless approved by the Engineer and Owner.
3. Refer to Section 00100 - Instructions to Bidders.
4. Names, addresses and subcontract values must be filled in. If a subcontractor is not to be used for any work listed, then show "By Own Forces".

SUB TRADE	NAME OF SUBCONTRACTOR / SUPPLIER	ADDRESS	VALUE OF SUBCONTRACT
Generator Supplier			
ATS Supplier			
Electrical Equipment			
Site Work			

[ ] Bidder's Initials

SECTION 00300 - STIPULATED PRICE BID

APPENDIX "C": ALTERNATIVE PRICES

Project Title: Chapleau Emergency Backup Power Modifications

Legal Name of Bidder: _____

1. I/We hereby offer alternative price(s) for Work as indicated, consistent with requirements of the Contract Documents. The alternative price(s) listed includes all applicable taxes and duties, all costs to complete the Work covered by the alternative price, and represents the amount by which the Total Tender Price will be increased or decreased, as applicable, if the alternative price is accepted.

DESCRIPTION OF ALTERNATIVE WORK	EFFECT ON STIPULATED PRICE ($)	
	ADDITION	DELETION

[ ] Bidder's Initials

SECTION 00300 - STIPULATED PRICE BID

APPENDIX "D": BREAKDOWN OF TOTAL TENDER PRICE

Project Title: Chapleau Emergency Backup Power Modifications

Legal Name of Bidder: _____

The bidder is required to submit to the Engineer the Breakdown of Total Stipulated Price Bid given in the form below. Unbalanced breakdowns may be refused or be adjusted by the Engineer.

Description		**Value of Work**
PART 'A' – CIVIC CENTRE		
1.	MOBILIZATION AND DEMOBILIZATION	$
2.	BONDS AND INSURANCE	$
3.	PERMITS	$
4.	SITE WORKS	$
5.	ELECTRICAL	
	5.1 MODIFICATIONS	$
	5.2 GENERATOR	$
	5.3 ATS	$
	5.4 CABLING	$
6.	COMMISSIONING AND TRAINING	$

Description		**Value of Work**
7.	OPERATION AND MAINTENANCE MANUALS / AS-BUILTS	$
8.	CONTINGENCY ALLOWANCE	$ 25,000.00
TOTAL TENDER PRICE PART 'A'		**$**

PART 'B' – RECREATION CENTRE		
1.	MOBILIZATION AND DEMOBILIZATION	$
2.	BONDS AND INSURANCE	$
3.	PERMITS	$
4.	SITE WORKS	
5.	ELECTRICAL	
	5.1 MODIFICATIONS	$
	5.2 GENERATOR	$
	5.3 ATS	$
	5.4 CABLING	$
6.	COMMISSIONING AND TRAINING	$
7.	OPERATION AND MAINTENANCE MANUALS / AS-BUILTS	$

Description		**Value of Work**
8.	CONTINGENCY ALLOWANCE	$25,000.00
TOTAL TENDER PRICE PART 'B'		**$**

SUMMARY OF TOTAL TENDER PRICES	
PART 'A' – CIVIC CENTRE	$
PART 'B' – RECREATION CENTRE	$
TOTAL STIPULATED PRICE BID (Excl. HST)	**$**

* The Tenderer agrees that the Contingency Allowance will not be expended without the written direction of the Contract Administrator. If the Allowances are not expended, the amount will be deducted from the Total Contract Price.

SECTION 00800 – SUPPLEMENTARY CONDITIONS

1.1 CCDC DOCUMENT

A. Standard Construction Document CCDC-2 2008, including Agreement Between Owner and Contractor, Definitions and General Conditions, and these Supplementary Conditions form a part of the Contract Documents. CCDC-2, is amended as specified in this Section.

B. A copy of CCDC-2 2008, is not bound in the bid documents but will be in the executed Contract Documents.

1.2 AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. Refer to Article A-5, Payment, of the AGREEMENT BETWEEN OWNER AND CONTRACTOR in the CCDC Standard Construction Document. Payments to the Contractor will reflect the maintenance security holdback as specified in this Section and revisions to article GC 12.3, Warranty.

1.3 DEFINITIONS

A. Whenever the term "Bid Documents" is used in the Specification, it refers to the documents issued for bid (including any addenda issued), and listed in Stipulated Price Bid Appendix "A" - List Of Bid Documents. When a Contract is executed the Bid Documents become the Contract Documents.

B. The following shall form a part of the "DEFINITIONS" found in the CCDC2-2008 Standard Construction Document:

1. "Install":
   "Install" means install and connect.

2. "Exposed":
   "Exposed" means all work normally visible to building occupants.

3. "Submit":
   "Submit", unless otherwise defined in succeeding Sections of the Specification, means submit to the Consultant. Similarly, words such as "reviewed", "witnessed", "designated" are to be read with the words "by the Consultant" immediately following the verb.

4. "Constructor":
   For the purposes of the Occupational Health and Safety Act, the Contractor for this Contract shall be designated the "Constructor" and shall assume all responsibilities of the Constructor set out in the Act and its Regulations.

1.4 GC 1.1 - CONTRACT DOCUMENTS

A. Add to paragraph 1.1.6 as follows:

"The Contractor shall be responsible for the Work in its entirety and shall assign responsibility for the performance of the Work in such manner as the Contractor deems appropriate, pursuant to the trade obligations, if any, of the Contractor and the Owner."

B. Add the following to paragraph 1.1.7:

"The location of apparatus, fixtures, outlets, etc. shown or specified, shall be considered as only approximate. The actual location shall be as directed and as required to suit the conditions at the time of installation. Before installation, the Contractor shall consult the Consultant and ascertain the actual location required."

C. Revise Paragraph 1.1.8 to the following:

"The Contractor will be provided, without charge, five copies of the Contract Documents or parts thereof to perform the Work. Additional "clear" copies of the Contract Documents in excess of five copies will be supplied to the Contractor at cost upon request of the Contractor.

1.5 GC 2.2 - ROLE OF THE CONSULTANT

A. Add new paragraph 2.2.15 as follows:

"2.2.15 Notwithstanding the requirements specified in paragraph 2.2.13, the Contractor shall prepare reproducible working detail and interference drawings, supplementary to the Contract Documents, when deemed necessary by the Consultant, for all constricted spaces, and areas where a multiplicity of materials and/or apparatus occur, or where the Work due to architectural and structural considerations involves special study and treatment. Such drawings shall be neatly prepared and dimensioned having regard for all trades affected. Right of way shall be given to services requiring continuous grade. Such drawings shall be submitted for information."

1.6 GC 2.3 - REVIEW AND INSPECTION OF THE WORK

A. Add new paragraph 2.3.8 as follows:

"2.3.8 The Consultant will have a field representative on the site of the Work on an as required basis to review and inspect the Work, to verify that the quality of the workmanship and products generally conform with the intent of the Contract Documents and to assess with the Contractor the value of the Work performed for the purpose of preparing Certificates of Payment. The presence of the field representatives on the site will not abrogate any of the Contractor's responsibility for performance of the Work required by the Contract Documents."

1.7 GC 3.4 - DOCUMENT REVIEW

A. Add new paragraph 3.4.2 as follows:

"3.4.2 Failure to perform such review shall not relieve the Contractor of responsibility."

1.8 GC 3.5 - CONSTRUCTION SCHEDULE

A. Amend paragraph 3.5.1.1 by adding to the first sentence thereof the following

"...and a current Products delivery schedule with respect to those Products identified in the Specification as Products requiring a shop drawing submittal. Also provide monthly project updates using appropriate means."

1.9 GC 3.6 - SUPERVISION

A. Add new paragraph 3.6.3 as follows:

"3.6.3 The Contractor shall submit to the Owner and the Consultant the name, address and home telephone number of the appointed representative, and any other responsible persons who may be contacted during non-working hours."

1.10 GC 3.7 -SUBCONTRACTORS AND SUPPLIERS

A. Add the following to the end of sub-paragraph .1 of paragraph 3.7.1:

"and to require Subcontractors to the Contractor to enter into contracts or written agreements with their Subcontractors and suppliers whereby their Subcontractors and suppliers will be required to perform their work in accordance with and subject to the terms and conditions of the Contract Documents."

B. Revise paragraph 3.7.2 by adding the following to the end of the paragraph:

"and further agrees not to change any Subcontractor or Supplier during the course of the Contract without the written consent of the Owner, which consent shall not be unreasonably withheld."

1.11 GC 3.9 - DOCUMENTS AT THE SITE

A. In Paragraph 3.9.1, insert after the words "Contract Documents", "shop drawings, change notices, Change Orders, Change Directives, other modifications to the Contract, materials and field test reports, and a copy of the current construction schedule and the current equipment and materials delivery schedule."

1.12 GC 3.11 - USE OF THE WORK

A. Add new paragraph:

"3.11.3 The Owner shall have the right to enter and occupy the Work in whole or in part for the purpose of placing fittings and equipment or for other uses before the issuance of a final certificate for payment, if, in the opinion of the Consultant such entry and occupation does not prevent or interfere with the Contractor in the completion of the Contract within the time specified. Such entry and occupation shall not be considered as acceptance of the Work or in any way relieve the Contractor from responsibility to complete the Contract."

1.13 GC 4.1 - CASH ALLOWANCES

A. Revise paragraph 4.1.4 to the following:

"4.1.4 The following will apply to adjustments to a Cash Allowance:

(a) if costs under a cash allowance exceed the amount of the allowance, the Contractor shall be compensated for any excess costs incurred and substantiated plus an allowance of ten percent for overhead and profit on such excess costs

(b) if costs under a cash allowance are less than the amount of the allowance, the Contractor shall submit a credit for the amount of the lesser costs plus an allowance of nine percent for the overhead and profit included in the Contract Price as provided for in paragraph 4.1.4

(c) the adjustments of overhead and profit hereunder will be calculated on the sum of the cash allowances included in the Contract Price and no adjustment of the overhead and profit on the said sum will be made until the excess or deficit of the said sum exceeds ten percent, and then only on the amount by which the excess costs or the credits exceed ten percent of the said sum”

1.14 GC 5.1 - FINANCING INFORMATION REQUIRED OF THE OWNER

A. Delete this Article in its entirety.

1.15 GC 5.2 - APPLICATIONS FOR PROGRESS PAYMENT

A. Add new paragraph:

"5.2.8 After the first application, the Contractor shall attach to all applications for payment, a statutory declaration in the prescribed form that all accounts for all indebtedness which may have been incurred by the Contractor and for which the Owner might in any way be held responsible have been paid in full, except for amounts properly retained as a holdback or as an identified amount in dispute, are paid up to the last invoice."

1.16 GC 5.3 - PROGRESS PAYMENT

A. Paragraph 5.3.1.2, first line: Delete "10 days" and substitute "14 days".

1.17 GC 5.5 - PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

A. Add new paragraphs 5.5.1.3 and 5.5.1.4 as follows:

"5.5.1.3 The release of holdback moneys to the Contractor will be subject to and conditional upon the Contractor furnishing the Owner with the following:

(a) the sworn statement of the Contractor as required under paragraph 5.5.1.2, which shall be in the form of CCDC document 9A

(b) a certificate of clearance from the Workplace Safety Insurance Board

(c) a written undertaking to complete expeditiously within a period of 45 days or as agreed upon by the Owner and the Contractor any outstanding Work and to discharge all unfulfilled obligations under the Contract

(d) the sworn statement of the Contractor that all Goods and Services Tax (GST) payable on the Contract Price has been paid.

(e) if the Contractor is a non-resident Contractor as defined in the Retail Sales Act, 12.5.0 1980, C. 454, as amended, a duplicate copy of a valid certificate issued by the Minister of Revenue indicating that the Contractor has fulfilled its obligation with the Treasurer of Ontario with respect to tax payable pursuant to or in the performance of the Contract

5.5.1.4 The release of holdback moneys to a Supplier or Subcontractor pursuant to Article GC 5.6 will be subject to and conditional upon the Contractor furnishing the Owner with the following:

(a) a declaration of last supply in the form prescribed in Form 5 of the Construction Act, declared by the Subcontractor

(b) the sworn statement of the Supplier or Subcontractor which shall be in the form of CCDC Document 9C

(c) a certificate of clearance from the Workplace Safety Insurance Board in respect of the Supplier or Subcontractors' standing with the Board."

1.18 GC 6.2 - CHANGE ORDER

A. Add new paragraph 6.2.3 as follows

"6.2.3 The value of a change shall be determined in one or more of the following methods as directed by the Consultant:

(a) by estimate and acceptance of a lump sum

(b) by unit prices as set out in the Contract or subsequently agreed upon, which shall include overhead and profit, and other reasonable charges of the Contractor which shall be the total cost to the Owner. Adjustment to the Contract Price shall be based on the net quantity difference from original quantity.

(c) by actual credits and costs to the Owner. Where additional work is required, the cost to the Owner shall be the actual cost plus a percentage covering overhead and profit, after all credits included in the change have been deducted.

The following percentage fee for overhead and profit shall be applied to additional work:

(a) On work performed by the Contractor's own forces, the Contractor may charge a maximum of 15% combined percentage for overhead and profit;

(b) On work performed by Subcontractors, the Subcontractors may charge a maximum of 10% combined percentage for overhead and profit. The Contractor may charge a maximum of 10% combined percentage for overhead and profit on work performed by the Subcontractor."

1.19 GC 6.3 - CHANGE DIRECTIVE

A. Add new paragraph 6.3.8 as follows:

"6.3.8 Without limitation, the cost of performing the Work attributable to the Change Directive does not include:

(a) head office salaries and benefits and all other overhead or general expenses, except only for the salaries, wages and benefits of personnel described in paragraph 6.3.7.1 and the contributions, assessments or taxes referred to in paragraph 6.3.7.2;

(b) capital expenses and interest on capital;

(c) general cleanup, except where the performance of the Work in the Change Directive causes specific additional cleanup requirements;

(d) wages paid for field supervision or subcontractors;

(e) wages, salaries, rentals, or other expenses that exceed the rates that are standard in the locality of the Place of Work that are otherwise unreasonable; any costs or expenses attributable to negligence, improper work, deficiencies, or breaches of contract by the Contractor or subcontractors; and

(f) any costs of quality assurance, such as inspection and testing services, charges levied by authorities, and any legal fees unless such costs or fees are preapproved in writing."

B. Add new paragraph 6.3.9:

"6.3.9 All trade discounts, rebates, and refunds, and all returns from the sale of surplus materials and equipment shall accrue to the benefit of the Owner in computing the actual cost and the Contractor shall make provisions so that they can be secured. "

1.20 GC 6.4 - CONCEALED OR UNKNOWN CONDITIONS

A. Add new paragraph 6.4.5 as follows:

"6.4.5 No claims for extra payment to the Contractor will be allowed for extra work made necessary because of difficulties due to the conditions of the site, which were visible upon or reasonably inferable from examination of the said site, at the time prior to the signing of the Tender. Failure of the Contractor to visit and examine the site shall be deemed a waiver of all claims for extra payment due to any condition arising from the above condition of the site existing prior to the signing of the Contract."

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

A. Paragraph 7.2.3.1.: Delete in its entirety.

1.22 GC 8.2 - NEGOTIATION, MEDIATION AND ARBITRATION

A. Add new paragraphs 8.2.9, 8.2.10, 8.2.11, 8.2.12, 8.2.13, 8.2.14 and 8.2.15 as follows:

"8.2.9 Within five days of receipt of the notice of arbitration by the responding party under paragraph 8.2.6, the Owner and the Contractor shall give the Consultant a written notice containing

(a) a copy of the notice of arbitration

(b) a copy of supplementary conditions 8.2.9 to 8.2.15 of this Contract, and:

(c) any claims or issues which the Contractor or the Owner, as the case may be, wish to raise in relation to the Consultant arising out of the issues in dispute in the arbitration.

8.2.10 The Owner and the Contractor agree that the Consultant may elect, within ten days of receipt of the notice under paragraph 8.2.9, to become a full party to the arbitration under paragraph 8.2.6 if the Consultant:

(a) has a vested or contingent financial interest in the outcome of the arbitration

(b) gives the notice of election to the Owner and the Contractor before the arbitrator is appointed;

(c) agrees to be a party to the arbitration within the meaning of the rules referred to in paragraph 8.2.6, and,

(d) agrees to be bound by the arbitral award made in the arbitration.

8.2.11 If the Consultant is not given the written notice required under paragraph 8.2.9, both the Owner and the Contractor are estopped from pursuing an action, counter claim or other proceeding or making an application against the Consultant arising out of the issues in dispute in the arbitration between the Owner and the Contractor under paragraph 8.2.6.

8.2.12 If an election is made under paragraph 8.2.10, the Consultant may participate in the appointment of the arbitrator and, notwithstanding the rules referred to in paragraph 8.2.6, the time period for reaching agreement on the appointment of the arbitrator shall begin to run from the date the Owner receives a copy of the notice of arbitration.

8.2.13 The arbitrator in the arbitration in which the Consultant has elected under paragraph 8.2.10 to become a full party may:

(a) on application of the Owner or the Contractor, determine whether the Consultant has satisfied the requirements of paragraph 8.2.10, and;

(b) make any procedural order considered necessary to facilitate the addition of the Consultant as a party to the arbitration.

8.2.14 The provisions of paragraph 8.2.9 shall apply mutatis mutandis to written notice to be given by the Consultant to any sub-consultant.

8.2.15 In the event of notice of arbitration given by a Consultant to a sub-consultant, the sub-consultant is not entitled to any election with respect to the proceeding as outlined in 8.2.10, and is deemed to be bound by the arbitration proceeding."

1.23 GC 10.2 - LAWS, NOTICES, PERMITS AND FEES

A. Revise Paragraph 10.2.2 to the following:

"10.2.0 All permits,including the Building Permit, licences, certificates and fees shall be obtained and paid for by the Contractor, where applicable.

B. Add new paragraph 10.2.8 as follows:

"10.2.8 The Contractor shall, as a condition of payment of the unpaid balance of the Contract Price, prior to issue of a Certificate of Total Performance of the Work, furnish all final certificates that are required or given by the appropriate governmental authorities as evidence that the Work as installed conforms with laws and regulations of authorities having jurisdiction, including certificates of compliance for Owner's occupancy or partial occupancy."

1.24 GC 11.1 - INSURANCE

A. Add the following to the end of para. 11.1.1.1:

"The policies shall include the Consultant, Subconsultants, Owner and Operator as an additional named insured but only in respect of, and during, operations performed by or on behalf of the Contractor. In addition, the policy shall contain a cross liability clause endorsement."

B. Add new paragraph 11.1.6 as follows:

"11.1.6 The Contractor shall submit annually to the Owner, for a period of four years after expiry of the twenty-four month Completed Operations Liability insurance coverage, successive one year Completed Operations Liability insurance policies issued by the insurer writing the twenty-four month Completed Operations Liability insurance coverage, and failure of the Contractor to do so will result in cancellation by the Owner of the waiver of liability specified in paragraph 12.2.1 of Article GC 12.2, and put the Contractor in breach of Contract."

1.25 GC 12.3 - WARRANTY

A. Add new paragraph 12.3.7 as follows:

"12.3.7 Should the Contractor fail to comply promptly with a written notice given by the Consultant pursuant to paragraph 12.3.3, the Owner may, 48 hours after a further written notice to the Contractor, perform the necessary Work, which costs shall be payable by the Contractor to the Owner."

B. Add new paragraphs 12.3.8, 12.3.9, 12.3.10 and 12.3.11 as follows:

"12.3.8 In addition to any other holdback required by statute or otherwise agreed by the Parties, the Owner will retain until expiry of the warranty, a warranty security holdback of **$5,000.**

12.3.9 The amount of the warranty security holdback may be applied by the Owner in whole or in part in order to reimburse the Owner for funds expended by the Owner as a result of default by the Contractor respecting the warranty obligations of the Contractor set out in the Contract, and is in addition to any other rights or remedies of the Owner in respect to the correction of the Contractor's default of its warranty obligations.

12.3.10 The warranty security holdback for warranty obligations referred to in paragraph 12.3.8 shall be first retained by the Owner when the Consultant certifies that Work to the value of 70 percent of the Contract Price has been performed and shall be calculated and shown as an amount to be retained in the monthly applications for payment by the Contractor in succeeding applications, commencing when the Contractor makes its first application for payment on the basis that Work to the value of 70 percent of the Contract Price has been performed.

12.3.11 At the time of the issue of the final certificate of payment the Owner will pay the Contractor the balance of the Tax (HST) with respect to the total amount of the Contract, so that no HST will be due on payment of the warranty security holdback."

1.26 OCCUPATIONAL HEALTH AND SAFETY

A. In order to avoid any misunderstanding as to the nature of the work to be performed herein, the Contractor by executing this Contract, unequivocally acknowledges that he is the constructor within the meaning of the Occupational Health and Safety Act, R.S.O. 1980, Chapter 321, as amended, and the Contractor undertakes to carry out the duties and responsibilities of a constructor with respect to the Work.

B. It is specifically drawn to the attention of the Contractor that the Occupational Health and Safety Act provides in addition to other matters that,

"A constructor shall ensure, on a project undertaken by the constructor that,

(a) the measures and procedures prescribed by this Act and the regulations are carried out on the project;

(b) every employer and every worker performing work on the project complies with this Act and the regulations; and,

(c) the health and safety of workers on the project is protected."

C. The Contractor shall with each request for progress payment provide a letter stating that all requirements under The Occupational Health and Safety Act have been satisfied.

1.27 OPERATIONAL RISKS

A. The position of all pole lines, conduits, watermains, sewers and other underground and overground utilities and structures is not necessarily shown on the Contract Drawings, and, where shown, the accuracy of the position of such utilities and structures is not guaranteed and the Owner disclaims, on behalf of himself and those responsible for such drawings, all liability with respect to same. Before starting Work, the Contractor shall inform himself of the exact locations of such utilities and structures, and shall be liable for damages to them as a result of any act or omission, whether or not the result of negligence, by those for whom he is responsible. Unless otherwise specified, the Contractor shall temporarily support or relocate such utilities and structures, or temporarily remove them, and restore them, to the satisfaction of the owners of the utilities and structures. The Contractor waives any claim and releases the Owner and the agents of the Owner from all liability for damages suffered as a result of such Contract Drawings.

B. Permanent relocation of underground or overhead utilities will be performed and paid for by the Owner, if necessitated by coincidence of lines or grades, or both. The Contractor shall be responsible for scheduling permanent relocations of utilities with the Contract Work.

C. The Consultant will provide the Contractor in writing with bench marks and points of reference to be used by him in setting out the Work. 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 setting out by the Contractor shall include but shall not be limited to the preparation of grade sheets, the installation of centre lines stakes, grade stakes, offsets, site rails and screeds.

1.28 EXAMINATION OF DOCUMENTS AND SITE

A. The Contractor declares and represents that in tendering for the Work, and in entering into a Contract with the Owner for the performance of the Work, he has either investigated for himself the character of the Work to be done and all local conditions, including the locality of any utility which can be determined from the records or other information available at the offices of any persons, partnership, corporation, including a municipal corporation and any board or commission thereof having jurisdiction or control over the utility that might affect his tender or his acceptance of the Work, or that, not having so investigated, the Contractor has assumed and does hereby assume all risk of conditions now existing or arising in the course of the Work which might or could make the Work, or any items thereof more expensive in character, or more onerous to fulfill, than was contemplated or known when the tender was made or the Contract signed.

B. The Contractor also declares that in tendering for the Work and in entering into this Contract, the Contractor did not and does not rely upon information furnished by the Owner or any of his agents or servants respecting the nature or confirmation of the ground at the site of the Work, or the location, character, quality or quantity of the materials to be removed or to be employed in the construction of Work, or the character of the construction machinery and equipment or facilities needed to perform the Work, or the general and local performance of the work under the Contract and expressly waives and releases the Owner from all claims with respect to the said information with respect to the Work.

1.29 LIQUIDATED DAMAGES

A. Should the Contractor fail to complete the works to the satisfaction of the Owner and in accordance with the Contract within the time for Completion specified in the Contract or the extended time allowed in writing by the Owner, the Contractor shall pay to the Owner as liquidation damages (in addition to the amounts payable by the Owner in respect to the Owner's representation on site) the sum of **$1,000** for each calendar day the the Works remain uncompleted after the time so specified or allowed. This figure has been derived from the cost to the Owner for delay in completion of Works, capital cost of the contract and other relevant cost where applicable.

B. It is understood that time is of the essence of this agreement, and that the Owner has no obligation during the course of the Contract to advise the Contractor that the Owner intends to implement the provisions of this Contract with respect to liquidated damages.

1.30 PRODUCTS AND WORKMANSHIP

A. All products and workmanship shall be in every respect first class and the Work shall be performed in accordance with the best modern practice. Whenever the Contract Documents, or directions of the Consultant admit of a reasonable doubt about what is permissible, and when they fail to state the quality of any Work, the interpretation that requires the best quality of Work is to be followed.

B. All products shall be new with date of manufacture on appropriate technical data and equipment nameplates, etc.

1.31 PUBLICITY RELEASES

A. The Contractor shall not release, or allow to be released by others, to the public, except as required by regulatory authorities, any information on the Contract without the prior written consent of the Owner and/or the Consultant. The Contractor shall submit to the Owner for review and consent a written copy of the information proposed to be released.

TECHNICAL SPECIFICATIONS

		REVISION	DISCIPLINE
Division 00 Procurement and Contracting Requirements			
00 00 00	Project Title Page	R00	
00 01 10	List of Contents	R00	
Division 1 General Requirements			
01000	General Requirements	R00	
01110	Environmental Protection	R00	
01135	Coordination	R00	
01150	Project Meetings	R00	
01200	Alternatives and Substitutions	R00	
01290	Measurement and Payment	R00	
01310	Schedules and Progress Reporting	R00	
01330	Submittals	R00	
01400	Quality Requirements	R00	
01410	Regulatory Requirements	R00	
01415	Safety Requirements	R00	
01510	Temporary Facilities	R00	
01600	Materials and Equipment	R00	
01700	Contract Closeout	R00	
01730	Operation and Maintenance Data	R00	
01740	Cleaning	R00	
01760	Warranty	R00	
01762	Commissioning	R00	
01764	Training	R00	
Division 16 Electrical			
16010	Electrical General Requirements	R00	E
16021	Demolition of Electrical Systems	R00	E
16050	Basic Electrical Materials Methods	R00	E
16060	Grounding	R00	E
16120	Wire and Cables 0-1000V	R00	E
16130	Raceways	R00	E
16180	Automatic Transfer Switches	R00	E
16231	Standby Diesel Generator	R00	E
16440	Disconnect Switches	R00	E
164441	Low Voltage Panelboards	R00	E

DIVISION 1 – GENERAL REQUIREMENTS

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01000 – GENERAL REQUIREMENTS

PART 1. GENERAL

1.1 SCOPE OF WORK

A. The work required to be completed under this Contract includes the supply of labour, material, equipment, site offices, and other requirements as necessary to complete the construction as shown in the Contract Drawings and as specified herein.

B. The description of the work is not, nor is it intended to be, a complete and all-inclusive description of the scope of the Work. The complete Tender Document package and specifications and drawings shall be read by the Contractor to determine the scope of the Work.

1.2 EXAMINATION OF THE SITE AND EXISTING DOCUMENTATION

A. Make a careful examination of the site and of all existing documents and take all such steps that are necessary to ascertain the conditions under which the work is to be carried out and assess any possible difficulties to be encountered. No extra money shall be payable to the Contractor due to difficulties adversely affecting his work or any other matter affected by conditions at the existing or proposed sites or from existing documentation.

1.3 CONTRACT DOCUMENTS

A. The Contractor shall study the Contract Documents to determine the extent of work required by each Section and upon which work of other Sections depend and to co-ordinate scope and extent of work to be performed by each trade.

B. The Contractor shall within 48 hours of becoming aware of circumstances which may require a clarification or change in the Work, give written notice to the Engineer outlining such circumstances and requesting written directions.

C. As applicable, maintain in good condition and order on site one copy of the documents approved for building permit, addenda, site instructions, proposed changes, change orders, test reports, manufacturer's installation and application instructions, progress photographs, as-built drawings, approved progress schedules, minutes of site meetings, and other modifications to the Contract Documents.

D. All sections in these specifications are related to each other unless exceptions are noted by the Engineer.

1.4 LIMITS OF THE SITE

A. The limits of the site are as shown on the Contract Drawings. Confine operations within these limits, unless written approval is obtained from the Engineer and from the property owners affected.

B. Provide, as required, a copy of the written approval and release from property owners, at start of the Work, to the Engineer.

1.5 OCCUPYING THE SITE

A. Use only those areas designated by the Owner for the access, except in so far as is necessary for the execution of the Works, and in so doing, do not unnecessarily obstruct the normal traffic of, to, from or about the Site; and do not unreasonably allow any vehicles or materials to stand in front of, or near to, any buildings on the Site or any access thereto.

B. All inquiries and deliveries related to the Contractor's activities will be directed to the Contractor's site trailer.

C. Areas shown as Work Limits are areas designed for construction. Those areas outside of the Contractors Limits are restricted areas.

D. Confine operations within areas designated for construction, storage and access as shown on the Contract Drawings and/or as directed by the Engineer.

E. Limit access to and from the site as instructed by the Engineer.

F. Maintain safe access to any existing facilities for the operations staff at all times.

G. Limit possession of any areas of the Site occupied by operational building(Restricted Areas) to such times as are necessary for the execution of the works in those areas.

H. Clearly identify in the schedule when occupation of Restricted Areas is required and notify the Engineer in writing when such possession is required at least ten (10) working days in advance.

I. Do not occupy or use any of the Restricted Areas for a longer period than is necessary for the execution of any part of the works to be undertaken in those areas. Occupy an area not greater than the minimum required for that part of the works.

1.6 ACCESS TO THE SITE

A. Take care when mobilizing heavy machinery, equipment and materials over existing roads. No tracked machinery on asphalt, protection shall be used to prevent any damage to the existing pavment. Keep existing roads in good travelling condition acceptable to the Engineer and make good all damage which may result from construction operations.

B. Keep existing roads and other construction areas clean. If it is necessary to haul wet material, use suitable watertight trucks.

C. Keep dust down using water or calcium chloride, or both, to the satisfaction of the Engineer.

D. The Contractor will not impede traffic at any time. No offloading/loading to occur on the main driveway.

E. The construction site to be secure at all times.

1.7 MOBILIZATION AND DEMOBILIZATION

A. Supply and erect all signs, barricades, flashers, delineators, flag persons, and such other protection as may be required to protect the works and other on-site personnel during construction.

B. Provide security protection for Contractor's office, building and stored materials.

C. Move onto site and set up offices, storage facilities, building, sanitary facilities, temporary fencing, hydro and telephone.

D. Provide all necessary access to the project including haul roads as required and restoration of surface to original condition after haul roads are removed.

E. Move off site and remove offices, storage facilities, and all temporary facilities and leave the site clean and tidy.

1.8 CONTRACTOR USE OF PREMISES

A. Arrange with the Owner and Engineer for storage areas and access to the Works.

B. Make arrangements with property owners if additional areas are required. Obtain written agreements and submit copies to the Engineer.

C. Confine operations within working limits for construction, storage and access.

D. Install and maintain temporary chain link fencing along working and storage areas and access routes as coordinated with the Engineer.

E. Carry out the construction of the Works in such a manner that a minimum of inconvenience is caused to the Owner and occupants of properties adjacent to the Works.

F. Store materials separately on the Site at locations agreed upon with the Engineer, suitably protected to prevent their deterioration or the intrusion of foreign matter. In the opinion of the Engineer, remove any material which has deteriorated or been damaged immediately from the Site at no additional cost to the Owner.

G. During construction of the facilities, liaise with the Engineer and Operator to schedule work to minimize impacts on building operations. Operator and the Owner may restrict the time and duration of shutdowns, tie-ins and other disruptions to building operations.

H. Obtain written approval from the Engineer for tie-in work to the existing facilities. Operations staff will operate any valve, switch, or other controls on existing facilities.

I. Meter the supply of water and electricity for the construction and commissioning of the Works. Meter this supply and reimburse the Owner for all usages at the completion of the Contract. Meters to be read monthly, and a record maintained to be reconciled at the end of the Contract. Refer to Section 01515 – Temporary Utilities.

1.9 OWNER OCCUPANCY

A. The Owner and its operations contractor will occupy premises during entire construction period for execution of normal operations.

B. Cooperate with the Owner and Operator in scheduling operations to minimize conflict and to facilitate the Owner and Operator usage.

C. Maintain free access and parking for the Owner and Operator.

1.10 PARTIAL OWNER OCCUPANCY

A. Schedule and substantially perform designated portions of Work for Owner's occupancy prior to Substantial Performance of entire Works.

B. Provide additional warranty for all equipment, materials and workmanship placed into service and used by the Owner to maintain operations in accordance with the sequence of construction until issuance of Substantial Performance for the entire Works.

C. The Owner will occupy designated areas for the purpose of operation to ensure effluent compliance.

1.11 DIMENSIONS OF EQUIPMENT, PIPING AND ASSOCIATED APPURTENANCES

A. Carefully check all dimensions shown on the drawings before commencing work. Notify the Engineer of any errors or discrepancies.

B. Where equipment is to connect to piping, and preliminary dimensions have been shown on the Contract Drawings, these dimensions will be superseded by those taken from final shop drawings. Co-ordinate and finalize installation details and dimensions in accordance with reviewed shop drawings.

C. Contractor to be satisfied of the equipment dimensions before ordering piping closure lengths and fittings.

1.12 TESTING

A. Provide samples for testing all materials as required by the Engineer. Prepare and store test samples under the direction of the Engineer. Bear all costs for providing and storing test samples.

B. Inspection and testing will be carried out by an independent testing laboratory selected by the Owner. Contractor to make samples available for the testing agency. Charges for the delivery, inspection and testing of samples will be borne by the Owner.

C. The cost of additional samples, delivery inspection and testing charges because of unsatisfactory test results shall be borne by the Contractor.

D. Where compaction of fill, backfill or subgrade is called for, the Engineer may order compaction tests, and tests will be arranged for by the Engineer.

E. Where tests show that the work does not meet the specified requirements, the Contractor shall bear the cost of further testing to establish proof of the specified requirement.

1.13 EQUIPMENT PRIME COATS

A. Where the factory prime coat or shop paint coats are not specified, ensure the equipment is primed or shop painted with paint that is compatible with the final paint coatings specified.

B. Surface preparation, priming and finishing for shop finished items and surface preparation and priming for shop primed items are to be allowed for in the specification section of the contract in which each unit is specified.

C. Preparation and coating systems to be used for shop primed and shop finished items are specified elsewhere.

1.14 STANDARDS AND CODES

A. Throughout these Specifications, references are made to standards and codes. The Contractor and Subcontractors shall be familiar with these standards and codes as they pertain to the work. The absence of a reference to a specific code does not relieve the Contractor or Subcontractors of the responsibility to adhere to all applicable codes and standards.

B. In all cases, the performance of the works, finished product and all other aspects of this Contract are to be in accordance with the Owner's requirements', subject to the approval of the Engineer.

1.15 PERMITS, FEES AND INSPECTION

A. Except as specified in the Supplementary General Conditions, the Contractor shall apply for, obtain, and pay for all permits, licenses, inspection, examination testing and fees required.

B. The Contractor shall arrange for inspection of all work by the authorities having jurisdiction over the work. On completion of the work, the Contractor shall present to the Owner the final unconditional certificate of approval of the inspecting authorities.

C. Comply with the requirements of the latest edition of the applicable CSA standards, the requirements of the authorities, federal, provincial and municipal codes, the standard of the Underwriters Association and all other authorities having jurisdiction. These codes and regulations constitute an integral part of these specifications. In case of conflict, the codes take precedence over the Contract Documents. In no instance, reduce the standard established by the drawings and specifications by applying any of the codes referred to herein.

D. Before starting any work, submit the required number of copies of drawings and specifications to the authorities for their approval and comments. Comply with any changes requested as part of the Contract but notify the Owner immediately of such changes for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required.

E. Any work rejected or requiring correction by the inspection authority shall be rectified at the Contractor's expense and any additional inspections caused by deficient work shall also be paid for by the Contractor.

F. All work is subject to inspection by video camera or by still photo. The cost of such inspection will be at the Owner's expense.

G. The Engineer will carry out general visual inspections and will, if necessary, prepare a deficiency list for action by the Contractor, during and upon completion of the project. The Contractor shall correct all deficiencies prior to payment being issued for any further work. Final inspection approval must be obtained from each inspection authority having jurisdiction.

1.16 INSTALLATION INSTRUCTIONS

A. When manufacturers' instructions are intended to govern or are required to supplement the specifications for the assembly and installation of specific materials or equipment, the Contractor or Supplier shall provide sufficient copies of such instructions so that each crew working on the items affected has ready access to the instructions. The Contractor shall provide to the Engineer one copy of the instructions for his office records, one copy for on-site use by the inspector and one additional copy for the Owner.

B. The Engineer may require supervision or inspection of any equipment installation by the manufacturer, supplier or manufacturers' sales representative at no additional cost to the Owner where, in his opinion, installation procedures have been or are being compromised. On completion of installation and testing, obtain certification from suppliers or manufacturers that the equipment is correctly installed, is in full operating condition, and is operating within its design rating. Submit original certificates to the Engineer.

1.17 START-UP OPERATION OF COMPLETED WORKS

A. Utilities, Chemicals and Consumables

1. The Contractor is required to pay for all services, chemicals, water, electricity and any other temporary services required during the construction period.

2. Prior to the commencement of operation, the Contractor shall ensure that all the equipment has been thoroughly greased and oiled with materials approved by the manufacturer and in accordance with the manufacturer's written instructions.

3. All manuals, parts and supplies, for equipment introduced by the Contractor, which are required by the Contract shall be turned over to the Owner.

4. Provide a full tank/vessel of all chemicals and/or fuels at the time of transfer to the Owner.

B. During the period of operation, the Contractor shall have at the site supervisory personnel, mechanics, electricians, and other workmen to attend to any adjustments, corrections or operations which may be required.

1.18 EXISTING UTILITIES

A. Location

1. No responsibility will be assumed by the Owner, other than as specified in the Supplementary General Conditions, for the correctness or completeness of the drawings with respect to existing utilities, and if the Drawings of such existing utilities are found to be incorrect or incomplete, no claim for additional payment shall be made or considered valid on that account. Prior to

construction, the Contractor shall obtain further information where necessary, from the utilities, Owner, and municipal works departments, in order to determine on the site, the locations of underground utilities which may affect or be affected by the Work. If information is not available, the contractor shall perform any necessary sub-surface investigations in order to determine the exact number and location of all existing utility services, structures, underground pipes, cables and other similar items.

B. Notice to Utilities

1. When work is to be carried out in the vicinity of pipelines, underground cable, overhead lines or other works or structures of a utility or municipality, the Contractor shall give the utility, Owner or municipality at least 48 hours notice in writing before commencing the Work.

2. For work that affects the operational status of the building, the Contractor shall comply with Construction Staging and Sequencing Requirements of the Contract Documents.

3. The Contractor shall send a copy of all such notices to the Engineer.

C. Protection of Utilities and Structures

1. The Contractor shall ensure that its construction operations do not interfere with or damage existing utilities, equipment, structures and property. The Contractor shall support and protect from direct or indirect damage, existing utilities, equipment, structures and property which occur within or over construction operations, or adjacent to the Work. The methods of protecting and temporarily supporting utilities, structures and other items, where required, shall be satisfactory to the Engineer and the utility Owner concerned.

2. All such work and costs shall be included in, and be considered part of payment under, the applicable items for building and site work construction.

3. If, in the opinion of the Engineer, it is necessary to remove and replace or to relocate utilities which interfere with the permanent works constructed under this Contract, such work shall be done at the expense of the Owner by the utility owner concerned, or as additional work under this Contract and paid for in accordance with the provisions of the Contract if so ordered, unless identified on the drawings.

4. If any damage is caused, repair and make good such damage at no additional cost within a reasonable time and to the complete satisfaction of the Engineer.

1.19 HANDLING AND STORAGE OF MATERIALS

A. Provide all necessary equipment, materials and labour to safely off-load equipment at the site or nearest point of delivery and provide for any additional transportation necessary for storage or installation on the site. The methods employed for handling and storage must meet the requirements of the manufacturer, the specifications and the Engineer. The Contractor shall plan delivery of any required equipment to meet construction schedule.

B. Arrange for prompt off loading and pay any additional costs due to delays from any cause. Prior to accepting delivery examine all equipment to be incorporated into the work for damage and remedy any damage due to shipping and handling. Ensure that any repairs are approved by the Supplier such that warranties or guarantees are not invalidated.

C. If not required for immediate use, store equipment and materials separately on the site in original sealed packaging and provide suitable protection to prevent their deterioration or the intrusion of foreign matter. All equipment and materials shall be received directly from the manufacturer and not from the Contractor's inventory unless approved by the Engineer. The Contractor shall store and maintain equipment in accordance with the manufacturer's written instructions. In the opinion of the Engineer, any equipment and material which has deteriorated or been damaged shall be removed immediately from the site and replaced with new at the Contractor's expense.

D. Arrange for all materials and equipment to be stored under lock and key at all times to avoid theft or vandalism.

1.20 PROTECTION OF WORK AND MATERIALS

E. Protect the materials and the finishes of the work from damage. This required protection shall be in effect up until the date of total completion of the work as defined in the General Conditions.

1.21 SPECIFIED MATERIAL SUBSTITUTION

A. As specified in Section 01200 - Alternatives.

1.22 TIME FOR COMPLETION

A. Failure to deliver equipment on time, or at all, does not in any way relieve the Contractor of the responsibility to complete the Contract by the stipulated Completion Date.

1.23 SUBSTANTIAL PERFORMANCE

A. Under no circumstances will the Owner take over the works from the Contractor or issue the Certificate of Substantial Performance, prior to the Contractor providing all certificates from equipment suppliers stating that their equipment has been installed, tested and is in proper working order. The Contractor shall also supply installation instructions, maintenance manuals and parts lists for all components incorporated into the Work, provide training of the Owner and Operator's staff, complete commissioning of the Works and provide a complete set of record drawings.

B. Where the manufacturer's standard guarantee or warranty is less than the period of guaranteed maintenance as required in the Contract Documents, provide for any additional warranty or guarantee period at the price bid for the item or lump sum tender price including the item or equipment.

1.24 EXAMINATION OF WORK OF OTHER TRADES

A. Examine the work of all other trades and ensure that conditions are satisfactory for the completion of any subsequent work.

B. Notify the Engineer immediately of any adverse conditions which may affect subsequent work and do not proceed with any subsequent work until such conditions are rectified.

1.25 PREPARATION FOR TRADES

A. Make all necessary preparations in the work to provide for the satisfactory connections to, and execution of, all other trades affected.

B. Supply any articles which are to be built in by other trades and provide the necessary drawings and instructions for their proper location and installation.

1.26 NOTICES TO TRADES

A. Provide all other trades with sufficient notice when materials are to be supplied, set and/or installed by the trades. Co-ordinate work of trade with all other trades. Protect work from damage by other trades and prevent damage to work of other trades. Make good any damage to work of other trades at no additional cost to the Owner.

B. After each working day clean up as the work proceeds. Remove rubbish from the site at regular intervals and upon completion of the Work to maintain the site in a neat and orderly appearance.

1.27 WORK CARRIED OUT IN COLD WEATHER

A. Includes all or any work done in any season with no limitation or restriction of the time of year.

B. When work is to be carried out in freezing weather, heat all crushed stone, sand, water and other such materials in compliance with the Engineer's requirements and protect the work from damage by frost during and after placement. Provide, at no additional cost, the necessary means of heating the materials and protecting the work.

1.28 TESTING COMPLETED SYSTEM

A. The Contractor shall submit the required operation and maintenance data in conjunction with the final submission of shop drawings.

B. The Contractor shall submit a draft equipment and maintenance manual prior to commissioning the works in accordance with Section 01330 prior to commissioning as specified in Section 01762 – Commissioning.

1.29 SPECIFICATIONS

A. Maintain a copy of these specifications and all other standard specifications or parts of specifications referred to herein on the Site at all times. All specifications shall be producible upon demand of the Engineer.

B. Specifications serve to indicate standards, materials and methods for completing the work.

C. Where Contract Documents do not provide sufficient information for completing installations comply with manufacturer's written instructions.

D. The following definitions apply:

1. Provide - To Supply and Install, complete and in place, including accessories, finishes, tests and services as required to render item so specified complete and ready for use.

2. Testing and Commissioning - Start-up and initial operation of equipment as required to demonstrate satisfactory operation of components and entire system including calibration of any control instrumentation as required to maintain operations and in accordance with Section 01762 –Commissioning.

3. Drawings Lists or Schedules of Items are intended to show scope and arrangement of work. For locations of items described refer to such Drawings, Lists or Schedules unless locations are stipulated in the Specifications.

E. Wherever words "reviewed", "selected", "directed", "designated", "permitted", "inspected", "instructed", "required", "report", "submit", "obtain", "consult", or similar words or phrases are used in the Contract Documents, it shall be understood that "by/to/from/with the Engineer" shall follow.

1.30 SHOP AND DESIGN DRAWINGS

A. As specified in Section 01330 - Submittals.

1.31 RECORD DRAWINGS

A. As specified in Section 01330 - Submittals.

1.32 WORKMANSHIP

A. The quality of the workmanship and materials shall be first class and the work shall present a neat and attractive appearance when finished.

B. If ordered by the Engineer, make enough openings in the work and/or materials as are necessary to inspect the work.

C. Should the Engineer find the work and/or materials opened to be faulty in any respect, remove and make good all defective work and/or materials at no additional cost to the Contract.

1.33 FIRST AID

A. The Contractor shall provide and maintain at the Site, a completely equipped first aid kit, MSA FA 1035 or equal, in a clean orderly condition, which shall always be readily accessible to all employees and the Engineer and his staff. The Contractor shall designate particular employees who are properly instructed in First Aid, to be always available at the Site while Work is being carried out. A telephone call list for summoning aid such as doctors, ambulances and rescue squads from outside sources shall be conspicuously posted.

1.34 SAFETY

A. The Contractor shall undertake the role of the “Constructor” as defined in the Occupational Health and Safety Act.

B. Prior to the commencement of the Work, the Contractor shall notify the office of the Ministry of Labour, submit a Notice of Project and shall provide copies of the Notice to the Owner and to the Engineer.

C. The Contractor will be responsible to take all necessary steps to protect personnel (workers, visitors, general public, etc.) and property, from any harm during the Contract.

D. The Contractor shall supply only competent personnel, who shall implement its safety program and ensure that the Contractor's standards, and those of the Occupational Health and Safety Act are being complied with.

E. The Contractor will report to the Owner, and jurisdictional authorities, any accident or incident involving the Contractor, Owner or public, personnel and/or property, arising from the Contractor's execution of the Work.

F. The Contractor will include all provisions of this Contract in any agreement with Subcontractors, and hold all Subcontractors equally responsible for safe work performance.

G. If the Contractor is responsible for a delay in the progress of the Work due to an infraction of legislated or Contractor health and safety requirements, the Contractor will, without additional cost to the Owner, acquire and use for the execution of the Work, such additional labour and equipment as are necessary, in the opinion of the Engineer, to avoid delay in the final completion of the Work or any operations thereof.

H. The Contractor is responsible for performing all work within the defined construction area in accordance with the Ontario Occupational Health and Safety Act, latest edition. The Contractor shall install temporary yellow marking tape or similar readily visible marking system to highlight the construction area. All treatment building staff, when entering this construction zone, are to follow the terms of the Contractor’s health and safety program. Similarly, when the Contractor enters the Owner’s property and/or the building, the Contractor will abide by the Owner’s health and safety program. Before construction commences, a plan for safety protocol relating to the two areas of jurisdiction shall be developed and implemented.

I. The Contractor is responsible for providing sufficient lighting required to maintain a safe work place.

1.35 SAFETY COMMITTEE

A. Where it is anticipated that more than twenty (20) workers, including all members of the Contractor's and subcontractor's staffs, will be on the construction site for a period of five months or more, the Contractor shall establish a Safety Committee for the project.

B. The role of the Safety Committee shall be in accordance with the recommendation of the Construction Safety Association of Ontario.

1.36 RECORD OF LABOUR AND LOST TIME INJURY

A. The Contractor shall prepare a record of person hours, including hours of subcontractors' staff, per month for the project. As well, a record of lost time injuries per month shall be prepared. These records shall be forwarded to the Construction

Safety Association of Ontario, with a copy being forwarded to the Engineer and the Owner.

1.37 WHMIS - WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM

A. The Contractor is reminded of the responsibility to provide training and necessary equipment to the Contractor's employees for the handling of hazardous materials.

B. Under this legislation the Contractor is responsible for making sure all hazardous materials have proper supplier labels and up to date (less than 3 years old) material safety data sheets (M.S.D.S.) are made available to the Owner at the work site, for all products which are hazardous materials in the Contract and/or on the construction site.

1.38 CO-OPERATION WITH OTHER CONTRACTORS

A. The Owner may award contracts for adjacent or complementary works during the course of this Contract. The Contractor will be required to co-operate and coordinate with other contractors for adjacent or complimentary works.

B. Physical separation of the various contracts is always to be provided and maintained in accordance with Ministry of Labour requirements.

C. The cost associated with coordination efforts with other contractors is considered to be included in the price tendered.

1.39 BASIS OF PAYMENT

A. Payment for the Work completed under this Contract shall be compensation in full for all labour, materials and equipment necessary to complete the Work in its entirety as specified.

1.40 SAMPLES

A. Before any material of any kind is used on the work, the Contractor shall submit samples thereof for the approval of the Engineer and must obtain such approval. No material shall be used on the work which is any way inferior to the approved samples. 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 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 Engineer with respect to the approval or rejection of samples shall be final.

1.41 FIELD SURVEYING

A. Unless otherwise specified, the Engineer will establish reference bench marks and base lines adjacent to the Work. The Contractor shall be responsible for laying out the Work from established reference points.

B. The Engineer may at any time check the Contractor’s survey and layout work, but this shall not relieve the Contractor of any of its responsibilities to carry out the Work to the lines and grades set out in accordance with the Drawings and Specifications

or as otherwise necessary for performance of the Work in accordance with the Contract Documents.

C. Notify the Engineer in writing at least five (5) working days prior to commencing work on any part of the construction to enable the Engineer to establish bench marks and base lines.

D. On request, submit documentation verifying accuracy of survey work.

E. Maintain a complete and accurate log of control and survey work as it progresses.

1.42 RESTORATION

A. As a minimum, restoration shall mean replacement, repairs, or reconstruction to a condition at least as good as or better than the condition prior to commencement of the Work.

B. Unless otherwise required, restore areas of the Work and areas affected by the performance of the Work to the conditions that existed prior to the commencement of the Work and to match the condition of similar adjacent, undisturbed areas.

C. Ensure that quality, grades, elevations, and extent of bedding, cover and other backfill materials including subgrades, finish grades, and thickness of pavements for roadways and parking areas are properly documented during their removal to ensure reconstruction to at least their original and functional condition.

D. The restoration material shall be new, except as otherwise specified. Furnish evidence as to the type, source, and quality of the material or product when requested by the Engineer.

E. Prior to commencement of restoration work, inform the Engineer of the proposed material, methods, and procedures to repair, replace, or reconstruct disturbed, damaged, or suspected damage to the Work.

1.43 PRE-START HEALTH AND SAFETY REVIEWS

A. Pre-Start Health and Safety Review shall be conducted by the Contractor prior to commissioning of the works. The review shall be completed by the Contractor in accordance with applicable legislation.

1.44 FALSEWORK FOR CONSTRUCTION PURPOSES

A. The Contractor shall provide and maintain required shoring and bracing in accordance with the applicable Provincial construction safety regulatory requirements and other applicable regulations.

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

1.45 SCAFFOLDING

A. The Contractor shall design, construct, install and dismantle scaffolding in accordance with the applicable Provincial construction safety regulatory requirements and other applicable regulations and the requirements of CSA S269.2.

1.46 SPARE PARTS, MAINTENANCE MATERIALS AND EXTRA MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in the specific Sections.

B. Deliver to the Site and place in location as directed; obtain receipt from Engineer or Owner.

C. Provide list of spare parts and maintenance and extra materials furnished prior to final payment.

PART 2. PRODUCTS

A. Not Used.

PART 3. EXECUTION

A. Not Used.

END OF SECTION

SECTION 01110 – ENVIRONMENTAL PROTECTION

PART 1. GENERAL

1.1 SCOPE

A. The Contractor shall be responsible for the protection of the natural environment of the site and surrounding areas, including air, land, and water. Protection of the environment must start with avoidance and prevention, and then control/mitigation, compensation, or enhancement (in order of descending preference).

B. The Contractor shall be solely responsible for complying with and ensuring that every person on the Site, whether such persons are members or the Contractor's own forces, Subcontractors, the Township and Engineer's representatives, utility companies, or other third parties present, complies with the measures and requirements contained in the following:

1. Environmental Protection Act, R.S.O. 1990 (as amended) and all applicable Regulations under this Act. (EPA)

2. Federal Species at Risk Act, S.C. 2002 (as amended) and all applicable Regulations under this Act.

3. Ontario Endangered Species Act, S.O. 2007 (as amended) and all applicable Regulations under this Act. (OESA)

4. Ontario Water Resources Act, R.S.O. 1990 (as amended) and all applicable Regulations under this Act. (OWRA)

5. Ministry of Environment, Conservation, and Parks (MECP) Guidelines.

6. Occupational Health & Safety Act R.S.O. 1990 (as amended) and all applicable Regulations under this Act. (OHSA)

C. All materials (hazardous and non-hazardous) shall be handled to protect human health and the environment.

D. Activities shall be planned and implemented, and equipment shall be managed and maintained in a manner that minimizes air emissions.

E. Erosion control measures shall be designed, implemented and maintained to ensure that there is no increased sediment loading to surface waters leaving the Project site. The Contractor is responsible for ensuring that the erosion control measures are implemented and maintained throughout the duration of Project.

1.2 Ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. It is the Contractor's responsibility to determine the specific construction techniques to meet these requirements.

A. The Contractor shall prevent the accidental discharge of contaminants into soils, surface water and/or groundwater. Any accidental contamination shall be reported to the appropriate authorities and cleaned up as per provincial requirements.

1.3 ENFORCEMENT

A. The Contractor shall be responsible for enforcing a zero-tolerance policy with respect to environmental protection practices and procedures. Those refusing to comply shall be asked to leave the Site and shall not be allowed to return to the Site without the Contract Administrator's prior approval.

B. The Contractor shall include all environmental protection provisions of this Contract in any agreement with Subcontractors and hold all Subcontractors equally responsible for protection of the environment.

C. The Contract Administrator and the Township shall have the right to issue warnings and/or to issue a Stop Work order if the Contractor fails to comply with any requirements under this Section including not maintaining appropriate control of operations, imminent or ongoing damage or detrimental effects to the environment.

D. Be advised that inspectors from the Ministry of the Environment, Conservation and Parks (MECP) and other authorities may make periodic visits to the site during construction. They have the power to order the Contractor to stop Work if the work, in their opinion is not being done to ensure compliance with environmental objectives. The Contract Administrator's acceptance of the work may be withheld until the Ministry or other authorities concerned have issued their approval.

1.4 ENVIRONMENTAL SITE AWARENESS

A. The Contractor shall be responsible for developing and implementing environmental awareness training to ensure that all on-site personnel are aware of environmental sensitivities associated with their actions; their roles and responsibilities in protecting the environment; and the mechanisms available to them to carry out their environmental protection responsibilities.

B. The Contractor shall maintain an awareness of environmental requirements and developing issues on site. The Contractor shall hold formal environmental meetings involving key site personnel. Orientation meetings with members of the site team shall be held at the start of the Work (at the time of mobilization) and when new staff join the workforce. The Contractor shall have an environmental component at its weekly work-group toolbox meetings involving all workers. Environmental review meetings with the site team shall also be held at other key times throughout the work prior to starting significant new tasks.

C. The Contractor shall review the environmental content of its orientation, as well as review and toolbox meetings with the Contract Administrator.

D. The Contractor shall provide minutes of its orientation, review and toolbox meetings to all attendees and the Contract Administrator. Each attendee shall be required to sign an attendance list which includes a point form summary of the meeting content.

1.5 REFERENCE CODES, STANDARDS, AND SPECIFICATIONS

A. Ontario Provincial Standard Drawings for Roads and Public Works (OPSD):

1. OPSD 219.100: Light Duty Straw Bale Barrier

2. OPSD 219.130: Heavy Duty Silt Fence Barrier

3. OPSD 219.180: Straw Bale Flow Check Dam

4. OPSD 219.190: Silt Fence Flow Check Dam

5. OPSD 219.220: Sediment Trap in Ditch

6. OPSD 219.240: Sediment Trap for Dewatering

B. Ontario Provincial Standard Specifications for Roads and Public Works (OPSS):

1. OPSS 182: Environmental Protection for Construction in Waterbodies and on Waterbody Banks

2. OPSS 801: Construction Specification for the Protection of Trees

3. OPSS 805: Construction Specification for Temporary Erosion and Sediment Control Measures

1.6 SUBMITTALS

A. No later than fifteen (15) Working Days prior to mobilizing on site, the Contractor shall submit a Spill Response Plan to address the response, interception and containment, and rapid cleanup and disposal of an accidental spill, including the following items:

1. Specific roles and responsibilities of construction staff, accountability, reporting and documentation.

2. The Contractor's proposal for the immediate containment and control of the spill, the clean-up procedures to be initiated immediately and any other action to be taken to mitigate the potential environmental damage while awaiting additional assistance.

3. Inventory and location of materials and products to be maintained available on site throughout construction such as sorbent booms, spill kits, disposal drums, etc.

4. The name and the telephone number of the Contractor's representative responsible for preparing, implementing, directing and supervising the response plan.

5. The names and the telephone numbers of the persons in the local municipalities to be notified forthwith of a spill.

6. The names and the telephone numbers of the representatives of the fire, the police and the health departments of the local municipalities who are responsible to respond to emergency situations.

7. The names and the telephone numbers of the companies experienced in the control and clean-up of hazardous materials that would be called upon in an emergency involving a spill.

B. No later than fifteen (15) Working Days prior to commencing excavation and construction on site, the Contractor shall submit an Environmental Management Plan, consisting of the following requirements:

1. Plans and sketches showing details and dimensions of areas proposed to be used for construction storage, the Contractor’s Site office, vehicle cleaning, concrete washout basin, equipment fueling and associated access routes, and show the location and size of all trees within and adjacent to these areas.

2. Plans and sketches showing the locations and details of proposed erosion and sediment control measures, exposed surfaces, temporary stockpiles, and drainage systems and watercourses within 30 meters of the site boundary.

3. Inventory of trees not designated for removal and tree protection measures to be employed throughout construction.

4. Procedures intended to handle and dispose of sewage.

5. Details of the environmental awareness training to be employed by the Contractor.

6. The Environmental Management Plan may be required to be submitted to the Conservation Authority and/or the Ministry of Natural Resources, prior to the commencement of the work. Coordinate with the review agencies such that the schedule of the work is not delayed. No additional payment will be authorized for issues arising from the review of the Environmental Management Plan.

1.7 CONFLICTS AND OMISSIONS

A. If the Contractor finds or observes that there appears to be a conflict between the contents of this Section or other sections of the Contract Documents and the requirements of legislative authorities, then the most stringent requirement is deemed to apply. The Contractor shall bring any conflicts to the attention of the Contract Administrator for clarification. Similarly, any omissions shall in no way diminish the Contractor's responsibility to comply with the statutes, regulations, bylaws and directives of legislative authorities.

PART 2. PRODUCTS

A. Silt Fence Barrier: Unless otherwise specified, install all silt fence in accordance with OPSS 805 and corresponding drawings:

1. OPSD 219.130 – Heavy Duty Silt Fence Barrier

2. OPSD 219.190 – Silt Fence Flow Check Dam

B. Straw Bale Barriers: Unless otherwise specified, install all straw bale barriers in accordance with OPSS 805 and corresponding drawings:

1. OPSD 219.100 – Light Duty Straw Bale Barrier

2. OPSD 219.180 – Straw Bale Flow Check Dam

C. Ditch Sediment Trap: Unless otherwise specified, install ditch sediment traps in accordance with OPSS 805 and corresponding drawings:

1. OPSD 219.220 – Sediment Trap in Ditch

2. OPSD 219.211 or OPSD 219.210 as applicable – Temporary Rock Flow Check Dam

3. Use filter fabric TERRAFIX 270R or equivalent.

D. Dewatering Sediment Trap: Unless otherwise specified, install dewatering sediment traps in accordance with OPSS 805 and corresponding drawings:

1. OPSD 219.240 – Sediment Trap for Dewatering (Dewatering Trap with Straw Bales)

2. OPSD 219.100 – Light Duty Straw Bale Barrier

3. OPSD 219.211 – Rock Flow Check Dam

PART 3. EXECUTION

3.1 HAZARDOUS SUBSTANCES

A. The Contractor shall make itself fully aware of all Federal and Provincial legislation and restrictions on the storage and use of certain products or materials considered harmful to the environment or persons and shall comply with all applicable regulations and guidelines.

B. The Contractor shall require its manufacturers or suppliers to provide current Safety Data Sheets (SDS) for all such products and shall comply with all requirements of the Workplace Hazardous Materials Information System (WHMIS) Regulations. The Contractor shall promptly provide the Contract Administrator with copies of all MSDS relating to all hazardous substances brought to the project site.

3.2 WASTE MANAGEMENT

A. The Contractor shall dispose of all wastes generated on site and shall be responsible for all permits and approvals required for waste disposal. For recycled materials and for disposal of hazardous, subject and contaminated wastes, the Contractor shall provide proof of recycling and / or disposal documentation to the Contract Administrator.

B. The Contractor shall provide information on quantities of principal products brought to site and quantities of like products reused, recycled and wasted in the process of using these products.

C. Waste types anticipated at the work site include sanitary sewage, domestic garbage, construction garbage, concrete and cement wastes, iron and steel wastes, granular materials wastes, operating fluid wastes from vehicles and construction equipment and collected sediment. The Contractor shall recycle wastes where possible.

D. Sanitary sewage shall be collected in portable toilet facilities. Waste shall be disposed of at a licensed disposal location by a licensed hauler. Waste shall be removed on a regular basis consistent with health and safety requirements.

E. The Contractor shall minimize the volumes of domestic and construction garbage produced on site. An MECP approved local landfill shall be used for disposal of domestic and construction garbage. Waste storage bins with lids shall be provided by the Contractor and used on site for collection and temporary storage of domestic garbage. The Contractor shall ensure that wastes are deposited in designated bins and that the site is kept in a clean and tidy condition. Waste shall be removed on a regular basis to avoid accumulation on site.

F. Quantities of construction lumber and wood products wasted during construction shall be minimized. Every reasonable effort shall be made to reuse waste or surplus wood. Waste wood that cannot be reused or given away shall be disposed of at an MECP approved local landfill site.

G. Operating fluid wastes arising on site from vehicles and construction equipment shall be collected in suitable containers with tight sealing lids and shall be removed from site for recycling or disposal as hazardous waste.

H. Wastes shall be properly labeled according to WHMIS regulations. Uncontaminated collected and excavated sediment shall be removed from the site for disposal as inert fill or as construction garbage. Collected and excavated sediment that is contaminated, or suspected to be contaminated by environmentally harmful substances shall be removed from site. The criteria, procedures, terms and conditions for disposal of contaminated sediment shall be those set out in current MECP regulations and guidelines.

I. Hazardous, subject and contaminated solid and liquid wastes shall be disposed of offsite using licensed disposal agents and haulers. The Contractor shall be responsible for registration of all hazardous, subject and contaminated wastes under Regulation 347 of the Ontario Environmental Protection Act. Wastes shall be properly stored and labeled according to Regulation 860 under the Occupational Health and Safety Act (WHMIS).

J. Burning rubbish and construction waste materials is not permitted on site.

3.3 LIQUID STORAGE, REFUELING, AND EQUIPMENT OPERATION

A. Liquid Storage:

1. On-site bulk fuel storage tanks and bulk storage for other environmentally hazardous liquids shall be located at least 30 m away from any surface watercourse or water bodies, within dikes or equivalent secondary containment on flat ground in the laydown area.

2. Secondary containment in liquid storage areas shall be such as to contain the total volume stored plus precipitation. A minimum secondary storage capacity equivalent to 110% of the volume of the stored liquid vessels shall be provided.

3. Secondary containment shall be provided throughout all the transportation and work area storage.

4. Small containers of fuel and other chemical products shall have secure secondary containment and shall be protected at all times from accidental spillage.

5. The Contractor shall regularly check all spill containment facilities for precipitation and spilled substance and maintain these facilities in a clean and serviceable condition, regularly removing precipitation to maintain the secondary storage volume.

6. Where effective secondary containment cannot otherwise be achieved, protection against seepage shall be provided by the use of impermeable liners.

7. Sorbent materials shall be on hand at all liquid storage areas, whether for large or small volumes, as a means of containing or soaking up errant spills. Empty open-head drums with sealable lids shall be on hand for predisposal storage of spilled substances; sufficient drums shall be available to accommodate stored and in service volumes of spillable substances.

B. Vehicle and Equipment Refueling:

1. Mobile highway vehicles shall be refueled off site.

2. Equipment which is not readily mobile may be refueled at the work site. Do not refuel or maintain equipment within 30 m of any watercourse. Establish a suitable fueling and maintenance area subject to the approval of the Contract Administrator and restrict maintenance and fueling to these areas.

3. Generators, cranes, backhoes or shovels may be fueled at other than the designated fueling areas, but not closer than 30 m from any watercourse.

4. When engaged in refueling, workers shall have with them a supply of sorbent material and drip trays as required to meet all needs in containing and / or soaking up all spills during refueling operation.

C. Equipment Operation:

1. All machinery and equipment operated by the Contractor and related hauling trucks shall have muffling systems that are up-to-date and fully operable. Trucks shall shut off engines while loading and unloading.

2. Equipment working near water shall be cleaned and serviced as necessary to prevent deposition of soils, oil, grease, coolant, fuel and any other containment.

3. Stationary equipment operation near open water or in dewatered areas shall be equipped with drip trays to contain any fuel, oil, coolant or grease leakage. Equipment drip trays shall be of a sufficient size to effectively protect from all potential drips or spills on the projected area beneath each piece of equipment for which protection is provided.

4. Concrete mixers and associated equipment shall be washed out such that all concrete washings are discharged into the excess concrete disposal basin.

5. Clean construction equipment prior to entering public roadways to prevent littering. Ensure the debris cleaned from equipment cannot gain access to storm sewers or watercourses. Vehicles should leave a construction site at a designated point or points provided with a bed of non-erodible material of sufficient length to ensure that a minimum of material (mud) is tracked off the site onto adjacent municipal streets.

6. No equipment shall be washed in or near open water or watercourses.

7. All equipment shall be in good condition and meet applicable statutory requirements for serviceability and exhaust emissions. Exhaust systems shall function in a manner to control exhaust noise within acceptable regulated levels.

8. Major repairs to equipment will not be permitted at the work site. Routine equipment servicing of a minor nature will be allowed on site with the provision that drip / spill trays be used to control on-ground spillage of fuels, oils, coolants and grease.

D. The Contractor shall be responsible for any and all clean-up of contamination resulting from its operations. Soils and similar materials contaminated by equipment operating fluids shall be carefully excavated, removed from site, and disposed of in accordance with this specification and all applicable regulations. These materials may be classified as hazardous waste.

3.4 SPILL CONTINGENCY PLANNING AND REPORTING

A. The Contractor shall endeavor at all times throughout the Work to prevent spills, and provide in the event of a spill, the best response within the shortest possible time. Environmental

legislation, with respect to spills, treats sediment releases to water as spills detrimental to the natural environment. Sediment releases to a watercourse or waterbody are therefore included in the same category as spills of pollutants. The Contractor shall designate an Emergency Response Coordinator (ERC) from suitably qualified member of its site workforce. The Contractor shall submit the name of the ERC for review and concurrence.

B. Sorbent booms shall also be provided and kept readily available at near-water work areas for local deployment as a precautionary measure.

C. Sorbent material shall be on hand at all work areas, at equipment storage or parking areas and at all refueling locations as a means of containing and soaking up any spill substance before it reaches the groundwater table or open water.

D. Unless otherwise approved by the Contract Administrator, drip and spill trays shall be constructed of metal or rigid molded plastic. Drip and spill trays shall be effectively of one-piece construction, have no leaks and shall not be readily deformable. Empty open-head drums with sealable lids shall be provided on site for predisposal storage of spillable substances and for disposal of used sorbents, contaminated soil, etc. A minimum of four 205-L nominal size disposal drums shall be provided and suitably located on site.

E. The Contractor shall provide a minimum of two complete spill kits to be located in the principal work areas. The exact location of any spill kit within a work area may vary but a kit shall always be located in close proximity to the actual work zone and shall be readily accessible.

F. Cement truck washouts and other liquid waste products shall be directed to secure containment facilities for subsequent removal and disposal in accordance with current guidelines.

G. Ensure the immediate availability of the products with which to effect temporary repair to broken pipelines and other services so the spill or other emission of a pollutant is immediately controlled and stopped and to mitigate the damages.

H. The Contractor shall be responsible for reporting spills. All spills shall be reported to the Contract Administrator immediately following their discovery. In the event of a spill or other emission of a pollutant into the natural environment, the Contractor must forthwith notify:

1. The Ontario Spills Action Center (Tel: 1-800-268-6060).

2. The local municipality or the regional municipality within the boundaries of which the spill occurred.

3. The owner of the pollutant, if known.

4. The person having control of the pollutant, if known.

I. The Contractor shall submit for the Contract Administrator's review and for the review of other authorities having jurisdiction a copy of a Spills Response report and make the appropriate changes to it based upon the comments received from these authorities. Report shall contain the following:

1. Date and time spill occurred.

2. Estimated volume of spill.

3. Duration of the spill.

4. Cause and discovery of the spill.

5. Cleanup and recovery measures taken.

6. Name of hauler or outside contractors called in to assist with cleanup and recovery measures.

7. Personnel on the scene.

8. Names of parties and agencies notified and the date and time of notification of each.

9. Steps to be taken to prevent a reoccurrence of the spill.

J. All spills to the natural environment resulting from action or inaction on the part of the Contractor or its subcontractors shall be the responsibility of the Contractor. All testing required by the Contractor, the Contract Administrator, MNRF and / or MECP, in connection with a spill shall be the responsibility of the Contractor.

K. Untreated wastewater is considered a contaminate and cannot be "spilled". The Contractor shall be responsible for any spills of process fluids within the facility that occur as a result of the Contractor's actions or lack thereof.

3.5 WORK NEAR WATER

A. The Contractor is prohibited from working within any river or tributary without obtaining approval from the applicable Regional Conservation Authority, Ministry of Northern Development, Mines, Natural Resources and Forest (MNRF), and the MECP. Working includes but is not limited to the placement of permanent or temporary structures, traversing through this area with equipment or material, depositing any material within the waterway.

B. The Contractor shall make itself fully aware of water level, water flow and weather conditions in and affecting the Work and shall allow for all effects that any such conditions might have on the Work.

C. The Contractor shall meet the water quality protection requirements and the erosion and sediment control requirements of this specification and all applicable regulations. Turbid water shall not be directly discharged to any watercourse or water body. Any dewatering set up in work areas shall be removed in their entirety upon completion of the Work. Collected and excavated sediments shall be carefully removed for disposal requirements in accordance with this specification and all applicable regulations. Where geotextiles and plastic geomembranes are used, they shall be removed in their entirety on completion and disposed of at an approved local landfill. Geotextile containing contaminated sediment shall be disposed of in accordance with this specification and all applicable regulations.

D. Do not dispose of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, wash water from concrete trucks or hydro seeders, or any other pollutant in streams, wet-lands, surface waters, or natural or man-made channels leading thereto, or unspecified locations.

3.6 DRAINAGE AND EROSION AND SEDIMENT CONTROL

A. The Contractor shall comply with the procedures outlined in the "GGHA CAS Erosion and Sediment Control Guidelines for Urban Construction".

B. The Contractor shall maintain ditches and watercourses for surface water drainage of the site and external properties during construction and bear the responsibility for damage that may result by reason of not doing so.

C. Clear, grub and strip topsoil from areas of the site immediately before commencing work in those areas. Do not allow large areas of the site to lie cleared, grubbed and stripped of topsoil unless work is progressing in those areas. The Contractor shall take steps to prevent sediments from disturbed surfaces being transported by surface runoff to existing creeks or storm drainage systems.

D. The Contractor shall intercept surface runoff within the working limits and prevent surface runoff from entering into the adjacent excavation pits and surrounding areas and divert flows to appropriate erosion and sedimentation control measures. Provide temporary ditches and /or sedimentation ponds of sufficient capacity to contain site run-off.

E. The Contractor shall take steps to prevent runoff from entering adjacent construction sites and properties. Where surface water runoff is discharged into an adjoining site through established ditches/creeks, the rate of discharge shall be controlled to ensure that it does not exceed the preconstruction rates and, in any event, does not cause flooding damage downstream of the Site.

F. The Contractor shall locate and protect temporary stockpiles of contaminated soil and/or material awaiting sampling and off-site disposal by providing separation between the stockpile and the surrounding ground, providing separation between the stockpile and rainfall, and encircling them with silt fencing to the satisfaction of the Contract Administrator to minimize any environmental interference. Cover stockpiles with plastic sheeting and construct perimeter drainage ditches to intercept and divert run-off to adjacent settling ponds.

G. Do not direct any flow of water across or over pavements, except through approved pipes or properly constructed troughs. Dispose of water so as not to be injurious to public health or safety, to property or to any part of work completed or under construction.

H. The Contractor shall provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during the construction period:

1. Incorporate the appropriate erosion and sediment control measures to ensure that sediment and other debris are not discharged to the adjacent ditches and watercourses. This shall include silt fencing, straw bale or rock check dams, etc. as necessary to capture all sediment and debris within the area of construction.

2. Design erosion and sediment controls to handle peak runoff resulting from storm events.

3. Provide strawbales or filter berms as required to retard and filter run-off prior to discharge to storm sewers or watercourses.

4. Provide ditches and ponds with silt traps built up with silt fence, straw bales and rock check dams to retard and filter run-off before it is discharged to a watercourse.

5. Maximum allowable slope length is 15 meters if slope gradient is between 2:1 to 3:1, or 25 meters for slope gradient of 3:1. For longer or steeper slopes, install cut-off swales/berms for any type of silt control fence.

6. A dewatering silt trap with straw bales and rock check-dam outlets shall be installed at low concentration points with minimum 120 cubic meters of capacity per 1 hectare of drainage area.

7. Inspect and clean protective devices once per day as a minimum. During rainy weather, inspect the protective devices twice per day, or more frequently if directed by the Contract Administrator. Replace clogged filter materials such as filter fabric, crushed stone or straw bales as required and as directed by the Contract Administrator.

8. Re-excavate settling ponds or silt traps or otherwise maintain as required from time to time or when sediment reaches 50% of the capacity of the structure. Re-excavate in such a manner as to ensure that no deleterious materials are introduced into adjacent watercourses. Dispose of excavated deleterious materials off site in accordance with applicable regulations.

9. Silt fences and straw bales shall be repaired or replaced as needed during execution of the Work and shall be removed when new surfaces have been placed and stabilized.

10. Have additional materials such as rip-rap, filter cloth, clear stone, silt fencing, erosion control blankets and filter bags readily available in case they are needed quickly for erosion and deleterious materials control.

11. Regrade temporary ditches and remove and dispose of sediment controls after restored areas have an established ground cover and upon approval from the Contract Administrator.

I. Provide temporary pumping as necessary to keep excavations and site free from water. Do not pump water containing suspended materials into waterways, storm sewers or drainage systems. Discharge silt-laden water from excavations into baled hay or straw sediment traps to ensure that only sediment-free water is returned to watercourses in accordance with the local conservation authority and MECP requirements. Effluent monitoring shall be completed by the Contractor to ensure discharge is consistent with the receiver's background quality.

J. Refer to Division 2 for requirements for excavation dewatering. The Contractor shall comply with the Water Taking requirements of the Ontario Water Resources Act in connection with the Work.

3.7 PROTECTION OF STORM SEWERS

A. Prevent construction material (including volatile liquid wastes such as oil, chemicals, paints), pavement, concrete, earth or other debris from entering existing storm sewer or sewer structure.

3.8 INCLEMENT WEATHER

A. The Contractor shall ensure adequate environmental protection and take precautions at times of inclement weather (e.g., ensure erosion and sedimentation control measures are functioning effectively and install additional measures as necessary).

B. Inclement weather or extra work caused by such weather shall not be accepted as reason for additional payment or an extension to the Time for Completion.

3.9 CONCRETE WASHOUT BASIN

A. All excess wet concrete and truck mixer washings shall be disposed of in a washout basin to be developed by the Contractor in the laydown area. The proposed design of the excess wet concrete washout basin shall be submitted to the Contract Administrator for approval. The basin shall be formed by substantial berms of imported sand and material excavated for the basin shall be used to form a berm around the basin or stockpiled for future use in restoration. Hardened excess concrete, cement grout and uncontaminated washings in a disposal basin shall be removed for disposal as concrete rubble if the capacity for the basin is reached before completion of the Work.

B. The concrete washout basin and surrounding area shall be restored upon completion of the Work. Loose or exposed concrete reinforcing steel or iron and other steel wastes if obtained shall be recycled by the Contractor. The Contractor shall collect the recycle metal wastes arising on site. Preference shall be given to constructive reuse of uncontaminated granular material no longer required for project.

3.10 ENDANGERED SPECIES

A. Contractor shall comply with the Federal Species at Risk Act, which states “No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species, or a threatened species”.

B. Comply with the relevant sections of the Ontario Endangered Species Act.

C. On encountering any species at risk, contact the Contract Administrator, the Township and the Ministry of Natural Resources to discuss management options to minimize, reduce or control adverse effects on endangered species.

3.11 CROSS CONTAMINATION

A. The Contractor shall ensure that all equipment is cleaned in accordance with the MNR “Clean Equipment Protocol for Industry” prior to entering the work site to ensure that there is no site to site cross contamination of invasive species.

3.12 TREE PROTECTION

A. Cut down trees only as shown on the Drawings or as designated by the Contract Administrator.

B. Take precautions to prevent damage to existing trees and shrubs, protect branches and foliage, protect trunks and stems, prevent machinery from travelling over roots within the 'drip-line' of the trees by placing and maintaining snow fencing around each tree outside of the ‘drip-line’. Do not pile excavated material within the ‘drip-line of existing trees.

C. Where required, tunnel under or around roots by hand digging without damaging roots where trees are not designated for removal.

D. In the event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, the Contractor shall treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and tree surgery practices by a qualified agency as accepted by the Contract Administrator.

E. Where trees or shrubs are damaged beyond recovery and cannot be replaced by similar plant material of the same type and size, pay penalties to the Township as established by the International Society of Arboriculture’s booklet entitled 'A Guide to Professional Evaluation of Landscape Trees, Specimen Shrubs and Evergreens'.

3.13 NOISE CONTROL

A. Comply with local Municipal by-laws regarding noise control.

B. Equip vehicles and equipment with efficient muffler devices to minimize noise levels in the vicinity of the site. Equip compressors with silencers on intake lines.

C. No excessive idling of motorized equipment is permitted.

D. Where necessary, place noise attenuation devices (barriers) around stationary pumps, compressors or at the site boundaries to limit the noise level at site boundaries in accordance with local by-laws.

3.14 DUST CONTROL

A. Undertake dust control measures to prevent dust nuisances from any phase of the construction operation.

B. Permitted dust control measures include the application of calcium chloride or water. In general, the use of calcium chloride is to be kept to a minimum and is restricted to vehicle rights-of-way. Use more frequent applications of water in close proximity to watercourses. Obtain Contract Administrator's acceptance before chemicals for dust control are used.

C. Transport dusty materials in covered haulage vehicles.

D. Transport wet materials in suitable watertight haulage vehicles.

E. Where the work requires saw-cutting of the asphalt or the saw-cutting or grinding of concrete, use blades and grinders of the wet type together with sufficient water to prevent the incidence of dust.

3.15 MUD CONTROL

A. Comply with local Municipal by-laws regarding mud control.

B. Keep public roadways clean and free of mud unless closed to through traffic with the permission of the Contract Administrator. The Contractor shall be responsible for a prompt and complete cleanup of all dirt and mud deposited on the public and/or private property as a consequence of work carried out under this Contract.

C. The Contractor shall wash mud from construction vehicles before leaving the construction Site within a dedicated wash-down area located a minimum of 30 m from any watercourse and with appropriate containment berms.

D. The Contractor shall provide road cleaning twice per week or more often as necessary during construction to keep the road free of construction debris and mud from construction vehicles and deliveries.

E. Upon request from the Contract Administrator, immediately proceed with clean-up operations at Contractor’s expense. If, after written instruction, or if, in the opinion of the Contract Administrator, the Contractor has not, or cannot, sufficiently remove mud from the road, the Contract Administrator/Township may arrange the necessary clean-up with all costs being charged to the Contractor.

END OF SECTION

SECTION 01135 – CO-ORDINATION

PART 1. GENERAL

1.1 COORDINATION

A. Coordinate scheduling, submittals, and work of the various Sections of the Project Specifications and other requirements of the Contract Documents to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such elements.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on the Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and cleanup of work of separate Sections in preparation for Substantial Performance.

F. Coordinate Work with Engineer so as not to interrupt building operations.

G. After the Owner's occupancy of the Site or premises, coordinate access to the Site for correction of defective Work and Work not in accordance with the Contract Documents, to minimize disruption of the Owner's activities.

H. CO-OPERATION WITH OTHER CONTRACTORS AND OPERATIONS STAFF:

a. The Township may award contracts for adjacent or complementary works during the course of this Contract. The Contractor will be required to co-operate and coordinate with other contractors for adjacent or complimentary works.

b. Physical separation of the various contracts is always to be provided and maintained in accordance with Ministry of Labour requirements.

c. The cost associated with coordination efforts with other contractors is considered to be included in the price tendered.

d. The contractor shall at all times co-ordinate with the operations staff.

I.

PART 2. PRODUCTS

A. Not Used

PART 3. EXECUTION

3.1 Supervision

A. Maintain supervision on the site at all times a general superintendent who is fully qualified to properly direct the progress of this Contract continuously, including the co-ordination and work of subcontractors.

B. During period when the work on this project is not being carried out, maintain protective fencing or competent security personnel on the site to guard the site, works, properties and possessions thereon of the Contractor and his subcontractors, as well as those of the Owner.

3.2 Sub-trades

A. The various Divisions of these Specifications have not necessarily been segregated into sub-trades or sub-contracts. Define the Scope of Work required for each sub-trade and apportion it, with special attention directed towards items or materials that are to be built into concrete, masonry, etc.

B. Coordinate architectural, structural, mechanical, electrical, and control work for the equipment being installed.

C. No extra payment will be considered based on the differences of interpretation of the Contract Documents, or lack of direction in the Specifications as to which trade should provide certain items or materials.

D. Should alternative equipment proposed by the Contractor be accepted, provide required changes to electrical equipment, wiring or raceways associated with that equipment, and bear the extra expense for such changes.

3.3 Access

A. At all times, maintain vehicular access along public roads when used by construction vehicles.

B. At all times, maintain vehicular access to the Facility.

3.4 Co-ordination of construction with operation of existing facility

A. Give the facility operations precedence over construction activities.

B. Maintain the conveyance of sewage flows at all times.

C. Upon award of the Contract, submit a list of services requiring shut-down, anticipated shutdown times, and their maximum duration.

D. Provide 14 days written notice to the Engineer where a temporary shut-down of any portion of the existing works is necessary to facilitate construction. Have the proposed timing of such construction reviewed by the Engineer prior to initiation of the work related to the shutdown.

E. Obtain acceptance from the Engineer for all proposed partial shutdowns required for equipment, piping, instrumentation, and electrical installation at least 3 weeks in advance.

F. Take every precaution to avoid interfering with facility operation and maintenance. In the event of conflict between the construction operations and the facility operations, facility operations have priority. Reschedule construction activities to suit the operation of the facility, as required, without change to the Contract Price.

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

3.5 Concealment of pipes and conduits

A. Unless specifically noted otherwise on the Drawings, completely conceal pipes, ducts and other such services within the construction of floors, walls, ceiling or soffits of the building. Leave electrical conduits exposed within unfinished areas.

B. If doubt arises as to the means of concealment or the intent of the Contract Documents in this connection, request clarification from the Engineer before proceeding with the work. Furring to conceal services on walls or ceilings will be allowed only where indicated on the Drawings, or reviewed by the Engineer.

C. Have the mechanical subcontractors lay out their work well in advance of erection of walls, ceilings, furring, etc., so that provision may be made for proper concealment where required. Have such work tested, inspected and pipe covering applied, where applicable, before being concealed.

D. Install pipes, ducts, and conduits, etc. that are to be furred in neatly and close to building structures so that furring can be kept as small as possible. Replace services or other work that are not installed as required, to the satisfaction of the Engineer.

E. Run exposed ducts, piping and conduit neatly along ceilings, walls or beams with hangers at right angles to walls and ceilings. Provide struts to support conduits. Do not secure conduits directly to walls.

3.6 Location of Fixtures:

A. The locations of un-dimensioned fixtures, apparatus, outlets, conduits, piping, etc., identified on the Contract Documents or as specified are approximate. Finalize the actual locations as reviewed by the Engineer and as required to suit conditions at the time of installation and as is reasonable.

B. Inform the Engineer of the impending installation and review with him the location details before installation.

3.7 CUTTING, DRILLING, FITTING, AND PATCHING

A. Complete the necessary cutting, fitting and patching to ensure that the various parts of the work fit properly. Complete cutting, fitting and patching as may be required to connect the work with that of any other Contractor as indicated on the Contract Documents.

B. Do not negatively impact existing work by cutting, digging, blasting or any other construction operation.

C. Do not cut load bearing members without the review by the Engineer.

D. Be responsible for costs occasioned by ill-timed work.

E. Prior to coring or drilling into existing concrete, in order to avoid damage to any encased piping, conduits, and other concealed items in the vicinity, ensure that:

1. The locations and the extent of cutting required are coordinated with the trade(s) involved and are accurately and carefully marked out.

2. The walls or slabs are scanned with ground penetrating radar (GPR) prior to drilling holes or coring openings to determine the location of existing services concealed in and/or behind the construction to be drilled.

3. Shop drawings applicable to the affected area have been reviewed.

3.8 ROUGHING IN

1. Be responsible for obtaining manufacturer's literature, for correct roughing in and hook up of equipment, fixtures, appliances, and other items.

END OF SECTION

SECTION 01150 – PROJECT MEETINGS

PART 1. GENERAL

1.1 RESPONSIBILITIES OF ENGINEER

A. Schedule and administer meetings.

B. Prepare the agenda with copies for all participants and preside at the meeting.

C. Record meeting notes and distribute via email to participants and those affected by decisions made within five (5) working days of meeting.

1.2 RESPONSIBILITIES OF CONTRACTOR

A. Provide physical space for meetings.

B. Provide data required to the Engineer and be prepared to discuss all items on the agenda.

C. Representatives of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of the party each represents.

D. Identify any errors in minutes to the Engineer in writing within three (3) days of receipt.

1.3 PRE-CONSTRUCTION MEETING

A. The Engineer will schedule and administer a pre-construction meeting prior to the date of the Notice to Proceed and prior to start of construction at the Site or another mutually agreed location.

B. Ensure that a senior Contractor's representative, the Contractor's project manager and designated site superintendent are in attendance. The Contractor's health and safety officer and major Subcontractors shall also be in attendance.

C. Agenda to include the following:

1. Appointment of official representative of participants in Work.
2. Schedule of Work and progress scheduling.
3. Schedule of submission of shop drawings, samples and colour chips.
4. Requirements for temporary facilities, site sign, offices, storage sheds, utilities, and fences.
5. Delivery schedule of specified equipment.
6. Site security, site access and use of site.
7. Contemplated change orders, procedures, approvals required, mark-up percentages permitted, time extensions and administrative requirements.

8. Owner supplied products.

9. Preconstruction photos and monthly progress photos.

10. Record drawings.

11. Operation and maintenance manuals.

12. Take-over procedures, acceptance and warranties.

13. Monthly progress claims, administrative procedures, progress photographs and holdbacks.

14. Appointment of inspection and testing agencies or firms.

15. Insurance.

16. Safety issues.

17. Environmental issues, including spills reporting.

18. Shutdowns and tie-in requirements

19. Proposed Construction Sequencing Plan

20. Hazardous Areas and Hot Work

21. Quality control plan

22. Permits and approvals obtained by the Owner and the Contractor

23. Traffic control

24. Other items of discussion

1.4 PROGRESS MEETINGS

A. The Engineer will schedule and administer progress meetings at the Site throughout the progress of the Work on a monthly basis, or more frequently should the Engineer deem it necessary.

B. Attendance Required: Contractor's health and safety officer, Contractor's superintendent, major Subcontractors and Suppliers, as appropriate to the agenda topics for each meeting.

C. Agenda to include the following:

1. Safety issues.

2. Review, approval of minutes of previous meeting.

3. Review of Work progress since previous meeting.

4. Field observations, problems and conflicts.

5. Problems which may impede construction schedule.

6. Review of off-site fabrication delivery schedules.

7. Corrective measures and procedures to regain projected schedule.

8. Revisions to construction schedule.

9. Progress, schedule, during succeeding work period.

10. Review submittal schedules: expedite as required.

11. Maintenance of quality standards.

12. Pending changes and substitutions.

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

14. Environmental issues.

15. Other business.

1.5 SHUTDOWN MEETINGS / TESTING AND COMMISSIONING MEETINGS

A. Coordinate all shutdown of building processes during the construction process with the Engineer and Operations at least 48-hours prior to the planned shutdown.

B. The Contractor shall schedule and attend regular (weekly or as appropriate) shutdown / testing and commissioning meetings throughout the duration of equipment and facility startup and commissioning. The first of such meetings shall be held prior to submitting the Facility Startup Plan, as specified in Section 01762 – Commissioning, and shall include preliminary discussions regarding such plan.

C. Agenda items shall include, but not be limited to, content of the Facility Startup Plan, coordination needed between various parties in attendance, and potential problems associated with startup.

D. Attendees will include members of the Testing and Commissioning Group as defined in Section 01762 –Commissioning.

E. Attendees shall include:

1. Contractor’s Project Manager and Site Superintendent.

2. Contractor’s designated quality control representative.

3. Subcontractors and equipment manufacturer’s representatives whom the Contractor deems to be directly involved in facility startup.

4. Engineer’s representatives.

5. Owner’s Engineering and Operations representatives.

6. Others as required by the Contract Documents or as deemed necessary by the Contractor.

F. Suggested Agenda:

7. Detailed testing and commissioning plans and schedules (Facility Startup Plan).

8. Coordination required between various parties in attendance, and potential problems associated with startup.

9. Coordination and shutdown requirements.

10. On-site witness testing by independent subconsultants and approval/regulatory agencies.

11. Sampling and analytical requirements and responsibilities.

12. Requirements and schedules for training of the Township's staff.

13. Requirements and schedules for O&M data.

14. Engineer's responsibility for separate training of the Township's staff.

15. Engineer's responsibility for separate process O&M manual.

1.6 PRE-INSTALLATION MEETINGS

A. When required in individual Sections, the Contractor shall convene a pre-installation meeting at the Site prior to commencing work of the Section.

B. Require attendance of all parties directly affecting, or affected by, work of the specific Section.

C. Notify the Engineer, in writing, seven (7) days in advance of the meeting date.

D. Prepare the agenda and preside at the meeting:

E. Review the conditions of installation, preparation, and installation procedures.

F. Review coordination with related work.

G. The Engineer will record minutes and distribute copies to participants and those affected by decisions made.

H. Identify errors in the minutes, if any, to the Engineer in writing within three (3) days of receipt.

1.7 OTHER MEETINGS

I. In accordance with the Contract Documents and as may be required by the Township and the Contract Administrator.

J. The Township and Engineer reserves the right to call additional Site meetings, or to request the attendance of particular personnel at any meeting.

PART 2. PRODUCTS

A. Not Used

PART 3. EXECUTION

A. Not Used

END OF SECTION

SECTION 01200 – ALTERNATIVES AND SUBSTITUTIONS

PART 1. GENERAL

1.1 GENERAL

A. The Contract Price is to be based upon those materials and equipment models identified and named in the detailed Specifications. Alternatives or variations to those specified shall not be allowed without formal submittal, review and acceptance in accordance with this Section.

B. Where more than one trade or supplier's name is given, the Contractor shall note that the design, as shown on the drawing, has been based on the first name listed. In the event that an alternate is proposed, the material and equipment supplied must be equal in quality, material and performance (including maximum and minimum criteria specified or implied) to the material/equipment first named in the specification. Any design and/or construction changes necessitated by the use of other trade or supplier's named given are the sole responsibility of the Contractor and shall be at the expense of the Contractor. The Contractor shall be responsible for coordinating these additional requirements assuring the proper fit and matching of all equipment and materials.

C. The Specification Sections contain pertinent performance criteria, quality, function and requirements for materials and methods to achieve work described.

D. Co-ordinate pertinent related work and modify surrounding work as required to complete project under each substitute designated at no additional cost to the Owner.

E. Only submit alternative materials and equipment with savings for the Engineer’s review.

F. Coordinate affected related work and modify surrounding work to integrate the works under each alterative.

G. No extension of time shall be granted for evaluation of alternatives.

H. Substitution of the pre-selected equipment will **NOT** be permitted.

1.2 REQUESTS FOR SUBSTITUTION

A. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier or manufacturer, the naming of the item is regarded as the standard to establish the type, function and quality required.

B. Material or equipment of equal or better performance and quality may be offered in substitution for those specified. Requests for review of substitute items of material and equipment shall not be accepted by the Engineer from anyone other than the Contractor.

C. All requests for substitution must be accompanied by a detailed listing of the expected cost savings to the Owner.

D. Substitutions shall not be considered when they are indicated or implied on Shop Drawings or product data submittals without a separate written request.

E. Requests for substitution shall include any request for changes from the Contractor that require significant design changes, redesign or significant design reviews.

F. A request for substitution constitutes a representation that the Contractor:

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

2. Shall provide the same warranty for the substitution as for the specified product.

3. Shall coordinate the installation and make changes to other Work which may be required for the Work to be complete at the Contractor's expense and at no additional cost to the Owner.

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

5. Shall reimburse the Owner for review or redesign services.

G. Request for substitution shall be made by written application to the Engineer, utilizing the form attached below, and shall include sufficient data to enable the Engineer to assess the acceptability of requirements, including the following:

1. All submittal information required for the specified equipment, including all deviations from the specified requirements and/or necessitated by the requested substitution.

2. Materials of construction, including material specifications and references.

3. Dimensional drawings, showing required access and clearances, including any changes to the work required to accommodate the proposed substitution.

4. Drawings and details showing changes if the offered substitution necessitates changes to or coordination with other portions of the Work. Perform these changes as part of the substitution of material or equipment at no additional cost.

5. Certification, with calculations as required, that the proposed substitute will adequately perform the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified with the same or better warranty.

6. Information and performance characteristics for all system components and ancillary devices to be furnished as part of the proposed substitution.

7. Certification that acceptance of the proposed substitute shall not prejudice achievement of Substantial Completion.

8. Itemization of all costs including any licenses fee or royalty that shall result directly or indirectly from the acceptance of the proposed substitution. Include

redesign and cost of claims of any other contract affected by the resulting change.

9. Guaranteed credit or cost reduction offered if the proposed substitution is accepted and a waiver of claims for additional expenses which may subsequently become apparent.

10. Recommended maintenance requirements and availability of spare parts and service.

11. Written confirmation from subcontractors and suppliers on cost, schedule, and technical requirements if requested by the Engineer.

1.3 ENGINEER'S REVIEW

A. The Engineer shall evaluate each proposed substitution. The Engineer shall be the sole judge of acceptability, and no substitute shall be ordered, installed or utilized without the Engineer's prior written acceptance by either a Change Order or a reviewed shop drawing. The burden of proof is on the Contractor.

B. The Contractor shall pay the Engineer's cost for evaluating the requested substitution even though the request may be denied, or for additional redesign work required as a result of any substitution. Costs shall be charged on a time and expense basis and shall be deducted from progress payments due the Contractor.

1.4 FIRST-NAMED AND ACCEPTABLE NAMED ALTERNATES

C. Where more than one trade or supplier's name is given, the Contractor shall note that the design, as shown on the Drawings, has been based on the first named supplier, manufacturer, or product listed.

D. In the event that an alternate is proposed, the material and equipment supplied must be equal in quality, material and performance (including maximum and minimum criteria specified or implied) to the material/equipment first named in the specification. The Specification Sections contain pertinent performance criteria, quality, function and requirements for materials and methods to achieve work described.

E. Any design and/or construction changes necessitated by the use of other trade or supplier's names given, are the sole responsibility of the Contractor and shall be at the expense of the Contractor. The Contractor shall be responsible for coordinating the affected related work and modifying surrounding work to integrate the works for each alternative proposed, assuring the proper fit and matching of all equipment and materials.

PART 2. PRODUCTS

A. Not Used

PART 3. EXECUTION

A. Not Used

Request for Substitution Form

Substitute Description:		Substitution Request #:		
OWNER:		Date Sent	Date Received	Initials
PROJECT :	Contractor → Engineer			
CONTRACTOR:	Engineer → Contractor			

Specification Title:		Description:
Section:	Page:	Article/Paragraph:

Proposed Substitution:		
Manufacturer:	Address:	Phone:
Trade Name:		Model No.:
Installer	Address:	Phone:

History: ☐ New Product ☐ 2-5 Years Old ☐ 5-10 Years Old ☐ > 10 Years Old

Reason for Request:

☐ Attached point-by-point comparative data.

☐ Attached complete dimensional information and technical data, including laboratory tests, if applicable.

☐ Attached complete information on changes to drawings and specifications which proposed substitution will require for proper installation.

Similar project which for product was used	
Project:	Consultant:
Address:	Owner:
	Date Installed:

Proposed substitution affects other parts of work: ☐ No ☐ Yes; explain:

Savings Offered to Owner for Accepting Substitution: $

Proposed substitution changes contract time: ☐ No ☐ Yes; ☐ Add ☐ Deduct: days.

If yes, indicate reason:

Proposed substitution affects the dimensions shown on drawings: ☐ No ☐ Yes;

If yes, indicate reason:

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other, specify:

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product, or liability is assumed for equivalent performance.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule other than specified herein.
- Cost data as stated above is complete and accurate. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances other than specified herein.
- Costs will be carried by the Contractor for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the work as necessary for accepted substitution will be complete in all respects.

Submitted by:

Contractor Signature: ***Signature Required.***

Address:

Telephone:

Attachments:

AECOM's REVIEW AND ACTION

☐ Substitution Recommended for Approval ☐ Substitution Recommended for Approval, as Noted ☐ Substitution rejected – Use Specified Materials. ☐ Resubmit as Noted – Additional Information Required.	AECOM's estimated budget impact to address design modifications, inspection, contract administration and as-built drawings. $ _____

Reviewer Comments:

Signed by:	**Date:**

END OF SECTION

SECTION 01290 – MEASUREMENT AND PAYMENT

PART 1. GENERAL

1.1 MEASUREMENT FOR PAYMENT

A. The Engineer shall calculate payment for lump sum contracts based on tendered price and Engineer's estimate of percentage of work item completed.

B. Where a method of measurement for payment for a work item is not specified, payment for that item will be deemed to be included in another pay item or other pay items, as appropriate.

C. No payment for any work will be made over 90% of the contract value on that item until all documentation for the completed O&M manuals are received and accepted as satisfactory.

1.2 PROGRESS PAYMENT DRAW

A. Contractor's Responsibilities:

1. Submit a detailed Lump Sum Price Breakdown for every division and every major item installed with an appropriate value to be used for payment draws. The cost of any item listed, that is in the opinion of the Engineer is inappropriate and unbalanced, shall be rejected and a new price shall be provided by the contractor.

2. Submit progress payment draw to Engineer within five (5) working days after each month end.

3. Progress payment draw to show estimate of percentage of work completed against each item of Lump Sum Price Breakdown.

4. Progress payment draw to include all labour and materials incorporated in work and all materials stored at site.

5. Progress payment draw to include labour and materials incorporated in work for all agreed extras and deductions.

6. Supply documentation to support the payment draw for materials on site in the form of itemized lists or unpriced purchase orders showing quantities.

7. Supply other evidence required by Engineer in support of progress payment draw.

B. Engineer's Responsibilities:

1. Review Contractor's payment draw, prepare Progress Payment Certificate and issue to Owner within ten (10) working days following receipt of Contractor's payment draw.

2. Engineer's estimate of percentage of work completed will govern calculation of payment on all Progress Payment Certificates.

3. Inform Contractor of amendments to the payment draw by copy of Progress Payment Certificate.

1.3 CHANGE ORDERS

1. The Contract Administrator may issue Requests for Quotations (RFQs) or Contemplated Change Notices (CCNs) that may alter the quantities and/or scope of work as defined in the Tender. Complete and promptly return all RFQs/CCNs issued by Contract Administrator, quoting lump sum prices as requested. Include appropriate supporting documentation to verify prices.

2. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins, determined as follows:

    a. All such work shall be valued at the price as set out in the Form of Tender or the Provisional Items if, in the opinion of the Contract Administrator, 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 Contract Administrator/Township may agree on a lump sum price for such work, in which case the price shall be comparable to prices quoted on work of a similar nature.

        i. A 5% markup shall be paid on lump sum change orders completed by the Contractor and 5% markup shall be paid on lump sum change orders prepared by sub-contractors.

3. If the lump sum method above is inapplicable, the Contract Administrator may direct that extra work shall be done by the Contractor on a Time and Materials basis provided for payment as follows:

        i. The actual cost of all labor, including an allowance for Payroll Burden required directly for the performance of extra work plus 12% of the same.

        ii. The actual cost of all materials including transportation charges required directly in the extra work, plus 12% of the same.

        iii. Rental for machinery and heavy equipment, such as tractors, bulldozers, ditching machines, air compressors, concrete mixers and graders, for the actual time required in operation for the performance of the extra work, to which no percentage shall be added.

4. If the Contractor is directed to carry out extra or additional work on a Time and Materials basis and proposes to have such work or a part thereof carried out by a Subcontractor or a Sub-Subcontractor, the Contractor shall notify the Contract Administrator to that effect before commencing the said work. Provided that the Contractor’s proposal and all Subcontractors and Sub-Subcontractors involved have first been approved by the Contract Administrator, the Contractor may claim payment from the Township for such work as follows:

a. In respect of work carried out by the Contractor's own forces, an amount equal to the sum of the amounts provided for as noted above.

b. In respect of work carried out by a Subcontractor's forces, an amount equal to the sum of the amounts provided for as noted above plus 5% of such sum.

c. In respect of work carried out by a Sub-Subcontractor's forces, an amount equal to the sum of the amounts provided for as noted above plus 5% of such sum plus a further 5% of the total so obtained.

5. The compensation provided for above shall be payment in full for all charges including superintendence, overhead, the use of small tools and profit.

6. Do not proceed with work affected by RFQs/CCNs until authorized to do so by a valid approved Change Order. Change Order is only valid when signed by the Contract Administrator, the Township and the Contractor.

1.4 LUMP SUM PRICE BREAKDOWN

A. Submit the Lump Sum Price Breakdown, in a spreadsheet format compatible with latest version of Excel.

B. Mobilization and Demobilization

1. The price provided for this item shall be consistent with the actual costs involved, but should not in any event, exceed 1% of the Lump Sum Total Price (not including HST). In the event the amount provided for this item exceeds 1% of the Lump Sum Total Price, the Owner reserves the right, at its sole discretion, to apportion any or all of the cost of this item to the Demobilization component, which shall be paid upon completion of demobilization.

C. Section 01762 –Commissioning and Section 01764 –Training

1. The combined price provided for these Sections shall be consistent with the actual costs involved, but should not in any event, be less than 5% of the Sub-Total of Lump Sum Prices for Division 16 inclusive (not including HST). In the event the amount provided for these Sections is less than 5% of the Sub-Total of Lump Sum Prices for Division 16 inclusive, the Owner reserves the right, at its sole discretion, to apportion any or all of the cost for these Sections from another Section as it sees fit.

1.5 OWNER APPLICATION FOR PAYMENT

A. Transmittal Summary Form: The Contractor shall attach one (1) Transmittal Summary Form with each detailed Application for Payment and shall include a Request for Payment of Materials and Equipment on Site as applicable.

B. The Contractor shall use a detailed Application for Payment Form in a format acceptable to the Owner and Engineer.

C. The Contractor shall provide a separate breakdown for Work to be paid for on the basis of unit prices or from cash allowances or provisional items.

D. Preparation:

1. The Contractor shall prepare an application for payment each month.

2. Prior to submitting the Contractor's Site Superintendent should review the proposed application with the on-site Contract Administrator and resolve any disputes.

3. The Contractor shall provide with each application after the first, a sworn statement, using a Statutory Declaration Form provided by the Owner or the Engineer, certifying that all accounts for the subcontracts, construction machinery and equipment, materials, products, labour and other indebtedness which may have been incurred by the Contractor, and for which the Owner might in any way be held responsible, have been paid in full, except for amounts properly retained as holdback or as an identified amount in dispute.

4. The Contractor shall provide a current Workplace and Safety Insurance Board (WSIB) certificate stating that the Contractor is in good standing with the WSIB and that all assessments have been paid by the Contractor to the date of the certificate.

5. The Contractor shall round values to nearest dollar.

6. The Contractor shall list each Change Order and Written Amendment executed prior to the date of submission as a separate line item.

7. The Contractor shall submit an Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form(s) as applicable, a listing of materials on Site as applicable, and such other supporting data as may be requested by the Engineer.

8. The Contractor shall submit Construction Photographs to illustrate the progress of the Work.

9. The Contractor shall upload scans or high quality photos of recorded information on the Contract Drawings to reflect "As Constructed" information as stipulated in Section 01330 - Submittals.

E. The Owner shall not release monies for Payment Certificates until the Contractor has provided all of the supporting documentation, as specified herein.

F. Deviations from the above specified requirements or incomplete submissions shall require resubmission of the application for payment.

1.6 PAYMENT

A. General:

1. Progress payments will be made monthly.

2. The date for the Contractor's submission of the monthly Application for Payment shall be established at the Preconstruction Meeting.

B. Payment for all of the Work shown or specified in the Contract Documents is included in the Contract Price.

C. Payment for unit price items covers all of the Work necessary to furnish and install the items identified in the schedule of Additional Unit Prices in the Form of Tender.

D. Payment for the Mobilization/Demobilization requirements of this Section shall be made as follows:

1. Forty percent (40%) upon commencement of construction, i.e. full mobilization. The payment of mobilization shall be included in the first payment certificate issued for the Contract subject to the Engineer being satisfied that full mobilization has been carried out. If the Engineer is not so satisfied, the Engineer shall allow a payment amount which, in the opinion of the Engineer, reflects the degree of mobilization effected to date.

2. Progressively from 40% at the commencement of construction to 80% at Substantial Performance of the Work.

3. The remaining 20% to be paid immediately prior to Completion of the Work for Demobilization.

4. In the event that the price of this item exceeds 1% of the Lump Sum Total Price, the Owner reserves the right, at its sole discretion, to apportion the payment of this item differently, including apportioning any or all of the cost of this item to the Demobilization component, which shall be paid upon the completion of Demobilization.

1.7 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for the following:

1. Loading, hauling, and disposing of rejected material.
2. Quantities of material wasted or disposed of in manner not called for under the Contract Documents.
3. Rejected loads of material, including material rejected after it has been placed by reason of failure of the Contractor to conform to requirements of the Contract Documents.
4. Material not unloaded from a transporting vehicle.
5. Defective Work not accepted by the Owner.
6. Material remaining on hand after completion of the Work.
7. Materials and equipment not delivered to site.

PART 2. PRODUCTS

A. Not Used

PART 3. EXECUTION

A. Not Used

END OF SECTION

SECTION 01310 – SCHEDULES AND PROGRESS REPORTING

PART 1. GENERAL

1.1 SCOPE

A. The Contractor has the obligation and responsibility at all times to plan and monitor all of its activities, anticipating and scheduling its staff, materials and Work methods in a manner that is likely to ensure completion of the Work in accordance with the terms and conditions of the Contract and at a rate that will allow it to be completed within the Contract Time.

B. The purpose of the schedule and reports mandated in this Section is to:

1. Ensure adequate planning and execution of the Work by the Contractor.

2. Establish the standard against which satisfactory completion of the Contract will be judged.

3. Ensure that the Contractor provides, at regular intervals, sufficiently detailed and accurate information on the actual progress of the Work to enable the Contract Administrator to analyze the validity of the Contractor's schedule updates.

4. Assess the impact of changes to the Work.

5. Substantiate, by way of a schedule demonstration, the Contractor's request for Extension of Time.

1.2 SCHEDULE SUBMISSIONS AND REVIEW

A. Submission of the schedules (including Baseline and Progress Schedules) referred to in this specification Section, and any subsequent updates to such schedules, shall constitute the Contractor's representation that:

1. The Contractor and its Subcontractors intend to execute the Work in the sequence indicated in such schedule.

2. The Contractor has distributed the proposed schedule to Subcontractors and Pre-Selected Equipment Vendors as required for their review and comment, and has obtained their concurrence.

3. All elements of the Work required for the performance of the Contract are included. Failure to include any such element shall not excuse the Contractor from completing the Work within the Milestone dates and Contract Time and other constraints specified in the Contract Documents.

4. Seasonal weather conditions have been considered and included in the planning and scheduling of the Work influenced by high and low ambient temperatures and/or precipitation.

5. The Contractor has thoroughly inspected the Site, considered the work of Other Contractors and, where necessary to complete the Work under this Contract, coordinated its plan with Other Contractors retained by the Township.

6. The Contractor has incorporated any other special conditions in planning the Work such as specified or required Work restriction periods, etc.

B. The express or implied acceptance by the Township and/or the Contract Administrator of the baseline schedule and any progress schedules shall not constitute an approval or acceptance of the Contractor's construction means, methods, or sequencing or its ability to complete the Work in a timely manner, and shall not place any obligation or responsibility on the Township toward the Contractor nor shall it, in any way, limit or restrict the Contractor's obligations and responsibilities under the Contract. The Township's and/or the Contract Administrator's acceptance shall demonstrate agreement that:

1. Contract Time, including dates of Substantial Performance, Contract Completion and all intermediate Milestones are within the specified times.

2. Specified Work constraints are shown as specified in the Contract Documents.

3. Specified Township-furnished Pre-Purchased equipment or material arrival dates, or range of dates, are included.

4. Access restrictions are accurately reflected.

5. Start-up, testing and facility commissioning times are as specified in the Contract Documents.

6. Submittal review times are as specified in the Contract Documents.

7. Training durations are as specified in the Contract Documents and timing is acceptable.

1.3 SCHEDULE PREPARATION

A. Project schedules shall be in the form of a Gantt chart and generated using professional computer software, such as Microsoft Project as a minimum.

B. Formatting requirements for schedules:

1. Title Block: Show the name of project, project number, Contract number and Township, Data Date, date submitted, revision or update number, and name of scheduler.

2. The Baseline Schedule will be numbered '0.0'. Revisions, if required, will be numbered '0.1', '0.2', etc. Numbering for the Progress Schedule updates shall reflect the number of months elapsed since the Contract commenced: i.e. the first update will be numbered '1.0'; 2nd month, '2.0', etc.

3. The Contractor shall identify horizontally, across the top of the schedule, the time frame by year, month, and day.

4. The Contractor shall identify each activity with a unique number and activity code and a brief description of the Work associated with that activity.

5. Legend to describe standard and special symbols and bars.

6. Schedules to be submitted electronically in PDF format. Provide hard copies of Schedules at Pre-Construction Meeting and each Progress Meeting on 11x17 size paper for all attendees.

1.4 COMPLIANCE WITH SCHEDULE

A. The Contractor shall comply with the latest schedule reviewed by the Township and Contract Administrator.

B. If, at any time, the Work is behind schedule with respect to the progress schedule currently in force, and if the Contract Administrator believes there is a risk of the Work not being completed within the Contract Time as a result of such delay, the Contractor shall take all necessary measures to make up for such delay either by increasing staff, facilities, or by amending its Work methods, whichever is applicable, with no change to the Contract Price.

C. In all cases of delay or potential delay, the Contractor shall keep the Contract Administrator informed of its intentions with regard to mitigation of such delay and the Contract Administrator may, if it is deemed necessary, require the Contractor to revise all or part of its current progress schedule.

1. If the Contractor fails to complete an activity by the latest approved scheduled completion date and this failure is anticipated to extend the Contract Time (or Milestones), the Contractor shall, within (5) Working Days of such failure, submit a written statement as to how the Contractor intends to recover the schedule shortfall and achieve targeted completion.

2. The Township may order the Contractor to increase its equipment, labour force, or working hours, at no additional cost, if the Contractor fails to:

a. Complete a Milestone activity by the stipulated completion date.

b. Satisfactorily execute the Work as necessary to prevent delay to overall completion.

PART 2. PRODUCTS

2.1 BASELINE SCHEDULE

A. Submit a baseline construction schedule showing the Contract starting date and the commencement and the completion of each substantial or key portion of the work. Provide an electronic PDF copy of the schedule to the Engineer for review at least two (2) working days prior to the Pre-Construction Meeting.

B. Construction activities with a value greater than $50,000 or a duration exceeding 2 weeks are to be shown as separate items in the Construction Schedule.

C. Indicate the following in the Baseline Schedule:

1. Identification and listing in chronological order of all construction, demolition and removal activities required to complete the Work, such as:

c. Mobilization and other preliminary activities.

d. Major components of the Work by all subtrades.

e. All subcontractors work.

f. Major equipment design, fabrication, factory testing, and delivery dates.

g. Equipment system testing and start-up activities.

h. Project closeout, cleanup, and site restoration.

i. Specified work sequences, constraints, and milestones, including Substantial Performance date.

2. Identify obtaining any applicable permits, design drawings, specifications and shop drawing submittals for early Product procurement, and long lead time items.

3. Identify timeframe, duration, early start, and completion for each activity and sub-activity, and any critical activities.

4. Identify the Work of separate stages and other logically grouped activities, and clearly identify critical path activities.

5. Identify shop drawing submission dates related to equipment or activity on the schedule.

6. The schedule shall demonstrate that the Contractor has compressed the on-site work to as short a period as possible in order to limit the amount of disruption to the Township's operation.

D. In the case that a schedule with insufficient detail is submitted, requests for progress payment will not be approved until such time that an appropriate schedule is provided.

E. Update the schedule based on review and comment by the Contract Administrator and/or Township and provide a finalized Baseline Schedule, against which progress will be measured.

2.2 PROGRESS SCHEDULES

A. The Contractor shall review and update the schedule, on a monthly basis at a minimum, and submit the updated Progress Schedule to the Contract Administrator at least two (2) working days prior to each Progress Meeting.

1. Each Progress Schedule shall record and report data and report actual completion and/or start dates for each completed or in-progress activity, activity percent complete for in-progress activities and forecast completion dates for all activities that are not yet complete.

2. The Progress Schedule shall show the projected completion date of the Work based on the progress information inserted into it, without changes to the schedule logic or the original duration of any activity.

3. Each Progress Schedule shall be shown as a target schedule to indicate whether the current progress schedule remains on target, has slipped or is ahead of schedule.

4. The Contractor may then, in a second and subsequent update to the progress schedule, incorporate any logic and duration changes that represent its revised planning, provided all such changes are identified.

B. Provide sub-schedules, such as Staging Plans and Sequencing Plans as required, to further define portions of the Work.

C. Each monthly progress payment application will not be reviewed until the updated Progress Schedule is submitted for that month. The Township shall withhold all or part of the monthly progress payment until the Progress Schedule is updated in a manner acceptable to the Contract Administrator.

D. Provide to the Contract Administrator in writing, a step-by-step procedure outlining the proposed method of accomplishing each portion of work that requires an interruption to the operation of the building. This proposed method of construction must be forwarded to the Contract Administrator for approval at least three (3) weeks in advance before any such work will be permitted. The Contractor shall include its proposed specific hours (times) of work in the submission.

2.3 LOOK-AHEAD SCHEDULES

A. The Contractor shall provide short interval “look ahead” schedules on a bi-weekly basis, identifying Work that has been performed during the past two weeks and activities that are planned for the next four to six weeks. The short interval schedule shall be consistent with the progress schedule currently in force.

B. The Look-Ahead Schedules shall generally reflect and be a snap shot of the work associated with the Progress Schedule. The activities in the Look-Ahead Schedules shall be identified by the same number coding as the Progress Schedule as revised as necessary.

C. All major upcoming items are to be highlighted, especially where coordination is required (e.g. shut-downs, inspections)

2.4 SITE PROGRESS RECORDS

A. All site progress reports shall be provided as required to the Contract Administrator and a copy shall also be kept for the Contractor’s records.

B. Provide by 10.00 am EST a Daily Progress Report including the following:

1. A summary of the previous day’s works including weather conditions, deliveries, installations, removals, a summary of any discoveries or delays, etc.

2. A list of the Contractor’s personnel on-site that day including name, trade/specialty, equipment to be used (as applicable), and location(s) of work.

C. Provide by 4.00 pm EST on the first working day of each week a Weekly Progress & Planning Report including the following:

1. An overview of the previous working week’s progress including quantification where applicable.

2. General summary of staff utilization including downtimes for training, maintenance of equipment, waiting on others (such as Engineer, Township or others), etc.

3. Summary log of all Issues/Concerns, RFIs, RFCs and their current status.

4. Health and Safety summary including the names of all those who have received the Contractor’s Site-specific training and any incident reports.

5. Summary of all external visitors to site including the Township, the Engineer, regulatory authorities, the testing companies, the subcontractors and the suppliers

2.5 PRECONSTRUCTION AND PROGRESS PHOTOGRAPHS

A. Provide preconstruction photographs in digital format, prior to commencement of work on the site. Deliver to the Township/Engineer before starting any construction, two electronic copies on USB. The Township/Engineer may direct the Contractor to obtain additional photographic records of structures and features within the site limits. The pre-construction records will be compared to the post-construction records to assess damage or displacement of existing structures.

B. Obtain pre-construction photos of the existing:

1. Roads, sidewalks and curbs

2. Shoulder and grass areas

3. Building exterior

4. Interior views of rooms, tunnels etc where modifications are planned.

C. On commencement of work and at monthly intervals thereafter, provide two (2) copies of six (6) different view photographs to illustrate the progress of the work. Photographs are to be taken by a professional photographer from locations selected by the Engineer. Township reserves the right to request hard copies of digital pictures as necessary, printed on photo quality media.

D. Photographs must be clearly identified with project name, date and location of exposure.

E. Submit progress photographs with monthly application for payment.

PART 3. EXECUTION

A. Not Used.

END OF SECTION

SECTION 01330 – SUBMITTALS

PART 1. GENERAL

1.1 WORK INCLUDED

A. This Section includes, but not necessarily limited to, the submission of the following data:

1. Construction schedule
2. Shop drawing and product data sheet submission schedule
3. Insert drawings
4. Sample submission schedule
5. Conduit and coordination drawings
6. Staging and sequencing plans
7. Test procedures, test results, installation certificates, instructions, etc.
8. Record drawings
9. Progress photographs
10. Environmental Control Plan
11. Sediment and Erosion Control Plan
12. Traffic control plan
13. Operating and maintenance manuals
14. Mockups
15. Other specific submittals as requested in individual specification sections.

1.2 RELATED SECTIONS

A. Section 01200 – Alternatives and Substitutions.

B. Section 01700 - Contract Closeout.

1.3 SUBMITTALS

A. Unless otherwise noted, make submittals to the Engineer for review.

B. Make submittals with reasonable promptness and in an orderly sequence to avoid any delay in the Work. Failure to submit in ample time is not considered cause for an

extension of Contract Time, and no claim for extension by reason of such default will be allowed.

C. Do not proceed with Work affected by submittals until review is complete.

D. Review submittals prior to submission to the Engineer. This review represents that the necessary requirements have been verified, checked and coordinated with the Contract Documents. Stamp, sign, date and identify all submissions. The Contractor's responsibility for errors and omissions for providing the specified Products and for the construction of the Work in accordance with the Contract Documents is not relieved or diminished in any way by the Engineer's review of submittals.

E. Cross-reference to specifications, using check marks to indicate compliance of every equipment with its corresponding specification section.

1.4 CATEGORIES OF SUBMITTALS:

A. Submittals fall into three categories: shop drawings, submittals for review and comment, and submittals that are primarily for information only.

B. Shop drawings: submittals that are required for all equipment and structures as detailed in individual sections. The Engineer will review and provide comments. The Engineer's review and comments, or lack of comments, will not relieve the Contractor of his responsibilities under the Contract.

C. Submittals for review and comment: are specified in the Contract Documents and include, but are not limited to, construction schedules, samples, coordination drawings, and construction coordination and sequencing plans. The Engineer will review the submittals and may provide comments. The Engineer's review and comments, or lack of comments, will not relieve the Contractor of his responsibilities under the Contract. The following submittals to be reviewed by the Engineer and commented on as necessary:

1. Test procedures, test results, installation certificates and manufacturers'/ suppliers' instructions.

2. Equipment Operations and Maintenance Manuals.

3. As-Built drawings.

D. Submittals that are primarily for information only: are specified as such in the Contract Documents and include:

1. Design drawings, calculations and specifications that are requested to be sealed by a Professional Engineer.

E. Submittals that are primarily for information only are not subject to submittal review procedures and will be provided as part of the work under this Contract and their acceptability determined under normal inspection procedures.

1.5 CONTRACTOR'S RESPONSIBILITIES:

A. Provide submittals to the Engineer as specified.

B. Be responsible for the accuracy and completeness of the information contained in each submittal and ensure that the material, equipment, or method of work is as described in the submittal. Verify that features of products conform to the specified requirements. Edit submittal documents to indicate only those items, models, or series of equipment that are being submitted for review. Cross out or otherwise obliterate extraneous materials. Coordinate submittals among the sub-contractors and suppliers and ensure there is no conflict with other submittals.

C. Verify that the materials and equipment to be furnished and method of work comply with the provisions and the intent of the Contract.

D. Coordinate submittals with the work so that work will not be delayed. Coordinate and schedule different categories of submittals, so that one will not be delayed for lack of coordination with another. No extension of time will be allowed because of failure to properly schedule submittals. Do not proceed with work related to a submittal until the submittal process is complete. This requires that submittals for review and comment are returned to the Contractor stamped “REVIEWED” or “REVIEWED AS NOTED”.

E. Stamp and date each submittal to certify that you have reviewed the submittal, verified field conditions, and complied with the Contract Documents.

F. The Engineer’s review of submissions does not relieve the Contractor of responsibility for correctness, adequacy, engineering and compliance with the Contract.

G. The Contractor may authorize a material or equipment supplier to deal directly with the Engineer with regard to a submittal. These dealings are limited to contract interpretations to clarify and expedite the work.

H. For any RFI where the information requested is apparent from field observations, is contained in the contract documents or is reasonably inferable from them, the Contractor shall be responsible to the Client for all reasonable costs charged by the Engineer to the Client for the additional services required to provide such information.

1.6 EFFECT OF REVIEW OF CONTRATOR’S SUBMITTALS

A. The review of methods of work, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of his responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Owner, or by any representative officer, employee or agent thereof. The Contractor shall have no claim under the contract on account of the failure, or partial failure, of the material, or equipment so reviewed.

B. Review of submittals does not extend to means, methods, techniques, sequences or procedures of construction, or to verifying quantities, dimensions, weights or gauges, or fabrication processes, except where specifically indicated or required by the project requirements or to safety precautions or programs incident thereto. Review of a separate item, as such, will not indicate approval of the assembly in which the item functions.

C. The Engineer will review shop drawings for general arrangement only. Be responsible for checking dimensions, quantities, proper fitting and construction of the work, and for furnishing materials or doing work required by the Contract Documents, which may not be indicated on shop drawings when reviewed.

1.7 SHOP DRAWINGS PROCEDURE

A. Show on the shop drawings the Products, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for proper performance of the Work. Where Products attach or connect to other Products, indicate that such items have been coordinated, regardless of the Section under which the various products have been specified. Identify by cross-references to design drawings and Specifications.

B. Product data sheets are defined as manufacturer's catalogue sheets, brochures, literature, technical data, performance charts and diagrams and similar data used to illustrate quality, characteristics, capacity and performance of the specified, manufactured Products.

C. Unless otherwise specified, within fifteen (15) business days after receipt of a shop drawing submittal for review and comment, the Engineer shall review the submittal and return one (1) copy of the marked-up shop drawing bearing the Engineer's Shop Drawing Review stamp. The Contractor shall note that this review period may be longer depending on the completeness of the submittal and number of submittals being issued. The returned submittal shall indicate one of the following actions:

1. If the review indicates that the material, equipment or work method complies with the Contract Documents, the submittal will be marked "REVIEWED". In this event, the Contractor may begin to incorporate the material or equipment covered by the submittal into the work.

2. If the review indicates limited corrections are required, the submittal will be marked "REVIEWED AS NOTED." The Contractor may begin incorporating the material or equipment covered by the submittal in accordance with the noted corrections. Provide six (6) copies of a corrected shop drawing for incorporation in the operations and maintenance data.

3. "REVISE AND RESUBMIT" - If the Engineer's review of a shop drawing or Product data sheet is not final, the Engineer will stamp the shop drawing or Product data sheet "REVISE AND RESUBMIT" and return a marked print to the Contractor. Revise the shop drawing or Product data sheet in accordance with the Engineer's notations and resubmit.

    a. Identify changes on resubmissions and indicate the revision dates. The Contractor shall clearly identify and highlight all changes made to the shop drawing. Revisions and changes not clearly highlighted in resubmissions may be missed. The Contractor will be responsible for any costs that may arise as a result of changes not highlighted as part of the resubmission, which may be approved unintentionally.

    b. Accept all risks associated with undertaking work covered by this submittal until it has been revised, resubmitted and returned marked either "REVIEWED" or "REVIEWED AS NOTED".

D. The shop drawing and the Product data sheet reviews do not authorize changes in cost or time. Changes involving cost or time are authorized only by a signed change order.

E. It is understood that the following is to be read in conjunction with the wording on the Engineer's shop drawing review stamp applied to each and every data sheet or drawing submitted:

1. "This review by the Engineer is for the sole purpose of ascertaining general conformance with the Contract design concept. This review does not mean that the Engineer approves the detail design inherent in the shop drawings, responsibility for which remains with the Contractor, and such review does not relieve the Contractor of the responsibility for errors or omissions in the shop drawings or of its responsibility for meeting all requirements of the Contract Documents. Be responsible for confirming and correlating dimensions at the Place of the Work, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all sub trades".

PART 2. PRODUCTS

2.1 CONSTRUCTION SCHEDULE

A. Submit a construction schedule showing the Contract starting date and the commencement and the completion of each substantial or key portion of the work. Provide the schedule to the Engineer for review within fourteen (14) days after the signing of the Contract. Include in the schedule the work of any sub-contractor, submission dates for shop drawings, and the project completion date.

B. Construction activities with a value greater than $100,000 or a duration exceeding 2 weeks are to be shown as separate items in the Construction Schedule.

C. Indicate in the Construction Schedule the Critical Path of the work including, but not limited to, the following:

1. Identification and listing in chronological order of all construction, demolition and removal activities required to complete the Work, such as mobilization and other activities; all subcontractor work; major equipment design, fabrication, factory testing, and delivery dates; equipment system testing and start-up activities; project closeout, cleanup, and site restoration; and specified work sequences, constraints, and milestones, including Substantial Performance date.

2. Project schedule shall be in the form of a Gantt chart and generated using professional computer software, such as Microsoft Project as a minimum, and updated as required at no additional cost to the Owner.

3. The construction schedule shall be reviewed before and updated at each progress meeting. An updated copy of the construction schedule shall be provided by the Contractor, at a minimum, on a monthly basis.

4. Identify timeframe, duration, early start, and completion for each activity and sub-activity, and any critical activities.

5. Identify shop drawing submission dates related to equipment or activity on the schedule.

D. Provide sub-schedules, such as Staging Plans and Sequencing Plans as required, to further define portions of the Work.

E. The Construction Schedule shall demonstrate that the Contractor has compressed the on-site work to as short a period as possible in order to limit the amount of disruption to the Owner's operation.

F. Provide to the Engineer in writing, a step-by-step procedure outlining the proposed method of accomplishing each portion of work that requires an interruption to the operation of the Building. This proposed method of construction must be forwarded to the Engineer for approval at least three (3) weeks in advance before any such work will be permitted. The Contractor shall include his proposed specific hours (times) of work in the submission.

G. Use additional work forces and equipment, or revise methods of operation when the progress of work is not sufficient to meet the approved Construction Schedule at no additional cost to the Owner.

H. In the case that a Construction Schedule with insufficient detail is submitted, requests for progress payment will not be approved until such time that an appropriate Construction Schedule is provided.

2.2 SHOP DRAWINGS:

A. Submit shop drawings, for piping arrangements, support/anchors, fabrication and erection drawings, design calculations, etc., where applicable, for all work in this Contract.

B. Submit shop drawings for all temporary works that control the dimensions of any part of the structures to be constructed under this Contract, or which impose loads on parts of the completed permanent works.

C. Ensure that shop drawings of mechanical and electrical equipment show details of construction, accurate dimensions, capacities and performance characteristics.

D. Ensure that shop drawings clearly show exposed fastenings and, where applicable, installation details, relationship to the building structure and/or finishes.

E. Manufacturer's standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and other standard descriptive data may be accepted in lieu of shop drawings, if they:

1. Supplement standard information to provide additional information applicable to the project.

2. Show dimensions and clearances required.

3. Show performance characteristics and capacities.

4. Show wiring diagrams and controls.

5. Delete non-applicable information.

F. Submit shop drawings in SI metric, or SI and Imperial units. Shop drawings in Imperial units only will be returned by the Engineer without review.

2.3 COORINDATION DRAWINGS

A. Prepare Coordination Drawings for areas of potential conflict, where interference may be caused by uncoordinated use of available space by the various trades and subcontractors. Clearly show on the same drawing the proposed works of all disciplines, such as process piping, plumbing and drains, air ducts, electrical cable trays and conduits, including valve orientation and access.

B. Show piping and other services that are to be cast into concrete.

C. Submit Coordination Drawings for review prior to commencement of the work.

D. Update and resubmit the Coordination Drawings when changes and relocations are to be made.

E. Carry out any relocation of work due to interference.

2.4 CONDUIT LAYOUT DRAWINGS:

A. Submit conduit layout drawings, clearly outlining proposed wiring routes as required and per Division 16, keeping in mind the requirements that conduits be concealed where required. These drawings will be reviewed similarly to shop drawings as previously described. At the completion of the project, submit as-constructed conduit drawings, clearly showing exact routing of conduit to permit future cutting of concrete safely. Ensure that the Engineer is given free access to conduit drawings kept on site to check their correctness as the work progresses.

B. Submit insert and sleeve location drawings showing the location and size of sleeves, anchor bolts, openings and miscellaneous items to be formed in the Work.

2.5 FALSEWORK, BRACING OR SHORING DRAWINGS:

A. Prepare and submit drawings of falsework, shoring and bracing to the Engineer for review when required. Falsework, shoring and bracing drawings shall bear the seal of a Professional Engineer licensed to practice in the Province of Ontario. The falsework, shoring or bracing shall be constructed in accordance with the reviewed drawings and at least one reviewed copy of falsework, shoring and bracing drawings shall be kept at the site at all times.

2.6 SAMPLES

A. Submit, in duplicate unless otherwise noted, samples as specified in Specification sections. Label samples as to origin and intended use in the Work.

B. Deliver samples prepaid to the Engineer's business address or testing company as directed.

C. Notify the Engineer in writing, at the time of submission, of any deviations in samples from requirements of the Contract Documents, and state the reason for such deviations.

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

E. Make changes in samples which the Engineer may require, consistent with the Contract Documents.

F. Where changes or modifications of the Products for which samples are submitted are required, re-submit samples embodying the required changes or modifications.

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

H. Reviewed samples will become the standard of workmanship and material against which the performed Work will be verified and accepted.

I. Do not use any material on the work that is in any way inferior to the approved samples. Approval of the Engineer does not obligate the Owner to pay for any material other than in accordance with the Contract. The approval will not prevent the rejection of any material that may be found, in the opinion of the 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. The approval will 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 being unsatisfactory or on any other account. The decision of the Engineer with respect to the approval or rejection of samples is final.

2.7 RECORD DRAWINGS

A. When work begins at the site, obtain from the Engineer a white print set of the Contract Drawings.

B. Record on the white prints on a daily basis, work constructed differently than shown on the Contract Documents. Record all changes in the Work caused by site conditions, or originated by the Owner, the Engineer, the Contractor, or a Subcontractor and by addenda, supplemental drawings, site instructions, supplementary instructions, change orders, correspondence, and directions of regulatory authorities. Accurately record the location of concealed mechanical services and electrical main feeders, junction boxes and pull boxes. Do not conceal critical Work until its location has been recorded. Do not use these drawings for daily working purposes and make the set available for periodic inspection by the Engineer.

C. Make records in a neat and legibly printed manner with a non-smudging medium.

D. Dimension the installed locations of concealed service lines on the site or within the structure by reference from the centre line of the service to structure column lines or other main finished faces or other structural points easily identified and located in the finished Work.

E. Submit record drawings to the Engineer for review.

2.8 PROGRESS PHOTOGRAPHS

A. On commencement of work and at monthly intervals thereafter, provide digital high quality photographs to illustrate the progress of the work.

B. Recommendation is to save daily photos of progress work, and new equipment upon arrival on a shared site or FTP with access to the CA.

2.9 EQUIPMENT OPERATING AND MAINTENANCE INSTRUCTION MANUALS

A. Submit a minimum of four weeks prior to the scheduled startup of the equipment or the application for a certificate of substantial performance, whichever occurs first, six (6) sets of the operating and maintenance manuals for each item of equipment.

B. Each manual is to contain operational information on equipment, cleaning and lubrication schedules, maintenance data, overhaul and adjustment schedules parts list and similar maintenance information. Instructions are to be in simple language so as to guide the Owner in the proper operation and maintenance of the equipment.

C. Bind each set in an identified three-post, hard-covered, plastic-jacketed binder equal to Grand and Toy No. L21-P5436. Organize contents into applicable categories of work as per Specifications Sections, and use identified tabs or coloured index sheets to separate categories. Emboss the front and the spine of each binder with the following information:

1. Township of Chapleau
2. Equipment manual for Township of Chapleau
3. Contract number.
4. Year of completion.
5. Volume number (e.g. 1 of 3).
6. Set number (e.g. 1 of 6).
7. Contractor’s name.

D. Submit electronic copies of the manual, organized in folders and sub-folders to follow the hard-copy manual. The manual shall be divided in accordance with the Division and Section format of the Specifications and shall include tabs for each section. Electronic Submission acceptable by email or USB.

E. Refer to other Divisions of the Specification for more specific requirements for the manual(s). In addition to information specified above or in other Divisions of the Specification, include the following in each binder:

1. A title sheet, labelled "EQUIPMENT OPERATING AND MAINTENANCE INSTRUCTIONS" containing the project title and submittal date;
2. A "List of Contents" page;
3. Contact persons, companies, names, mail and e-mail addresses and telephone and facsimile numbers of sub-contractors and suppliers.
4. Manufacturer's data on operation, maintenance, replacement parts lists, lubrication charts and recommended inspection intervals for all equipment covered by Divisions 16 of the Specifications as well as mechanically and/or

electrically operated items of equipment, including, but not limited to, valves, plumbing fixtures, electrical lighting, controls, cranes, switches, heating and ventilating equipment, etc. Ensure that the manufacturer's data includes a maintenance schedule for the equipment including a list of required activities as well as the recommended frequency for each activity.

5. Instructions for the care and maintenance of the building components, including, but not limited to, the care of tiled and other types of floor finishes, wall finishes or other surfaces, as well as manufacturers' data with suppliers' names and addresses for, finishing hardware, doors, etc.

6. A final, reviewed copy of shop drawings and product data sheets.

7. Complete parts list with catalogue numbers, as well as equipment, valve and hardware schedules.

8. Copies of warranties and guarantees with guarantee commencement date and duration of guarantee;

9. copies of approvals, certificates, and similar documents from governing authorities;

10. a final, reviewed copy of all shop drawings and Product data sheets;

11. a complete list of instructions and names of Products to be used for the cleaning of and the maintaining of finished building surfaces.

12. letters from suppliers indicating that the Owner may purchase spare and replacement parts from any supplier and they are not limited to purchasing spare or replacement parts from any specific supplier.

13. letters from the manufacturer's representatives who have inspected the installation of equipment.

14. A complete list of instructions and products required for lubrication and maintenance of all equipment.

F. If, during the Engineer's review of the manuals, revisions are required, the manuals will be returned with details of the revisions required. Revise the manuals accordingly and resubmit them for further review.

G. Submit the final operating and maintenance manuals to the Engineer prior to the application for a Certificate of Substantial Performance.

H. The submission of the "Equipment Operating and Maintenance Instruction" manual is a condition precedent to the certification of substantial performance.

2.10 OTHER SUBMITTALS:

A. Submit promptly, all other items required to be submitted in accordance with various Sections of the Specifications including but not limited to:

1. Installation/Inspection Certificates and various warrantees, as specified in individual specification sections.

2. Updated schedules.

15. Test and inspection reports.

16. Emergency response plan for spill contingency, temporary and standby equipment failure.

17. Summary list of loose items and spare parts in a tabular form with columns indicating Specification Section, Item Number, Description, Number of Units, and Expected Date of Delivery.

PART 3. EXECUTION

3.1 TRANSMITTAL PROCEDURE FOR SUBMITTALS:

A. When the Contract Documents require a submittal, submit the specified information as either hard-copy submissions or electronic submissions as follows:

18. Electronic Submissions

a. Upload submittal package to the Engineer's ftp site, which will be set up after Contract award.

b. Send an email to the Engineer notifying that the submittal or submittals have been uploaded. In the email, include the name and division number of the submittal in the subject line. The email should identify the folder/location it was uploaded to.

B. The Engineer reserves the right to request that a submittal be based only in hard-copy or only in electronic format as they deem necessary.

C. Have each submittal accompanied by a "Submittal Transmittal Form", to be standardized for all submittals. Apply a unique number, sequentially assigned, on the transmittal form. Original submittal numbers to have the following format: "XXX"; where "XXX" is the sequential number assigned by the Contractor. Resubmittals to have the following format: "XXX-A"; where "XXX" is the originally assigned submittal number and "A" is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25B, for example, is the second resubmittal of submittal 25.

D. On the transmittal form, clearly identify Contract, Contract No., Contractor, Pertinent Drawing No., Specification Sheet No. and Article No., as applicable, for the submittal.

E. Use a separate transmittal for each specific item, class of material, equipment, and items specified in separate, discrete sections, for which the submittal is required. Submittal documents common to more than one piece of equipment to be identified with all the appropriate equipment numbers. Make submittals for various items with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

3.2 SUBMITTAL COMPLETENESS:

A. Submittals that do not have all the information required to be submitted, including acknowledgement of deviations, are not acceptable and will be returned without review.

B. Bear the cost of any delay or cost implications arising from the improper submittals.

3.3 SHOP DRAWING TRANSMITTAL PROCEDURE:

A. Check shop drawings before submission to the Engineer for review to coordinate the activities on the project and intercept errors and omissions.

B. Submit shop drawings accompanied by a Submittal Transmittal Form. Failure to provide a Submittal Transmittal Form, in particular in the Contractor's certification section, shall be sufficient for rejection of the entire submittal with no further consideration.

C. Include in every shop drawing submission, a copy of the relevant specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included. Check-mark each paragraph to indicate compliance with the specification or mark otherwise to indicate requested deviations from specified requirements. Check marks (✓) denote full compliance with a paragraph in its entirety. If deviations from the specifications are indicated, underline each point of deviation and denote by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance with the specified requirements. Provide in the submittal a detailed, written justification for each deviation.

D. Failure to include a copy of the marked-up specification sections, along with justifications for any requested deviations to specified requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

END OF SECTION

SECTION 01400 – QUALITY REQUIREMENTS

PART 1. GENERAL

1.1 QUALITY CONTROL

A. The Contractor is responsible for controlling and demonstrating the quality of workmanship and materials, including work of its subcontractors and suppliers, and for assuring the quality specified in the Contract is achieved.

B. The Contractor shall provide a written Quality Control Program within fifteen (15) Working Days after the date of the Notice to Commence Work demonstrating how the Contractor's responsibilities for Quality Control will be fulfilled.

C. The Contractor shall coordinate and pay for testing and inspection services, and laboratory testing services, including but not limited to the following:

1. Inspection and testing required by by-laws, statutes and regulations relating to the Work and the preservation of public health.

2. Inspection and testing performed exclusively for the Contractor's convenience.

3. Testing, adjusting and balancing of air ducts and other conveying systems, mechanical and electrical equipment and systems.

4. Mill tests and certificates of compliance.

5. Tests specified to be carried out by the Contractor under the supervision of the Engineer.

6. Other tests as specified in the Contract Documents.

D. The Contractor shall furnish test results for any of the above-listed tests to the Contract Administrator when requested and consistent with the progress of the Work.

E. Bring to the attention of the Contract Administrator any condition or equipment, or installation which may not be suitable for the intended purpose.

F. The Contractor shall notify the Contract Administrator and the appropriate inspection and testing agent not less than five (5) Working Days prior to the commencement of the part of the Work to be inspected and tested.

G. Ensure the presence of the authorized inspection and testing agent at the commencement of the part of the Work specified to be inspected or tested.

H. Where practical, tests shall be done prior to incorporating into the permanent Works or prior to Site delivery. Where this is not practical, the Works shall be tested when placed and prior to being covered.

I. Ensure the inspection and testing reports are issued promptly (normally within forty-eight hours), and that the Engineer is notified forthwith if the report indicates improper conditions or procedures.

J. Where tests or inspections reveal work not in accordance with contract requirements:

1. Contractor shall pay costs for additional tests or inspections as Engineer may require verifying acceptability of corrected work.

2. Remove and replace Products indicated in inspection and test reports as failing to comply with the Contract Documents.

3. Correct improper installation procedures reported in the inspection and test reports.

4. Pay the costs for the re-inspection and testing of replaced work.

K. Cooperate with and provide facilities for the inspection and testing agents to perform their duties.

L. Correct defective work within the Contract Time; the performing of such work is not a cause for an extension of the Contract Time.

M. rate of 110% of the invoiced amount.

1.2 INSPECTION AND TESTING BY THE ENGINEER

A. The Engineer may inspect, test and reject materials and equipment and the process of preparation or manufacture of materials or equipment at any time. The Engineer will provide reasonable notice of the materials and equipment proposed to be inspected or tested during the process of preparation or manufacture, save that in the case of materials or equipment specifically stated in the Contract as required to be tested or inspected by, or in the presence of, the Engineer, the Engineer will not give such notice. Notify the Engineer in writing with sufficient advance notice of the commencement of preparation or manufacture of each item of such materials or equipment of the time and place at which such preparation or manufacture is to commence in order that the Engineer may be present.

B. Notwithstanding compliance with the foregoing paragraph, if any material or equipment prepared or manufactured away from the site of the works and required by the Contract or by the Engineer to be inspected, or tested by, or in the presence of, the Engineer at the place of preparation or manufacture become ready for delivery to the site of the works without being inspected or tested as required, notify the Engineer in writing and do not have such material or equipment delivered to the site of the works until authorized to do so in writing by the Engineer.

C. In any event, do not incorporate into the work any material or equipment required by the Contract or by the Engineer to be inspected or tested by, or in the presence of, the Engineer until the required inspection or testing has been carried out to the satisfaction of the Engineer.

D. Do not backfill or otherwise cover up work without having it inspected and passed by the Engineer. If ordered by the Engineer, open for inspection any work covered up without prior inspection by the Engineer. Make good again openings, excavations and disturbances of property, resulting from the inspection to the satisfaction of the Engineer.

E. Be responsible for the obligations under the Contract regardless of the approval by the Engineer or failure of the Engineer to carry out an inspection. Do not interpret action or lack of action of the Engineer as being an acceptance of defective or improper work or material. Remove and replace properly or otherwise rectify such work or material to the satisfaction of the Engineer.

1.3 INSPECTION AND TESTING REPORTS

A. Prepare and submit certified written reports specified herein and other Sections, signed by a responsible officer of the inspection and testing agency. Each report is to include at a minimum:

1. Date of issue.
2. Contract name and number.
3. Name, address, and contact information of inspection and testing company.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

PART 2. PRODUCTS

A. Not Used.

PART 3. EXECUTION

3.1 RECEIPT OF MATERIALS AND EQUIPMENT

A. During the process of unloading any material, etc., inspect it for loss or damage in transit in the presence of the Engineer. Notify the agent of the carrier of any loss or damage to the shipment.

B. The Engineer may reject materials supplied by the Contractor if found faulty or defective upon delivery. Replace such faulty or defective materials. Be responsible for removing faulty or detective materials and replacing same with good materials regardless of when the defects are discovered. Carefully unload equipment and materials in an approved manner to avoid damage thereto. Provide ample facilities for handling the equipment.

3.2 SURVEY LINES AND LEVELS

A. The Engineer will supply information to establish co-ordinates and basic benchmarks. The Contractor shall verify the correctness of stakes and marks and perform survey and layout Work.

B. Place the Work of this Contract according to lines and levels indicated on the Drawings.

C. The Contractor shall erect and protect batterboards, site lines and reference boards, during excavation and construction of structures.

D. The layout of the Work may be based on the connections and relationships with the existing infrastructure. Dimensions shown require verification and adjustment as the existing infrastructure is exposed:

1. The Contractor shall expose the existing structures, piping, duct banks, etc. and confirm existing dimensions both above and below grade.

2. The Contractor shall co-ordinate with the dimensions shown on the Contract Drawings and propose the final dimensions to be used for the layout. The Contractor shall provide accurate measurements to the Engineer and the proposed final dimensions. The Contractor shall await the Engineer's review and complete the layout to the approved dimensions.

E. The Contractor shall establish points from which floor and wall surfaces in each room can be determined and maintain these points for coordinating the work of various Subcontractors and Other Contractors.

F. The Contractor shall carefully protect all benchmarks and reference points.

G. The Contractor shall periodically verify by instrument, reference marks and Site lines. The Contractor shall be responsible throughout the Contract for the accuracy of lines and levels.

H. The Engineer may, from time to time, verify lines, elevations, grades, reference marks and batterboards. The Contractor shall re-measure and correct any errors in lines, elevations, grades, reference marks and batterboards disclosed by the verification of the Engineer.

I. The Contractor shall make the Work available for checking as required by the resident field staff of the Engineer.

3.3 LAYOUT OF THE WORK

A. Where several systems and Products are concentrated in an area, and prior to installation, pre-plan the total installation by preparing minimum 1:50 scale reproducible interference drawings detailing the location and identifying each system and Product. Submit the drawings to the Engineer for review.

B. Install systems and Products so as to provide the maximum headroom, clearances for access, specified floor to ceiling heights, and to minimize offsets in pipes, conduit, ducts and structural framing.

C. Run pipes, ducts, tubing and conduit plumb or level (except where specific slope is required for proper function) and parallel with building surfaces.

D. Unless indicated or specified otherwise, install pipes, ducts, tubing and conduit so they will be concealed above ceilings, behind furring and in walls as required to conform to finished room dimensions, except in mechanical and electrical equipment rooms or similar spaces.

E. Notify the Engineer and request clarification if locations of fixtures, fittings, equipment and services to these items interferes with interior finishes and use of the Work.

3.4 MANUFACTURER'S REQUIREMENTS

A. The Contractor shall adhere to the Supplier's and Manufacturer's recommendations with respect to the handling, preparation, installation, testing, operation or protection of any Product or material to be incorporated into the Work.

B. Where reference is made to a manufacturer's direction, instruction, or specification it is deemed to include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the Products pertinent to their use and their relationship to Products with which they are incorporated.

3.5 FASTENERS, ANCHORS, BRACES AND SUPPORTS

A. Provide the fasteners, anchors, braces and supports required to maintain installations attached to the structure or to finished floors, walls and ceilings in a secure and rigid manner capable of withstanding the dead loads, live loads, superimposed dead loads, and any vibration of the installed Products.

B. Use fasteners compatible with the structural requirements, finishes and types of Products to be connected. Do not mix Products subject to electrolytic action or corrosion where conditions are liable to cause such action.

C. Where hangers are suspended from concrete slabs, install inserts before concrete is placed using inserts designed for the specific purpose.

D. Where built-in inserts are inaccessible due to subsequent installation of ducts, pipes or other installations, use anchors appropriate to the load requirements. Locate anchors to avoid damage to reinforcing bars.

E. Verify that the fasteners, anchors, braces and supports for suspended installations, and the structure to which they are to be secured are designed to support the load requirements, including safety factor.

F. Where a fastener installation is suspect, have on-site tests of installed fasteners, performed by an independent testing laboratory acceptable to the Engineer, using properly engineered and calibrated force measuring meters.

G. Where the floor, wall or ceiling construction is not suitable to support the loads, provide additional framing or special fasteners to ensure proper securement to the structure that is to support the Products.

H. Provide reinforcing or connecting supports, where required, to distribute the loads on the structural components.

I. Do not use wood plugs or hammer-impact fasteners. Anchoring to floor topping fills is not acceptable. Secure the anchors in floors to the floor structure.

J. Where a performance requirement is specified, submit engineering calculations and written verification signed by a Professional Engineer, registered in the province of Ontario, that the installation has been inspected and is structurally sound and in accordance with design requirements.

K. Fastenings which cause spalling or cracking of the structure or Products to which anchorage is made are not acceptable.

L. Space the anchors within limits of load bearing or shear capacity and ensure they provide positive permanent anchorage.

3.6 CUTTING AND PATCHING

A. Remove and replace defective and non-conforming work.

B. Where new work connects with existing work and where existing work is altered, cut, patch and make good to match existing work.

C. Do all cutting with power saws or core drilling equipment. Do not use pneumatic or impact tools. Make all cuts with clean, true, smooth edges.

D. Do not cut, bore, or sleeve any load bearing structure without the written consent of the Engineer, unless specifically detailed on the Drawings. Submit details with each request for consent.

E. Make connections watertight.

F. Provide openings in non-structural elements of the Work for penetrations of mechanical and electrical work. Co-ordinate size and location of such openings with the trade involved.

G. Fit construction tightly to ducts, pipes, conduits and similar Products to stop air movement completely. Where such work penetrates a fire separation element or wall of the building, pack the penetration around the duct, pipe, conduit or similar for the length of the openings with ULC listed fire stopping packing Product.

H. Prepare the surfaces to receive patching and finishing.

I. Refinish the surfaces to match the adjacent finishes. For continuous surfaces refinish to the nearest intersection, and for an assembly, refinish the entire unit.

END OF SECTION

SECTION 01410 – REGULATORY REQUIREMENTS

PART 1. GENERAL

1.1 SCOPE

A. Comply with the requirements of the latest edition of the applicable CSA standards, the requirements of the authorities, federal, provincial and municipal codes, the standard of the Underwriters Association and all other authorities having jurisdiction. These codes and regulations constitute an integral part of these specifications. In case of conflict, the codes take precedence over the Contract Documents. In no instance, reduce the standard established by the drawings and specifications by applying any of the codes referred to herein.

B. The Contractor shall:

1. Execute Work in accordance with the applicable Federal, Provincial, Territorial and Municipal statutes, laws, regulations to the location of the Work to be performed.

2. Perform work in accordance with the latest named published editions of codes and standards.

3. Provide material and workmanship, which meet or exceed the specifically named code or standard.

4. In the event of conflict of statutes, laws, regulations, and codes, execute work in accordance with the requirements of the Authority having jurisdiction.

1.2 RELATED WORK

A. Section 01420 – Reference Standards.

1.3 CODES AND STANDARDS

A. The construction of the Works and the operations connected therewith are subject to the approval, inspection, by-laws, and regulations of municipal, provincial and federal authorities and organizations concerned with roads, streets, railways, telephones, electrical supplies, gas supplies and other public services or utilities having jurisdiction in respect to any aspect of this Contract.

B. The Contractor shall ensure that the Work confirms with the applicable Codes and Standards listed in Section 01420. Canadian standards take precedence over American standards in the case of duplication or conflict.

C. Perform the Work in accordance with the latest editions of applicable codes, standards, and Regulations affecting the Work including but not limited to:

1. Ontario Building Code (OBC).

2. Occupational Health and Safety Act (OHSA) and Regulations.

3. Plumbing Code

4. Ontario Electrical Safety Code (OESC)

5. Ontario Ministry of the Environment, Conservation and Parks (MECP)

6. Codes or standards by the National Fire Protection Association (NFPA)

7. Workplace Hazardous Materials Information System (WHMIS)

8. Codes and Standards by the Canadian Gas Association (CGA)

9. Technical Standards and Safety Authority (TSSA)

10. Municipal by-laws and servicing standards.

11. Municipal utilities.

D. Where reference is made to regulatory authorities, it includes all authorities who have, within their constituted powers, the right to enforce the laws of the Place of Work.

1.4 PERMITS, FEES AND INSPECTIONS

A. Except as specified herein, the Contractor shall apply for, obtain, and pay for all permits, licenses, inspection, examination testing and fees required.

B. The Contractor shall notify the Engineer before any application for a license or permit is made in order that the Engineer may be represented if the Engineer so elects when such application is made.

C. The Contractor shall arrange for inspection of all work by the authorities having jurisdiction over the work. Final inspection approval must be obtained from each inspection authority having jurisdiction. On completion of the work, the Contractor shall present to the Township the final unconditional certificate of approval of the inspecting authorities.

D. Before starting any work, submit the required number of copies of drawings and specifications to the authorities for their approval and comments. Comply with any changes requested as part of the Contract but notify the Township and Contract Administrator immediately of such changes for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required.

E. Any work rejected or requiring correction by the inspection authority shall be rectified at the Contractor's expense and any additional inspections caused by deficient work shall also be paid for by the Contractor.

F. The Contractor shall apply for, obtain, and pay for permits required for the project, including but not limited to:

1. Mud tracking permit

2. Plumbing Permit

3. Electrical Safety Authority

4. Other permits as required by law.

1.5 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Township's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

PART 2. PRODUCTS

A. Not Used.

PART 3. EXECUTION

A. Not Used.

END OF SECTION

SECTION 01415 – SAFETY REQUIREMENTS

PART 1. GENERAL

1.1 SCOPE

A. The Contractor shall be solely responsible for construction safety for this Contract and unequivocally acknowledges that it shall undertake the role of the "Constructor" as defined in the OHSA for all purposes. It is not intended that the Township will assume the role of Constructor under any circumstances.

1. Bear the increases in costs that may result if the Township becomes designated as the "Constructor" as a result of the Contractor's acts or lack thereof.

B. The Contractor shall be responsible to take all necessary steps to protect personnel (workers, visitors, general public, etc.) and property from any harm during the Contract.

C. The Contractor shall be solely responsible for complying with and ensuring that every person on the Site, whether such persons are members or the Contractor's own forces, Subcontractors, Township and Engineer's representatives, utility companies, or other third parties present, complies with the measures and requirements contained in the following:

1. Occupational Health & Safety Act R.S.O. 1990 (as amended) and all applicable Regulations under this Act. (OHSA)

2. Environmental Protection Act, R.S.O. 1990 (as amended) and all applicable Regulations under this Act. (EPA)

3. Dangerous Goods Transportation Act, R.S.O. 1990 (as amended) and all applicable Regulations under this Act. (DGTA)

4. Workplace Safety and Insurance Act, 1997 (as amended) and all applicable Regulations under this Act. (WSIA)

5. Highway Traffic Act, R.S.O. 1990 (as amended) and all applicable Regulations under this Act. (HTA)

6. Technical Standards and Safety Act, 2000 (as amended) and all applicable Regulations under this Act. (TSSA)

7. Township's facility-specific safety rules and requirements, emergency evacuation, spill response procedures, etc.

8. Contract Documents.

D. The above list is not organized by order of precedence. In event of a conflict between any provisions of the above authorities, the most stringent provision shall govern.

1.2 FACILITY-SPECIFIC SAFETY REQUIREMENTS

A. The Contractor shall comply with the Township's Health and Safety Procedures where necessary. The Township will provide a general health and safety orientation to all Contractor's personnel who will be working at the site. The Township will also provide a site-specific orientation to all Contractor's personnel who will be working at the site. All personnel

must attend the orientations and be approved by the Township. Allow for 2 hours for each person.

B. Smoking is not permitted in hazardous areas or other areas as designated by the Township.

1.3 WORK HAZARDS

A. It is the responsibility of the Contractor to address all work hazards that could be reasonably expected on the project site and to develop both training and written policy and procedures for protection of workers and the general public.

B. Without restricting the generality of the foregoing, the Township expects training and written procedures pertaining to the following:

1. Tag and lockout
2. Pinch points and guarding
3. Equipment use, maintenance and operation, including no climbing policy
4. Reporting and documentation of accidents, incidents, and unsafe circumstances
5. Handling and disposal of sharp objects
6. Use, wearing and care of personal protective equipment and its limitations
7. Operation of equipment near live power lines
8. Hygiene
9. Material handling
10. Confined space entry
11. Hot work
12. Emergency procedures

1.4 PRE-CONSTRUCTION REQUIREMENTS

A. Prior to the commencement of the Work, the Contractor shall notify the office of the Ministry of Labour, submit a Notice of Project and shall provide copies of the Notice to the Township and to the Contract Administrator.

B. The Contractor shall submit a Site-specific Health and Safety Plan within seven (7) Working Days after the date of the Notice to Commence Work. The Site-specific Health and Safety Plan shall address the requirements of the above referenced documents.

C. Prior to commencement of any Work, the Contractor shall post the following in a conspicuous location at the Site:

1. A copy of the Ontario Occupational Health and Safety Act and applicable Regulations.
2. A copy of the Contractor’s Health and Safety Policy and Site-specific Health and Safety Plan.

3. Arrangements for provision of first aid, including the names of First Aid attendants.

4. Arrangements for transportation and emergency medical aid, including the route to the nearest hospital.

5. Emergency response and evacuation procedures, including local contact names and numbers.

6. Procedures in the event of a spill including local contact names and numbers.

1.5 SAFETY ENFORCEMENT

A. The Contractor shall be responsible for enforcing a zero-tolerance policy with respect to health and safety requirements, safe work practices and procedures. Those refusing to comply shall be asked to leave the Site and shall not be allowed to return to the Site without the Contract Administrator's prior approval.

B. The Contractor shall ensure that all employees are competent, as prescribed by the applicable legislation in performing the Work and have been trained on the Contractor's Site-specific Health and Safety Plan prior to starting Work on the Contract. The Contractor shall make available all training records for the Township and Contract Administrator's review.

C. The Contractor shall include all safety provisions of this Contract in any agreement with Subcontractors and hold all Subcontractors equally responsible for safe work performance.

D. The Engineer and the Township shall have the right to issue warnings and/or to issue a Stop Work order if the Contractor fails to comply with any requirements under this Section.

1.6 CONSTRUCTION ZONE DELINEATION

A. The Contractor is responsible for performing all work within the defined construction area in accordance with the OHSA.

B. The Contractor shall install temporary yellow marking tape or similar readily visible marking system to highlight the construction area.

C. All of the Township's staff and Operators, when entering this construction zone, are to follow the terms of the Contractor's health and safety program. Similarly, when the Contractor enters the Township's property and/or the building, the Contractor will abide by the Township's health and safety program.

D. Before construction commences, a plan for safety protocol relating to the two areas of jurisdiction shall be developed and implemented.

1.7 SAFETY MANAGER AND COMMITTEE

A. The Contractor shall designate a Health and Safety representative, herein referred to as the Health and Safety Manager for the duration of the Contract. The Health and Safety Manager shall, at a minimum, have attended Joint Health and Safety Committee Certified Member training as administered by the Workplace Safety and Insurance Board, or equivalent training, and must have familiarity with construction project activities. The Contractor shall make available a record of qualifications of the Health and Safety Manager to the Contract Administrator for review.

B. The Joint Health and Safety Committee shall consist of the following persons, at a minimum:

1. The Contractor's designated Health and Safety Manager.

2. At least one person from each of the following, who does not exercise managerial functions:

   a. The Contractor's own forces.

   b. Each Subcontractor.

C. The Contractor shall invite a representative from the Township or Engineer to participate in the Joint Health and Safety Committee and respective meetings. The Township/Engineer may accept the invitation at their discretion.

1.8 ACCIDENTS AND INJURIES

A. The Contractor shall report to the Ministry of Labour, the Township, the Contract Administrator, and other jurisdictional authorities, any accident or incident involving the Contractor, Township or public, personnel and/or property, arising from the Contractor's execution of the Work.

1. A copy of all critical injury reports and investigations shall be provided to the Township and the Contract Administrator.

2. The Contractor shall prepare a monthly summary of all accidents and incidents and record of lost time to the Contract Administrator. These records shall be forwarded to the Construction Safety Association of Ontario, with a copy being forwarded to the Contract Administrator and the Township.

1.9 IMPACTS TO SCHEDULE

A. If the Contractor is responsible for a delay in the progress of the Work due to an infraction of legislated or Contractor health and safety requirements, the Contractor will, without additional cost to the Township, acquire and use for the execution of the Work, such additional labour and equipment as are necessary, in the opinion of the Contract Administrator, to avoid delay in the final completion of the Work or any operations thereof.

1.10 SAFETY SIGNAGE AND WARNINGS

A. The Contractor shall provide signage acceptable to the Township at all entry points to the Site to advise personnel entering the Site of the requirements respecting the use and wearing of personal protective equipment.

B. The Contractor shall provide signage acceptable to the Township at all entry points to the Site identifying the name, address and telephone number of the Contractor and advising employees, Subcontractors and other individuals entering the Site that:

1. All personnel and employees on the Site are required to comply with safety policies, procedures and instructions of the Contractor.

2. Any personnel failing to adhere to the safety policies, procedures and instructions of the Contractor may be removed from the Site and denied further access.

C. The Contractor shall provide signs relating to safety on the Site, and signs or notices required by the applicable provincial and local regulations or by the Contract Documents.

D. The Contractor shall establish, maintain and mark clear routes, paths and points for routine and emergency exit to, from and within the Site for personnel and vehicles.

1.11 SAFETY EQUIPMENT

A. Provide personal protective equipment for Contractor's own workers where prescribed.

B. The Contractor shall provide first aid, hygiene and medical facilities at the Site in accordance with the applicable provincial regulatory requirements. These facilities shall be kept in a clean orderly condition and always be readily accessible to all employees and the Township's and Engineer's staff.

C. Facilities and staffing to be in accordance with the Industrial First Aid Regulations of the Workplace Safety and Insurance Board and OSHA regulations.

D. The Contractor shall designate particular employees who are properly instructed in First Aid, to be always available at the Site while Work is being carried out.

E. Safety equipment such as gas detection equipment for explosive or toxic gases or oxygen deficiency, safety harness, Self-Contained Breathing Apparatus (SCBA) and ropes are to be made available to the Township's and the Engineer's staff when required. When it is required for the resident inspection staff to enter manholes, elevated areas or other potentially hazardous areas, provide competent personnel to assist with the entry into the said areas with the inspection staff and personnel with the necessary safety equipment to be present as required.

1.12 WHMIS - WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM

A. Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and the provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

B. The Contractor is reminded of the responsibility to provide training and necessary equipment to the Contractor's employees for the handling of hazardous materials.

C. Under this legislation the Contractor is responsible for making sure all hazardous materials have proper supplier labels and up to date (less than 3 years old) material safety data sheets (M.S.D.S.) are made available to the Township at the work site, for all products which are hazardous materials in the Contract and/or on the construction site.

D. The Contractor shall inform the Township and the Contract Administrator of new controlled products on or before delivery of the materials and provide a current MSDS to the Contract Administrator and/or Township. The Contractor shall inform the Township and the Contract Administrator of the location of these materials and shall ensure that these materials are not kept stored or used on Site without the Township's and the Contract Administrator's prior consent or approval.

1.13 NATURAL GAS

A. The Contractor shall ensure compliance with the requirements of the TSSA and applicable safety codes when working on, or in the area of, natural gas lines. Purge all gas lines with nitrogen prior to proceeding with Work. Existing gas lines passing through the Work area may continue in service during this construction. The Contractor shall take suitable safety precautions at all times.

1.14 DESIGNATED SUBSTANCES

A. Designated substances may be present on Site. Known designated substances will be noted in the plans, Drawings and Specifications. If a designated substance which has not been identified in the plans, Drawings and Specifications is located during the performance of the Work, the Contractor shall stop Work in that area and immediately notify the Contract Administrator or Township.

B. The Contractor shall comply with the governing OHSA Regulations and MOL requirements respecting protection of workers, removal, handling and disposition of any Designated Substances encountered in carrying out the work.

C. Should a Designated Substance not herein identified be encountered in the work, then management of such substance shall be treated as Extra Work.

1.15 CONFINED SPACE

A. Where work is intended to be completed in confined spaces, a Confined Space Assessment shall be performed and, where necessary, a Confined Space Entry Coordination Document and Plan, as prescribed by provincial regulatory requirements, shall be established by the Contractor.

1. Persons intended to work in confined spaces must have formal training in performing work in confined spaces. Provide proof of valid certificates of such training for all workers prior to entry of such workers into confined spaces.

2. Provide all necessary safety equipment for entry into confined spaces.

3. Where workers are required to enter a confined space, as defined by the OHSA, O.Reg. 632/05, ensure that workers of the Contractor and all Subcontractors follow the requirements of the above legislation, including but not limited to:

a. having a method for recognizing each confined space to which the program applies.

b. having a method for assessing the hazards to which workers may be exposed.

c. having a method for the development of confined space entry plans (which include on-site rescue procedures)

d. having a method for training workers.

e. having an entry-permit system.

4. Supply the necessary tools and equipment to perform the confined space entry. These items include, but are not limited to, required documentation, gas detectors, breathing equipment, fall protection and rescue equipment.

5. Work areas suspected of containing explosive or toxic gases or that are oxygen deficient must be routinely tested for presence of same before any work is done. Make safe work areas that are found to be hazardous before work proceeds, in accordance with safe practice and applicable statutes.

1.16 HOT WORK PERMIT

A. Prior to starting Work which requires welding, cutting, open flame or heat in hazardous or confined locations, or on and around heavy equipment, the Contractor shall obtain a Hot Work Permit and submit the Hot Work Permit to the Contract Administrator and Safety and Operations staff for review of location and timing.

1. Hazardous locations are areas containing flammable liquid, flammable gas or combustible material.

2. Confined locations include manholes, underground chambers, tunnels, or other locations where the atmosphere may be contaminated by combustible gas or lack of oxygen.

3. Heavy equipment includes bulldozers, tractor trailers, trucks, and earth moving equipment.

1.17 TEMPORARY LIGHTING

A. The Contractor is responsible for providing sufficient lighting required to maintain a safe workplace and meet all safety requirements regarding proper illumination of work areas.

B. The Contractor shall install temporary lighting in all rooms before any other work is performed.

C. Damaged or inoperable lamps are to be replaced promptly.

PART 2. PRODUCTS

A. Not Used.

PART 3. EXECUTION

3.1 INSPECTION

A. The Contractor shall inspect the physical condition of the workplace at least weekly, or as often as required by provincial health and safety regulatory requirements, in order to ensure that the Work is performed safely and that the Site is maintained in accordance with the provincial regulatory requirements and the Contract Documents.

B. The Contractor shall prepare and maintain a documented record of each inspection describing the scope of inspection and findings. Copies of all safety inspections shall be kept on Site and available for review by the Contract Administrator.

3.2 MATERIAL HANDLING

A. All materials on Site shall be stored, stacked, placed, removed and handled in a stable and secure manner so as not to endanger the safety of personnel or cause damage to property.

B. Materials which, by virtue of their configuration or weight, cannot be stored or stacked in a secure and stable manner, shall be secured against tipping, collapse, or falling by use of appropriate bracing systems, structures or equipment.

C. The Contractor shall ensure that vehicles, construction machinery, and materials handling equipment are only operated on the Project by persons suitably qualified to do so.

3.3 OVERLOADING

A. Ensure that no part of the Work is subjected to a load that will endanger its safety or will cause permanent deformation.

3.4 PRE-START HEALTH AND SAFETY REVIEWS

A. A Pre-Start Health and Safety Review (PSHSR) and Report shall be completed prior to commissioning of the works in accordance with the requirements of OHSA O. Reg. 851 Industrial Establishments, Section 7:

1. The Contractor shall retain a third party to perform a maximum of two (2) pre-start health and safety reviews of the facilities and equipment designated as part of this Contract.

2. The Contractor is to coordinate these inspections as required by the contract staging/partial hand-over and provide thirty (30) Working Days advance notice of when a review is required.

3. A separate report shall be prepared for each review and submitted to the Contract Administrator for approval prior to commissioning of the applicable section of the Works.

4. Approved PSHSR Firms: ProSafe Inc., SAFE Engineering Inc., approved alternate.

B. If an additional pre-start health and safety review of the facility is needed as a result of the Contractor's Work being incomplete or deficient, the Contractor shall pay for additional reviews.

C. Should any pre-start health and safety review reveal a deficiency in the Work, the Contractor shall be solely responsible to rectify such a deficiency, at no change to the Contract Price or Contract Time.

END OF SECTION

SECTION 01510 – TEMPORARY FACILITIES

PART 1. GENERAL

1.1 WORK INCLUDED

A. The work under this Section includes, but is not limited to, provision of:

1. Access to the site and the Work.
2. Temporary facilities including site and building enclosures, storage areas, shelters, sanitary facilities, Engineer's field office.
3. Temporary utilities.
4. Temporary controls, including fire protection, first aid, security, and traffic control.
5. Temporary equipment to maintain treatment operations during construction.

1.2 CONSTRUCTION FACILITIES

A. Contractor's Field Office and Sheds

1. Provide temporary buildings and hygienic facilities which meet the requirements of Ontario Reg. 213/91.
2. The Contractor shall maintain a temporary field office near the work for use during the period of construction at which readily accessible copies of all contract documents shall be kept. The office shall be located where it will not interfere with the progress of the work.
3. Provide site office heated to 22°C, lighted to 750 Lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table, and telephone, pay telephone not acceptable.
4. Maintain documents in order and make available for viewing by Engineer and Ministry of Labour Inspector at all times.
5. Post emergency phone numbers including police, fire, ambulance, hospital, poison control centre, and appropriate regulatory agencies in a prominent location.
6. Provide five (3) protective helmets and five (3) reflective vests for visitors' use.

1.3 INSTALLATION AND REMOVAL

A. Provide temporary construction facilities in order to execute work expeditiously.

B. Make necessary applications to authorities having jurisdiction, obtain required permits, and pay all fees and related charges.

C. Remove all such work from site after use.

D. Make all necessary applications, obtain permits and pay for all fees.

E. Restore site to clean, sanitary condition.

F. Location of all temporary utilities to be approved by the Engineer.

1.4 SCAFFOLDING AND SUPPORTS

A. Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs required to complete the work.

1.5 FIRE PROTECTION

A. Provide and maintain temporary fire protection equipment during performance of the Works required by governing codes, regulations and bylaws.

B. Burning rubbish and construction waste materials is not permitted on site.

C. Confine work and operations of employees as required by Contract Documents. Do not unreasonably encumber premises with products.

D. Do not load or permit the loading of any part of the Works with a weight or force that will endanger the Works.

1.6 EQUIPMENT, TOOLS AND MATERIALS STORAGE

A. Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

B. Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities and normal operation of the existing facility.

PART 2. PRODUCTS

2.1 PROJECT IDENTIFICATION SIGNS

A. Produce and deliver to the site, two (2) project identification signs. Erect within one (1) week of signing the Contract in locations designated by the Contract Administrator.

1. Construction sign: 1.2 m x 2.4 m, of wood frame and minimum 19 mm plywood construction with suitable stable framework.

2. Remove project signboards after completion of the project.

3. Design sign and structure to withstand 100 km/hr wind velocity.

4. Finishes, Painting: Exterior grade enamel adequate to withstand weathering, fading, and chipping for duration of construction.

5. Sign Painter: Experienced as professional sign painter for minimum three (3) years.

6. Lettering: Highway Gothic

7. Sign Content:
   a) Contract Number and Title as indicated on Contract Documents.

b) The Name and Logo of the Township in colour.

c) The Name and Logo of Engineer in colour.

d) Name of Prime Contractor.

PART 3. EXECUTION

3.1 VEHICULAR ACCESS AND PARKING

A. Access Roads

1. Use of existing site access road for construction traffic is permitted.

B. Temporary Roads

1. maintain temporary access roads to serve construction areas of width and load bearing capacity to provide unimpeded traffic for construction purposes as the Contractor requires for performance of the Work.

2. Provide unimpeded access for emergency vehicles. Maintain sufficient width and turning space.

3. Provide and maintain access to fire hydrants and control valves, free of obstructions.

C. Parking

4. Locate parking areas as directed by the Engineer and/or Owner.

5. Ensure that a minimum of five (6) parking spaces are kept available for Owner staff, facility operators, the Engineer, and their representatives.

6. Maintain separate parking area for construction equipment.

7. If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

D. Traffic Regulation

1. Provide signs, signals, and flag person equipment as required by local jurisdictions.

2. Control construction vehicular parking to prevent interference with public traffic and parking, and access by emergency vehicles.

3. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes including site entrance/exit

E. Snow Removal

1. Snow removal within Construction area to be performed and paid for by the Contractor at no additional cost to the Contract.

2. Snow removal to occur as required and as directed by the Engineer.

3. Included in the cost of snow removal is the off-Site disposal of accumulated removed snow, at a time deemed necessary by the Engineer.

4. The Contractor shall be responsible for maintaining the access roads within the facility, including snow removal. Access road maintenance shall be the responsibility of the Contractor from mobilization until Substantial Performance. Access roads include all roads and parking areas within the fenced area of the building.

5. Do not store materials or modify road that will affect snow clearing. Any damages resulting from Contractors negligence will be the responsibility of the Contractor.

3.2 TEMPORARY BARRIERS AND ENCLOSURES

A. Provide temporary barriers to prevent unauthorized entry to construction, Site office, and on-Site parking areas, and to protect existing facilities and adjacent properties from damage from the Contractor's operations.

B. Where appropriate, equip barriers with vehicular and pedestrian gates with locks.

C. Provide security and facilities to protect the Work and the Site from unauthorized entry, vandalism and theft.

D. Maintain a log of workers and visitors and make the log available to the Engineer upon request. Include the date, name, address, and company employed by, company/person visited, time in and time out for each person, and record deliveries and security incidents.

3.3 REMOVAL OF TEMPORARY FACILITIES AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials prior to the Substantial Performance inspection.

B. Remove underground installations to a minimum depth of 600 mm. Grade the Site as shown on the Drawings.

C. Clean and repair damage caused by installation or use of temporary work. Restore existing facilities used during construction to their original and functional condition.

3.4 POWER

A. Any temporary power system using existing electrical installation shall be independently metered, recorded (kWh) and paid by the Contractor. For the purposes of this Bid allow a rate of $0.14/kWh.

B. Arrange, pay for (including monthly usage charges) and maintain temporary electrical power supply in accordance with governing regulations and ordinances.

C. Install temporary facilities for power such as pole lines and underground cables, to approval of local power supply authority.

D. Locate temporary power at designated location, or at an acceptable location subject to approval of Engineer.

E. Electrical power and lighting systems installed under this Contract may be used for construction requirements with prior approval of Engineer provided that guarantees are not

affected. Replace all lamps used, which have been in service for over a period of three (3) months.

3.5 WATER SUPPLY

A. Arrange, pay for and maintain temporary water supply in accordance with governing regulations and ordinances. If temporary water supply uses existing water supply, such water use to be metered and paid for. For the purposes of this Bid allow a rate of $4.50/m^3$ for potable water.

B. Locate temporary water supply at a location acceptable to Engineer.

3.6 SANITARY FACILITIES

A. Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

B. Post notices and take such precautions as required by local health authorities.

C. Keep area and premises in sanitary condition.

D. Disinfect facilities frequently.

E. Dispose of sanitary wastes in accordance with the applicable regulations, and subject to approval of Engineer.

F. Provide all sanitary supplies required for use by Contractor's work force and staff of Engineer.

G. Prohibit the committing of nuisance. Promptly discharge any employee violating such provision.

H. 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 Engineer.

3.7 MAINTENANCE OF PUBLIC UTILITIES

A. Arrange Work to avoid interruption of utilities serving the public. Contractor to pay for damages that result from his work.

B. Where interruption of public utilities is unavoidable, obtain prior approval for interruption from responsible authority.

C. As required by utility authority, establish and pay for temporary relocation of utility during construction.

D. Comply with utility authority requirements in giving notice to users and fire department prior to interruption of service.

3.8 TELEPHONE SERVICE

A. The Contractor will provide and pay for telephone hook up equipment necessary for the Contractor’s own uses.

B. The Contractor shall provide all phone and internet services, for the Contractor's employees, Subcontractors, and all other on-Site workers and as required by the Contract Administrator.

C. Provide and maintain e-mail access at the site on a separate dedicated line.

D. Post emergency phone numbers including police, fire, ambulance, hospital, poison control centre, and appropriate regulatory agencies in a prominent location near each telephone.

3.9 TEMPORARY HEATING AND VENTILATION

A. Provide heating devices, fuel, and attendance as needed to maintain specified conditions for construction operations and to protect the Work and material against damage by dampness, cold, and freezing and to facilitate completion of the Work.

B. Provide separate metering and reimburse the Owner for cost of energy used.

C. Do not use permanent heat system.

D. Maintain minimum ambient temperature of 10 degrees Celsius in areas where construction is in progress, unless indicated otherwise in the Specifications.

E. Any construction heaters used inside building must be vented to the outside or be flameless type. Solid fuel salamanders are not permitted.

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

1. Facilitate progress of the Works.

2. Protect the Works 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.

G. 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 a 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.

H. The permanent heating system of the building may be used when available. Be responsible for damage to heating system if use is permitted.

I. Date of Substantial Performance and Warranties for heating system will not commence until the entire system is in as near original condition as possible and is certified by the Engineer.

J. Maintain strict supervision of temporary heating and ventilating equipment to:

1. Conform to 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.

K. Be responsible for damage to the Works due to failure in providing adequate heat and protection during construction.

END OF SECTION

SECTION 01600 – MATERIALS & EQUIPMENT

PART 1. GENERAL

1.1 INTENT

A. Product quality, availability, storage, handling, protection, transportation.

B. Manufacturer's instructions.

C. Workmanship and co-ordination.

1.2 REFERENCE STANDARDS

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

OBC	Ontario Building Code
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASTM	American Society of Testing and Materials
CEC	Canadian Electrical Code (published by CSA)
CEMA	Canadian Electrical Manufacturer's Association
CGSB	Canadian General Standards Board
CISC	Canadian Institute of Steel Construction
CPCA	Canadian Painting Contractors' Association
CPCI	Canadian Prestressed Concrete Institute
CRCA	Canadian Roofing Construction Association
CSA	Canadian Standards Association
IPCEA	Insulated Power Cable Engineers Association
NBC	National Building Code
NFPA	National Fire Protection Association
NEMA	National Electrical Manufacturers' Association
ULC	Underwriters' Laboratories of Canada

B. Conform to these standards, in whole or in part, when identified or referenced in the specification sections.

C. If there are questions as to whether any product or system is in conformance with applicable standards, the Consultant reserves the right to have such products or systems tested to prove or disapprove conformance.

D. The cost for such testing will be borne by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.

E. Conform to latest date of issue of reference standards in effect on date of submission of bids except where a specific date or issue is noted.

1.3 PRODUCTS AND MATERIALS

A. Quality

1. Products, materials, equipment and articles (referred to as Products throughout the specifications) incorporated in the Work shall be new, no damaged or defective, and of the best quality (compatible with specifications) for the purpose intended. When requested, furnish evidence as to type, source and quality of Products provided.

2. Defective Products, whenever identified prior to the completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve the Contractor of responsibility, but is a 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 the quality or fitness of Products, the decision rests strictly with the Engineer based upon the requirements of the Contract Documents.

4. Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item throughout the building.

B. 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 the Consultant 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 the event of failure to notify the Consultant at commencement of Work of product availability and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves the right to substitute more readily available products of similar character, at no increase in Contract Price.

3. The Owner will not consider any requests for substitution of materials by the Contractor after the deadline for submitting alternatives.

C. Storage, Handling and Protection

1. Handle and store Products in a 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 seals and labels intact. Do not remove from packaging or bundling until required in the Work.

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

4. Remove and replace damaged Products at own expense and to the satisfaction of the Engineer.

D. Transportation

1. Pay costs of transportation of Products required in the performance of Work.

2. The transportation cost of Products supplied by the Owner will be paid for by the Owner. Unloading, handling and store such Products will be paid for by the Contractor.

1.4 MANUFACTURER'S INSTRUCTIONS

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

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

C. Improper installation or erection of Products, due to failure in complying with these requirements, authorizes the Engineer to require removal and re-installation at no increase in Contract Price. All damaged products caused by the installation and/or removal shall be replaced with new product and paid for completely by the Contractor.

1.5 WORKMANSHIP

A. General

1. Workmanship shall be of the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Engineer if required Work is such as to make it impractical to produce required results.

2. Do not employ any unfit person or anyone unskilled in their required duties. The Engineer reserves the right to require the dismissal from the site, workers deemed incompetent, careless, insubordinate or otherwise objectionable.

3. Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Engineer, whose decision is final.

B. Coordination

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

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

C. Cutting and Removal Work

1. Perform cutting and remedial work required to make the parts of the Work come together. Coordinate the Work to ensure this requirement is maintained.

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

D. Location of Fixtures and Outlets

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

2. Inform the Engineer of a conflicting installation. Install in conformance with the Specifications, manufacturer's recommendations and all codes and standards.

E. Protection of Work in Progress

1. Adequately protect work completed or in progress. Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Consultant, at no increase in Contract Price.

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

PART 2. PRODUCTS

2.1 MANUFACTURED AND FABRICATED MATERIALS AND EQUIPMENT

F. Design, fabricate, and assemble in accordance with engineering and shop practices standard with industry.

G. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.

H. Two or more items of same kind shall be identical, by same manufacturer.

I. Material and equipment shall be suitable for service conditions.

J. Equipment capabilities, sizes, and dimensions shown or specified shall be adhered to, unless variations are specifically accepted, in writing.

K. Equipment shall be adapted to best economy in power consumption and maintenance. Parts and components shall be proportioned for stresses occurring during continuous or intermittent operation, and for additional stresses occurring during fabrication, delivery, or installation.

L. Design so working parts are readily accessible for inspection and repair, easily duplicated, and replaced.

M. Design structural members of equipment for anticipated shock and vibratory loads.

N. Design machinery such that working parts are readily accessible for inspection and repair, and that each part is suitable for the service required.

O. Do not use material or equipment for purpose other than for which it is designed or specified.

2.2 FASTENINGS

A. Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

B. Prevent electrolytic action between dissimilar metals and materials.

C. Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

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

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

F. Use fastenings of standard commercial sized and patterns with material and finish suitable for service.

G. Use heavy hexagon heads, semi-finished unless otherwise specified. Use AISI Type 304 Stainless Steel for exterior areas. Use AISI Type 316 L stainless steel for items in contact with chemicals or sludge.

H. Bolts may not project more than one diameter beyond nuts.

I. Use plain-type washers on equipment, sheet metal and soft gasket lock-type washers where vibration occurs and resilient washers with stainless steel.

2.3 LUBRICANTS AND CHARTS

A. Provide lubricants and maintenance charts as required, for a complete, operational system.

B. Provide hot-plasticized charts suitable for wall mounting.

2.4 SPECIAL TOOLS AND TEMPLATES

A. Provide templates and special tools required for the installation and operation of any part of the system. Provide such templates and tools complete with a detailed list thereof. Hand over templates and tools to the Owner at the end of the initial operation period.

B. Provide special tools required for the routine maintenance of equipment items supplied under this Contract.

2.5 EQUIPMENT PRIME COATS

C. Where the factory prime coat or shop paint coats are not specified, ensure the equipment is primed or shop painted with paint that is compatible with the final paint coatings specified.

D. Surface preparation, priming and finishing for shop finished items and surface preparation and priming for shop primed items are to be allowed for in the specification section of the contract in which each unit is specified.

E. Preparation and coating systems to be used for shop primed and shop finished items are specified elsewhere.

PART 3. EXECUTION

3.1 GENERAL

A. Be responsible for ensuring that products supplied under the Contract comply with the requirements of the Contract. Ensure that suppliers of products comply with the specified requirements. If a supplier fails to comply with specified requirements, be responsible for ensuring that the requirements of the Contract have been fulfilled.

B. Use only new products and material of best quality unless otherwise specified, and suitable for the specific service. At the request of the Engineer, provide evidence as to type, source and quality of products to be supplied.

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

D. Have the equipment conform to the requirements of the applicable standards of Canadian Standards Association (CSA), Technical Standards and Safety Authority (TSSA), and Electrical Safety Authority (ESA).

E. When material or equipment is specified to standard or performance specifications, at request of the Engineer, obtain from the manufacturer an independent laboratory testing report stating that the material or equipment meets or exceeds the specified requirements.

F. Provide ancillary parts, fittings, connections, piping, nuts and bolts, gaskets, wiring, and other items necessary to properly install the component and equipment into a complete system.

3.2 AVAILABILITY

A. Immediately upon signing the Contract, review product delivery requirements and anticipate foreseeable supply delays for any items, including those items supplied by the Owner. Notify the Engineer of delays in supply of products, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of the Work.

B. In the event of failure to notify the Engineer at commencement of the Work and should it subsequently appear that the Work may be delayed for such reason, the Engineer reserves the right to substitute more readily available products of similar character, at no increase in contract price.

3.3 DELIVERY, STORAGE, HANDLING AND PROTECTION

C. Contractor shall arrange deliveries of materials and equipment in accordance with Progress Schedule, coordinate to avoid conflict with Work and conditions at site.

D. All equipment and materials shall be received directly from the manufacturer and not from the Contractor's inventory unless approved by the Engineer.

E. Transport, deliver, store, and handle products using means and methods that will prevent damage, adulteration, deterioration, and loss, including theft and vandalism.

F. The Township assumes no responsibility for damage or loss due to storage of materials and equipment.

G. Transportation:

1. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Shipment shall not be made until the equipment supplier coordinates shipment to the Site with the Contractor, ensuring that the equipment will be properly received and stored.

2. Ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.

3. All equipment shall be skid mounted or crated to protect against damage during shipment. Carefully pack and crate equipment for shipment. Protect polished and machined metal surfaces from corrosion and damage during shipment and installation. Specially pack electrical equipment to prevent damage by moisture. Cover equipment having exposed bearings and glands to exclude foreign matter. Carefully pack machines for shipment and protect electrical equipment from moisture damage. Protect bearings, seals and glands from grit and dirt.

4. Identify each component with durable identifying labels or tags securely attached to each piece of equipment, crate or container.

5. Finished surfaces of all exposed flanges shall be protected by fiberboard blank flanges strongly built and securely bolted thereto.

6. Pack spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended. All spare parts shall be cross-referenced to their applicable the Specification Section.

7. The transportation cost of Products supplied by the Township will be paid for by the Township. Unloading, handling and storage of such Products will be paid for by the Contractor.

H. Delivery:

1. Provide all necessary equipment, materials and labour to safely off-load equipment at the site or nearest point of delivery and provide for any additional transportation necessary for storage or installation on the site. The methods employed for handling and storage must meet the requirements of the manufacturer, the specifications and the Engineer.

2. Arrange for prompt off loading and pay any additional costs due to delays from any cause. Prior to accepting delivery examine all equipment to be incorporated into the work for damage and remedy any damage due to shipping and handling. Ensure that any repairs are approved by the Supplier such that warranties or guarantees are not invalidated.

3. Wheeling of loads over finished floors, with or without plank protection, is not permitted in anything except rubber-tired wheelbarrows, buggies, trucks or dollies. This applies to finished floors and exposed concrete floors, as well as those covered with composition tile or other applied surfacing. Where structural concrete is also finished surface, avoid marking or damaging surface.

I. Storage:

1. If not required for immediate use, store equipment and materials separately on the site in original sealed packaging with manufacturer’s seals and labels intact and provide suitable protection to prevent their deterioration or the intrusion of foreign matter. Do not remove from packaging or bundling until required in the Work, or until preventive maintenance is required.

2. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed, and the units and equipment are ready for operation.

3. Interior Storage:

a. Store materials and equipment subject to damage by elements in weathertight enclosures, including all mechanical and electrical equipment and instruments at a minimum.

b. Maintain temperature and humidity within ranges required by manufacturer's instructions. Provide ventilation to avoid condensation.

c. Store combustible materials (paints, solvents, fuels) in a heated and ventilated room meeting all applicable safety standards. Remove oily rags and other combustible debris from the site daily. Take every precaution necessary to prevent spontaneous combustion.

4. Exterior Storage:

a. Store fabricated materials and equipment not required to be stored in weatherproof sheds on site a minimum of 150 mm above ground on blocking or skids to prevent soiling or staining. Cover materials and equipment subject to deterioration with impervious sheet coverings.

b. Store loose granular materials in well drained area on solid surfaces to prevent mixing with foreign matter.

c. 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.

d.

e. Store materials such as pipe, reinforcing steel, structural steel, and equipment on pallets or racks, off ground.

5. Inspection and Maintenance:

a. Arrange storage to provide easy access for inspection, maintenance, and inventory.

b. Make periodic inspections of stored materials and equipment to ensure materials and equipment maintained under specified conditions are free from damage or deterioration, and coverings are in place and in condition to provide required protection.

c. Provide protective maintenance during storage consisting of manually exercising equipment, inspecting mechanical surfaces for signs or corrosion or other damage, lubricating, applying any coatings as recommended by the equipment manufacturer necessary for its protection and all other precautions to assure proper protection of all equipment stored and for compliance with manufacturers' requirements related to warranties. Log all protective maintenance for each piece of equipment in the written record noted above.

6. Arrange for all materials and equipment to be stored under lock and key at all times to avoid theft or vandalism.

J. Protection:

1. Protect equipment supplied and/or installed, under this contract, from damage, dust, dirt, etc., to the satisfaction of the Engineer. If required, supply temporary housing for equipment or items supplied.

K. If in the opinion of the Engineer, any equipment and material which has deteriorated or been damaged shall be removed immediately from the site and replaced with new identical equipment and material at the Contractor's expense.

3.4 WORKMANSHIP

A. General:

1. Workmanship shall be of the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Engineer if required Work is such as to make it impractical to produce required results.

2. Do not employ any unfit person or anyone unskilled in their required duties. The Contract Administrator reserves the right to require the dismissal from the site, workers deemed incompetent, careless, insubordinate or otherwise objectionable.

3. Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Engineer, whose decision is final.

B. Coordination:

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

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

C. Cutting and Removal Work:

1. Perform cutting and remedial work required to make the parts of the Work come together. Coordinate the Work to ensure this requirement is maintained.

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

D. Location of Fixtures and Outlets:

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

2. Inform the Engineer of a conflicting installation. Install in conformance with the Specifications, manufacturer’s recommendations and all codes and standards.

E. Protection of Work in Progress:

1. Adequately protect work completed or in progress. Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Consultant, at no increase in Contract Price.

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

3.5 METRIC MATERIAL AND EQUIPMENT

A. Where metric and imperial material and equipment are to be installed under the same contract, be satisfied that mating of metric and non-metric material and equipment is possible. Provide transition couplings, adapters, etc. as necessary for a complete working system.

END OF SECTION

SECTION 01700 – CONTRACT CLOSEOUT

PART 1. GENERAL

1.1 DESCRIPTION

A. This Section includes administrative and procedural requirements for contract closeout.

1.2 RELATED WORK

A. Section 01730 – Operation and Maintenance Data

B. Section 01740 – Cleaning

C. Section 01760 – Warranty

D. Section 01762 – Commissioning

E. Section 01764 – Training

1.3 SUBSTANTIAL PERFORMANCE

A. In addition to the requirements of the OPS General Conditions of Contract and the Construction Act, the following shall be required prior to issuance of Substantial Performance:

1. Provide all certificates from equipment suppliers stating that their equipment has been installed, tested, and is in proper working order.

2. Provide required Operation and Maintenance Data in accordance with Section 01730.

3. Provide Training for the Township's personnel in accordance with Sections 01764, including submission of all training materials.

4. Complete successful commissioning of the entire facility as a whole in accordance with Section 01762.

5. Provide completed Project Record Documents as specified herein.

6. Deliver and submit receipt transmittal from the Township for all Spare Parts and Special Tools to be provided under the Contract.

7. Provide emergency contacts and any service agreements for the warranty period.

B. Complete the following a minimum of ten (10) days prior to requesting inspection for determining Substantial Performance:

1. The Contractor shall conduct an inspection of the 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.

2. Provide an Itemized List of Outstanding Work: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Organize items applying to each space by major

element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Advise the Township of pending insurance changeover requirements and changeover in heat and other utilities.

4. Make final changeover of permanent locks and deliver keys to the Township. Advise the Township's personnel of changeover in security provisions.

5. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements that are not required for the remaining Work to be performed.

C. Once the above items are completed, request an inspection for determination of Substantial Performance. After receipt of the Contractor's written request, the Contract Administrator and/or the Engineer, the Contractor, and those Subcontractors whose participation may be required will perform an inspection of the Work to review and identify defects or deficiencies. The Township may also choose to attend the inspection. The Contractor shall correct Work accordingly to meet the requirements of Substantial Performance and request a reinspection if necessary.

D. When the Contract Administrator verifies that the requirements of the Contract have been substantially performed, make application for certificate of Substantial Performance.

1.4 DEMOBILIZATION FROM SITE

A. The following shall be required prior to Demobilization from site and payment thereof:

1. Complete all deficiencies and remaining Work identified during the inspection for determination of Substantial Performance.

2. Complete Touch-up, Repair, and complete Restoration of all areas of the Work and areas affected by the performance of the Work.

3. Complete Final Cleaning in accordance with Section 01740.

4. Terminate and remove all temporary facilities from the Site, along with mockups, construction tools, and similar elements.

1.5 COMPLETION OF THE CONTRACT

A. The following shall be required to be completed prior to requesting a final inspection for determination of Contract Completion:

1. Complete all outstanding deficiencies, repair noted defects, and complete all outstanding warranty work in accordance with Section 01760.

2. Complete cleaning and restoration of all areas affected by work performed during the Warranty Period.

3. Complete end of warranty equipment inspections, correction of deficiencies, and provide Warranty Inspection Summary Reports in accordance with Division 11.

4. The Contractor and all Subcontractors shall conduct an inspection of the 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.

B. Once the above items are completed, request an inspection for determination of Contract Completion. Final inspection procedure shall be as follows:

1. After receipt of the Contractor's written request, the Engineer and/or Contract Administrator, the Contractor, and those Subcontractors whose participation may be required will perform an inspection of the Work to review and identify defects or deficiencies. Review the status of all Warranty items carried out during the Warranty Period with the Engineer. Arrange for, coordinate and pay for any special access required to inspect the Works, such as the draining of tanks. The Contractor shall correct Work accordingly.

2. When the items noted above are complete, request a final inspection of the Work by the Township, the Contract Administrator and/or Engineer, and the Contractor. If Work is deemed incomplete, complete the outstanding items and request a reinspection.

3. When the Contract Administrator consider final deficiencies and defects have been corrected and it appears requirements of the Contract have been totally performed, make application for certificate of Completion Certificate.

PART 2. PRODUCTS

2.1 PROJECT RECORD DOCUMENTS

A. The Contractor shall maintain one (1) spare set of the following Record Documents on Site in a clean, dry, and legible condition that are not to be used for daily working construction purposes:

1. Issued for Construction Contract Drawings (Full Size), Specifications, and Addenda.

2. Change Orders, Field Orders, and other written notices.

3. Approved Shop Drawings, Product data, and samples.

4. Records of surveying and layout Work.

B. Store record documents and samples in field office apart from documents used for construction.

C. Label record documents and file in accordance with Specification Section number. Label each document "CONSTRUCTION RECORD" in neat, large, printed letters.

D. Keep record documents and samples up to date and available for inspection by the Engineer on a monthly basis. Payment against the Progress Payment line item for updated record documents will be withheld if they have not been not maintained up-to-date.

E. The Contractor shall record thereon actual conditions and information for work constructed differently than shown on the Contract Documents on the Project Record Documents concurrent with construction progress. Record the following at a minimum:

1. Details not on original Contract Drawings.

2. Changes in the Work caused by Site conditions, or originated by the Township, the Contract Administrator, the Engineer, the Contractor, Preselected Equipment Vendors, or Subcontractors and by addenda, supplemental drawings, Site instructions, supplementary instructions, change orders, correspondence, and directions of any regulatory authorities.

3. Field changes of dimensions and details.

4. Measured depths of elements of foundation in relation to finish first floor datum.

5. The Contractor shall dimension the installed locations of concealed service lines and conduits within the structure by reference from the centerline of the service to the structure column lines, or other main finished faces, or other structural points which are easily identified and located in the finished Work. Do not conceal Work until required information is recorded.

6. Measured horizontal and vertical locations of underground utilities and appurtenances on Site, referenced to permanent structures or surface improvements. Do not backfill excavations and trenches until required information is recorded.

7. References to related shop drawings and modifications.

8. Make records in a neat and legibly printed manner with non-smudging felt tip marking pens. Maintain separate colours for each major system for recording information. If in the opinion of the Engineer, the records are unclear or illegible, neatly transfer all as constructed notations to an additional set of prints prior to final submission.

F. The Contractor shall scan the Project Record Drawings and submit original hard copies and two (2) USB flash drive sets with scanned copies consisting of the following:

1. Marked up Issued for Construction Contract Drawings.

2. Marked up Drawings and Details issued through Change Orders as applicable.

2.2 SPARE PARTS AND SPECIAL TOOLS

A. Provide products, spare parts, maintenance and extra materials, and special tools in quantities specified in individual specification Sections.

B. Provide items of same manufacture and quality as items in Work.

C. Provide items with tags identifying their associated function and equipment.

D. Deliver to site location in containers designed for prolonged storage suitable for handling with hoisting equipment containers. Place in storage as directed by the Township.

E. Obtain receipt for all delivered products from the Township or Engineer and submit these receipts prior to Substantial Performance.

PART 3. EXECUTION

3.1 TOUCH-UP AND REPAIR

A. Perform touch up of paint on buildings, equipment, piping, conduits, etc. Remove paint applied to labels and identification.

B. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

C. Repair or remove and replace defective or damaged construction including buildings, equipment and furnishing. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

D. Repair damage to landscaped areas.

E. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION

SECTION 01730 – OPERATION AND MAINTENANCE DATA

PART 1. GENERAL

1.1 SUBMITTALS

A. Although the requirement for final operating and maintenance manuals is for a complete bound set, the Township recognizes that the staged start-up of many projects requires some equipment to be put in service while other equipment has not been finalized. The Township also recognizes that many certificates and reports are not available prior to the start-up. As such, the Contractor shall submit manuals staged as described below.

B. Manufacturer's Operation and Maintenance Manuals for Equipment:

1. Four (4) weeks prior to the scheduled Equipment start-up, provide one (1) hard copy of the Manufacturer's Operating and Maintenance Manual as specified herein for each piece of equipment. Start-up and commissioning will not be permitted to commence before receiving the operating and maintenance manuals for the specific equipment that will be placed into service.

2. If the manual is deemed incomplete by the Engineer, replace manual or provide additional information for inclusion into the manual prior to the start-up of the Equipment.

3. This one (1) hard copy of each manual shall remain the property of the Contractor but must remain in an agreeable location accessible by the Township for their use until the final manuals are provided. The Contractor may take this copy back to use in the final copy once they have been replaced with a final bound copy.

C. Complete Operation and Maintenance Manual:

1. Submit to the Engineer for review one (1) draft hard copy and one (1) draft electronic copy of the complete Operation and Maintenance Manual as specified herein.

2. If, during the Engineer's review of the manuals, revisions are required, the manuals will be returned with details of the revisions required. Revise the manuals accordingly and resubmit them for further review.

3. Following the Engineer's review and approval, submit four (4) sets of hard copies of the final version of the manuals and one (1) electronic copy.

4. The submission of the complete Operating and Maintenance Manuals is a condition precedent to the certification of substantial performance.

PART 2. PRODUCTS

2.1 FORMAT

A. Hard Copies:

1. Bind each hard copy set of manuals in an identified three-post, hard-covered, plastic jacketed binder equal to Acco® Casemade Flip-Lock Style Catalogue Ring Binder, 4", Black – Staples.

2. Organize contents into applicable categories of work as per Division and Specifications Sections.

3. Provide sufficient volumes to limit the number of sheets included in each binder to 90% of manufacturer's published sheet capacity.

4. Emboss the front and the spine of each binder with the following information:

   a. Township's name.

   b. Equipment manual for Contract name.

   c. Contract number.

   d. Year of completion.

   e. Volume number (e.g. 1 of 3).

   f. Set number (e.g. 1 of 4).

   g. Contractor's name.

5. Tabs: The Contractor shall provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment. Dividers with rip-proof, three-hole punched strip, typed tab label, numbered to correspond to table of contents shall be used.

6. Text: Vendor's and manufacturer's printed data or type written data on 20-pound minimum, white punched paper. Computer generated data shall be printed by letter quality printers or laser printers. The Contractor shall reinforce holes with plastic, cloth, or metal.

7. Drawings: The Contractor shall provide drawings on 11x17 inch sheets with reinforced punched binder tab. Bind in with text and fold to 8-1/2 x 11 inch.

B. Electronic Copy:

1. The digital copy shall be provided on a USB Key and shall include both a single compiled PDF with bookmarked Divisions and Sections and separate individual PDF files for each Division and Section organized in folders and sub-folders to follow the hard-copy manual.

2. Electronic maintenance manuals must be in the original PDF format (scans will not be accepted unless optical character recognition (OCR) has been applied to document and the scan is deemed to be of sufficient quality by the Engineer).

2.2 CONTENTS

A. In addition to information specified in other Divisions of the Specification, the manuals shall include the following information:

1. A title sheet labelled "EQUIPMENT OPERATING AND MAINTENANCE INSTRUCTIONS" containing the project title and submittal date.

2. Table of contents: Provide Township's project name and number; names, addresses, telephone numbers and facsimile numbers of Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3. Contact persons, companies, names, mail and e-mail addresses and telephone and facsimile numbers of all subcontractors and suppliers.

4. Copy of signed Owner Attendance Sheet from the training session for all Equipment.

5. A final, reviewed and approved copy of shop drawings and product data sheets.

6. Manufacturer's Operation and Maintenance Manuals: Manuals for all equipment covered by DIV.16 of the Specifications Instructions are to be in simple language so as to guide the Township in the proper operation and maintenance of the equipment. Manuals shall include, but not be limited to, the following:

a. Complete nameplate data and engineering data.

b. Operational information on equipment including function, normal operating characteristics, and limiting conditions including temperature, capacity, speed, etc.

c. Description of sequence of operation of controls.

d. Regulation, control, stopping, shutdown, and emergency instructions.

e. Summer, winter, and special operating instructions.

f. Inspection and maintenance schedule for the equipment including a list of required activities as well as the recommended frequency for each activity.

g. Manufacturer’s recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning.

h. Routine procedures for troubleshooting.

i. Disassembly, repair, and reassembly instructions. Alignment, adjusting, and checking instructions.

j. Assembly drawings and diagrams required for maintenance.

k. Manufacturer's printed instructions regarding safety precautions for both (a) protection of personnel operating equipment and systems and (b) prevention of damage to equipment and systems.

l. Safety information including shear pin strength, torque limits, lock-out recommendation, etc.

m. Material safety data sheets, as appropriate.

n. Reference manuals, User Guides and Programming Instruction manuals for hardware and software.

o. Complete parts list with catalogue numbers, as well as equipment, valve and hardware schedules.

p. Replacement parts list, spare parts list and special tools list. Recommended spare parts inventory to be maintained.

7. Factory test reports, installation and field test reports including recommended settings, and certificates of proper installation.

8. Copy of each product or equipment signed warranty certificate, bond, and service contract.

9. A complete list of instructions and names of Products to be used for the cleaning of and the maintaining of finished building surfaces.

10. Approvals, certificates, permits, and similar documents from all governing authorities.

PART 3. EXECUTION

A. Not Used.

END OF SECTION

SECTION 01740 – CLEANING

PART 1. GENERAL

1.1 SCOPE

A. Execute cleaning during progress of Work and at completion of Work as indicated and in compliance with Contract Documents.

B. Final cleaning is required for existing buildings/structures wherever contract work has been performed at any time during the Contract. Final cleaning is required for new buildings/structures at all locations.

C. The cost of final cleaning shall be incidental to other items.

D. Throughout the Contract, provide all labour, materials and equipment for the cleaning of the site. Use experienced workers or professional cleaners.

1.2 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with local codes, ordinances, regulations, and anti-pollution laws. Do not burn or bury rubbish or waste materials on Project site. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains. Do not dispose of wastes into streams or waterways.

PART 2. PRODUCTS

2.1 CLEANING MATERIALS

A. Use only those cleaning materials which will not create hazards to property and persons or damage surfaces of material to be cleaned.

B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

C. Acid cleaning will not be permitted unless specifically approved by the Engineer.

PART 3. EXECUTION

3.1 CLEANING DURING CONSTRUCTION

A. At all times maintain areas covered by the contract and adjacent properties and public access roads free from accumulations of waste, debris, and rubbish caused by construction operations. Keep the site neat, tidy, and free from rubbish and surplus materials at all times.

B. During execution of work, clean site, adjacent properties, and public access roads and dispose of waste materials, debris, and rubbish to assure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish. Unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.

C. Remove snow and ice from all site access points, driveways, parking areas, work areas and building access points to a location approved by the Contract Administrator. When piles of removed snow become large, the Contractor is to remove those piles from the site and dispose of them, or at the direction of the Contract Administrator, and at no additional cost to the Municipality.

D. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

E. Cover or wet excavated material leaving and arriving at the site to prevent blowing dust. Clean the public access roads to the site of any material falling from the haul trucks.

F. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes structures, work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.

G. Provide on site containers for collection and removal of waste materials, debris, and rubbish in accordance with applicable regulations.

3.2 FINAL CLEANING

A. Upon completion of the work, the Contractor shall perform a Final Cleaning consisting of the following requirements:

1. Tear down and remove all temporary buildings, structures and facilities.

2. Remove all equipment, tools, temporary work, machinery, and surplus materials.

3. Remove all rubbish from any grounds occupied throughout construction.

4. Remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings

5. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

6. Vacuum inside and outside of all new and existing electrical panels, MCCs, which have been affected by dust or dirt due to construction activities.

7. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

8. Replace disposable air filters and clean permanent air filters. Vacuum clean exposed surfaces of diffusers, registers, and grills.

9. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

10. Leave the roads and all parts of the premises and adjacent property affected by construction in a neat and satisfactory condition.

11. Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

12. Clean roofs, downspouts, gutters, and drainage systems.

13. Remove grease, dust, dirt, stains, labels, fingerprints, paint spots and other foreign materials from interior and exterior finished surfaces including glass and other polished surfaces.

14. Clean light fixtures, lighting reflectors, lenses, and other lighting surfaces. Replace light bulbs if lights were operated for more than six (6) months during construction.

15. Vacuum clean and dust building interiors, behind grilles, louvers and screens.

16. Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

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

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

19. Inspect valve boxes, manholes and hydrants to check for debris and proper operation.

20. Remove labels and signs that are not permanent.

21. Repair, patch and touch-up marred surfaces to match adjacent finishes.

END OF SECTION

SECTION 01760 – WARRANTY

PART 1. GENERAL

1.1 WARRANTY PERIOD

A. Provide a warranty to cover all parts and labour for all Work performed and equipment and appurtenances furnished under this Contract. Be responsible for all maintenance during the progress of the work up to the date of completion and rectification of deficiencies during the Warranty Period.

B. The warranty period for the Contract shall commence from the date of issuance of the certificate of Substantial Performance for the entire Contract and shall continue for a period of **twenty-four (24) months**.

C. Equipment and appurtenances shall be warranted to be free from defects in workmanship, design or material:

1. If the equipment should fail during the warranty period due to a defective part(s), it shall be replaced, and the unit(s) restored to service at no expense to the Township. Defective or broken parts shall be replaced with new parts, not rebuilt parts.

2. The Warranty Period shall cover adjustment, equipment inspections and diagnostic testing, parts replacement, major and minor overhauls, rebalancing, retesting and recommissioning of all replaced parts and equipment.

D. Extended warranties shall be provided on any equipment or component of the work that is required to be placed in operation prior to Substantial Performance for the purpose of complying with the sequence of construction.

E. Where the manufacturer's standard guarantee or warranty is less than the warranty period stipulated herein, provide for any additional warranty or guarantee period at the price bid for the item or lump sum tender price including the item or equipment.

F. Be responsible for extended warranties and/or guarantees as detailed in the various sections of the Specifications.

1.2 RESPONSIBILITIES OF THE TOWNSHIP

A. During the Warranty Period, the Township is responsible for proper operation of the equipment and shall perform routine maintenance and service for the equipment according to the written recommendations of the Contractor.

1.3 SUBMITTALS

A. Submit the required Guarantee/Warranty certificates and/or written documentation as specified for inclusion in the Operation and Maintenance Data.

B. Inform the Contract Administrator in writing of the arrangements made for carrying out warranty work during the Warranty Period.

C. Provide a Warranty Inspection Summary Report covering each inspection, indicating the number and type of failures observed, material and part where materials have failed, the percentage of the surface area where corrosion protection system failure has occurred, and

the names of the persons making the inspection. Colour photographs illustrating each type of failure shall be included in the report.

PART 2. PRODUCTS

A. Not Used.

PART 3. EXECUTION

3.1 WORK DURING THE WARRANTY PERIOD

A. Perform warranty work required during progress of the work and during the Warranty Period upon receipt of verbal or written notices from the Contract Administrator.

B. The Contractor shall repair or replace all parts that are defective in materials and workmanship or broken.

C. Before starting corrective work, the Contractor shall submit to the Engineer for review and analysis of the cause of the failure and details of the proposed corrective work. The Contractor shall make repairs acceptable to the Engineer at all points where failures are observed within the Warranty Period.

D. The Contractor may use spare parts from the Township's inventory provided they are replaced at the Contractor's expense within twenty-one (21) days.

E. The Contractor shall be responsible for providing all labour and tools necessary to perform any repair work. The Contractor may use special maintenance tools provided with the equipment.

F. Repair or make good settlements and defects on surfaces of backfilled trench or excavations.

G. Repair all damages to structures caused by settlement of ground adjacent to or over excavation.

H. Maintain all trees and shrubs either planted or relocated for the duration of the Warranty Period.

3.2 REPAIR BY TOWNSHIP

A. All deficient work shall be rectified within two (2) months of receipt of the written notification of the deficiency from the Contract Administrator. Should the Contractor fail to repair any deficiency to the Contract Administrator's satisfaction within the prescribed time, the Township shall have the right to have outstanding repairs paid for by drawing from the maintenance holdback, after giving the Contractor twenty-four (24) hours' notice.

B. The Township may, without giving notice to the Contractor, repair shrinkages or defects that are dangerous in nature, that constitute an extreme emergency or that affect the operation of the Works.

1. The cost of labour, equipment and material to perform emergency work will be charged to the Contractor by drawing from the maintenance holdback.

2. The Contract Administrator will notify the Contractor of emergency work performed by the Township.

C. The Township reserves the right to withhold any amount associated with work to be charged to the Contractor, from the amounts owed to the Contractor through monthly payment draws.

3.3 END OF WARRANTY MANUFACTURER INSPECTIONS

A. Where specified, equipment shall be inspected within thirty (30) days prior to the end of the warranty period by the manufacturer's representative in the presence of the Engineer, the Township, and the General Contractor.

1. The General Contractor shall establish the date of each inspection and shall notify the Township at least twenty (20) working days in advance. The scheduled inspection shall not relieve the General Contractor from the obligation to perform corrective work whenever needed.

2. Any deficiencies found during this inspection shall be corrected by the Contractor prior to issuance of Final Completion.

END OF SECTION

SECTION 01762 – COMMISSIONING

PART 1. GENERAL

1.1 DESCRIPTION

A. This specification defines the commissioning requirements to be completed by the Contractor in order to demonstrate that the Facility will operate as intended to the satisfaction of the Engineer.

B. This specification shall apply to all the electrical systems in the facility.

C. This section shall apply to the Electric Vehicle charging stations supplied by the Owner and installed by the Contractor.

1.2 SCOPE

A. The Contractor shall coordinate the testing and commissioning of equipment and systems with the Engineer, Equipment Supplier, and the Township's staff.

B. The Contractor shall provide all materials, power, fuel, labour, and all other items and work required to complete the various tests specified.

C. The Contractor shall organize teams made up of qualified representatives of equipment suppliers, the subcontractors, design engineers, and others, as appropriate, to efficiently and expeditiously calibrate and test the equipment and systems. The objective of the testing program shall be to demonstrate to the Engineer and Township that the facility will operate as intended.

D. The Contractor shall provide all assistance to the Engineer or their representative to inspect or witness any portion of the testing. The Engineer at their discretion may or may not witness any or all of the tests or inspections carried out under this specification. Whether the Engineer is in attendance or not, the test results shall be forwarded to the Engineer.

E. During the period of operation, the Contractor shall have at the site supervisory personnel, mechanics, electricians, and other skilled trades workers or labourers to attend to any adjustments, corrections or operations which may be required.

F. In addition to the OPS requirements, Substantial Performance is contingent on successful completion of the Facility Commissioning regardless of any previously completed partial commissioning of individual equipment, processes, or systems.

1.3 RELATED WORK

A. All other Divisions with respect to testing and commissioning requirements specified for individual equipment.

1.4 SUBMITTALS

A. Submit a Commissioning Plan and Schedule a minimum of (21) days prior to the start-up and Functional Testing of equipment, defining the logical and systematic performance of physical inspections, field and function tests, startup, performance testing and commissioning, including:

1. Each system and major piece of equipment to be started up.

2. A checklist of all inspection and testing activities broken down by location, discipline, system, and device or item.

3. A chronological schedule of all testing and inspection activities including the time and date of each test and inspection. Do not schedule startup of more than one piece of major equipment in one Working Day.

4. Step-by-step descriptions of the procedures proposed by the Contractor for the systematic testing of all equipment and systems.

5. For each system, the Contractor's Work items including checkout, training, operation and maintenance data, functional testing, prestart health and safety inspections, performance testing, and facility commissioning.

6. Constraints, equipment to be decommissioned, temporary systems, and any other items that may impact upon testing and commissioning.

7. Provide the names of the Contractor's personnel, Subcontractor(s), manufacturer(s), or organization(s) proposed to perform the services, and documentation to confirm their qualifications.

B. Test results, certificates, studies, and reports of equipment or system as specified. Documentation of the successful test will be required to ensure that a testing phase has been completed and the Contractor can move into the next phase of testing.products

1.5 GENERAL

A. The Contractor shall provide, at no expense to the Township, all power, fuel, labour, temporary piping, valves, gauges, test equipment, heating, ventilating, air conditioning and all other items and work required to complete the testing and commissioning as specified.

B. When testing requires the use of another system such as electrical power, compressed air, control air, or instrumentation which has not yet been placed in service, the Contractor shall provide alternative sources at their cost.

1.6 CHEMICALS AND FUELS

A. Provide the oil, grease, and other products necessary to put the equipment into operating condition as instructed by the equipment manufacturers.

PART 2. EXECUTION

2.1 PRE-COMMISSIONING ACTIVITIES

A. The Pre-commissioning Activities will be conducted to provide an initial check out of each component prior to first testing the equipment. The following shall be completed as part of the Pre-commissioning Activities at a minimum, and shall be carried out generally in the order listed:

B. Equipment Physical Check Out:

1. As each component or system is installed the Contractor shall document the installation details on the Manufacturer's check-out sheets. Check out sheets shall be subject to the Engineer's approval or on the Engineer's standard forms (upon request).

2. Check equipment for soundness (without cracks or otherwise damaged parts) and the correctness of the setting and the relative arrangement of various parts of the system.

3. Equipment base is to be true and leveled.

4. Inspect bearings, clean and remove foreign matter, and verify alignment.

5. Lubricate according to the manufacturer's instructions.

6. Open and close valves and rotating equipment by hand to check for binding, interference, or improper functioning.

7. Inspect valves, clean bonnets and stems, adjust as necessary, and tighten packing glands to ensure no leakage while permitting valve stem operation without galling.

C. Inspect and clean equipment, devices, connected piping, and structures to ensure that they are free of foreign material.

D. Provide Manufacturer's Operation and Maintenance Manuals accessible on Site a minimum of thirty (30) days prior to start-up of Equipment as per Section 01730.

2.2 FUNCTIONAL TESTING

A. Once the Pre-commissioning Activities have been completed to the satisfaction of the Engineer, individual items of equipment and systems can be initially started and operated under a variety of simulated operating conditions.

B. Coordinate equipment commissioning with the manufacturer. Adhere to all manufacturer guidelines and procedures.

C. All equipment shall be inspected for proper alignment, quiet operation, proper connection, and satisfactory performance, and tested in the presence of the Engineer.

1. Test to demonstrate that the equipment and Work is not defective electrically, mechanically, or otherwise and is in a safe and satisfactory operation condition.

2. Provide all materials, labour and equipment to make any adjustments to the installation as required by the manufacturer or the Engineer to affect performance.

D. The equipment shall be operated a sufficient period of time to determine the system operating characteristics and to allow initial adjustment of operating controls. Equipment shall be operated for a minimum period of 24 hours without fault or issues.

E. Perform specified field tests for equipment and provide field test reports.

F. Noise Level Testing: Perform noise level testing on each installed device as required by the technical specifications. Establish a background noise level and eliminate noise sources generated by adjacent construction activity prior to testing.

G. Once equipment and systems are fully tested and all aspects are operational, instruct the Township's designated representatives in all aspects of the operation and maintenance of systems and equipment provided under the Contract in accordance with Section 01764. Submit signed attendance sheet and all presentation materials as specified.

H. On completion of the installation, testing, start-up, and training for each item of equipment, submit to the Engineer the manufacturer's certificate stating the installation of the equipment has been inspected, is installed in accordance with the instructions, has been started and adjusted as necessary, and it is in warranty condition.

I. Provide all equipment, piping, electrical and instrumentation tagging as specified.

J. Complete Pre-Start Health and Safety Review and submit Report in accordance with Section 01415.

K. Provide electrical inspection certificate from the Electric Safety Authority having jurisdiction, stating that its representative has inspected the electrical installations in the works and is satisfied that they are in accordance with the code requirements.

2.3 POST TEST INSPECTION

A. Post Test Inspection: Once Commissioning has been completed, all new equipment shall be inspected for proper functioning as indicated by the manufacturer. If equipment does not meet the specified functioning, it shall be rectified. All equipment shall be checked for loose connections, unusual movement, or other indications of improper operating characteristics. All deficiencies shall be corrected to the satisfaction of the Engineer.

END OF SECTION

SECTION 01764 – TRAINING

PART 1. GENERAL

1.1 DESCRIPTION

A. This section details the specifications for training of the Owner's staff in the operation and maintenance of all equipment installed under this contract.

B. Training shall include instruction of operating personnel in equipment operation, preventive and normal maintenance and repair of the equipment.

1.2 QUALITY ASSURANCE

A. The training sessions shall be conducted by qualified, experienced (five years minimum), factory-trained representatives for the equipment manufacturers.

1.3 SUBMITALS

A. The following information shall be submitted to the Owner no later than three weeks prior to training occurring.

1. Date and time of training.
2. Subject of each training session
3. Individuals conducting each training session.

PART 2. PRODUCTS

2.1 GENERAL

A. Training shall take place at the equipment itself. Operation and maintenance manuals shall be submitted to the Owner a minimum of 60 days prior to the training occurring.

2.2 FORMAT AND CONTENT

A. Each training session shall encompass the following topics as a minimum.

1. Location and function of the equipment.
2. Theory of the equipment operation
3. Start-up, shutdown, normal operation, and emergency operating procedures of the equipment
4. Identify and discuss safety items and procedures.
5. Safety concerns and safe operation of the equipment.
6. Preventive maintenance procedures including lubrication requirements

7. Monitoring of the operation of the equipment including standard checks
8. Normal and major repair procedures
9. Equipment calibration
10. Parts suppliers
11. Local representation
12. Any other items which the manufacturer feels are necessary for the proper operation and maintenance of the equipment.

2.3 TRAINING DURATION

A. The minimum on-site training required is identified by the equipment specifications. If specification do not indicate minimum requirements for training for that particular equipment, then the supplier of that equipment shall provide training as recommended by them on-site with the operators.

PART 3. EXECUTION

3.1 GENERAL REQUIREMENTS

A. Training shall be conducted in conjunction with the performance testing and will be conducted prior to substantial performance being issued.

B. Contractor to video tape all training sessions and provide USBs with video files saved with high quality video and sound. Video files shall be named appropriately for ease of navigation of the USB file structure. Contractor to include a digital copy of all training material on the USB in conjunction with every video recorded.

C. Contractor to provide a projector, screen, notebooks, pens, and all training materials.

END OF SECTION

DIVISION 16 - ELECTRICAL

DIVISION 16 - ELECTRICAL

Section No.	Title
16010	Electrical General Requirements
16021	Demolition of Electrical Systems
16050	Basic Electrical Materials Methods
16060	Grounding
16120	Wire and Cables 0-1000V
16130	Raceways
16180	Automatic Transfer Switches
16231	Standby Diesel Generator
16440	Disconnect Switches
16441	Low Voltage Panelboards

SECTION 16010 – ELECTRICAL GENERAL REQUIREMENTS

PART 1. GENERAL

1.1 SUMMARY

A. Read and conform to the General Requirements (Division 1), which applies to and forms part of all sections of the work. The general instructions are intended to supplement and not to replace Division 1 requirements.

B. The Contractor shall provide all labour, supervision, tools, equipment, materials, services and miscellaneous expenses to complete the work as outlined in this Section. Supply and install all electrical and instrumentation equipment, controls and devices supplied under other Sections.

C. The Contractor shall provide all labour, supervision, tools, equipment, disposal, remediation of existing conditions, materials, services and miscellaneous expenses to complete the removals work as outlined in this Section. The word “removal” shall be defined to mean disconnect, make safe, dispose of from site, including all components, electrical distribution, raceways associated with the item identified for removal that is rendered redundant as a result of the removal, excluding items that are specifically identified to remain in service. The contractor shall provide remediation of any voids and/or damages that result and/or are caused by the removal works. The contractor shall restore existing infrastructure that was negatively impacted by the removals, to its original condition.

D. “Provide” is understood to mean “supply and install”.

E. Electrical Drawings indicate the general location and route to be followed by major raceways and electrical equipment arrangements. They do not show all structural, architectural and mechanical details. In some cases, conduit or wiring is only shown diagrammatically on Drawings and may not detail exact or complete wiring or raceway requirements.

F. To provide sufficient detail and the maximum degree of clarity on the Drawings, symbols used for various electrical devices, particularly wall-mounted devices, take up more space on Drawings than devices physically do. Locate devices with primary regard for the convenience of operation and space utilization, rather than stringing devices out so as to comply with scaled locations of electrical symbols.

G. The Contractor shall provide all required incidental devices to ensure a complete and fully functional working system.

H. Visit and examine the site and review the drawings thoroughly. It is contractor’s responsibility to generate a plan for a ‘make safe’ procedure for proceed the construction. No compensation will be considered for difficulties arising from failure to do so.

1.2 RELATED SECTIONS

A. Division 1 - General Requirements

1.3 REFERENCES

A. CSA C22.2 No. 0 General Requirements - Canadian Electrical Code - Part 2

B. National Electrical Manufacturers Association (NEMA)

C. Institute of the Electrical and Electronic Engineers (IEEE)

D. Canadian Standards Association (CSA)

E. Underwriters Laboratories Canada (ULC)

F. National Fire Protection Agency (NFPA)

G. Ontario Electrical Safety Code (OESC)

H. Comply with latest editions of the CSA Certification Standards and Bulletins.

I. Comply with latest standard of power supply authority- PUC.

J. Comply with latest editions of the ESA Bulletins.

K. IEEE 519 for total harmonic distortion, Latest Revision.

L. Grounding to CSA C22.3 No.2 – 1975 (R.1980).

1.4 DEFINITIONS

A. The following are definitions used in Division 16. Refer also to Division 1.

1. Inspection Authority means agent of any authority having jurisdiction over construction and safety standards associated with any part of electrical Site Work.

2. Electrical Code or Code means the Ontario Electrical Safety Code.

3. CEC means latest edition of the Canadian Electrical Code.

4. ESA means Electrical Safety Authority.

1.5 CONTRACT DRAWINGS AND SPECIFICATIONS

A. Follow the Contract Drawings to become familiar with all conditions affecting the work and verify spaces in which the work will be installed.

B. The drawings for electrical work are performance drawings, diagrammatic, intended to convey the scope of work and indicate general arrangement and approximate location of apparatus, fixtures and approximate sizes and location of equipment and outlets. The drawings do not show architectural, process and structural details.

C. Do not scale the drawings to determine dimensions but obtain information for accurate dimensions by referring to architectural and structural drawings, or by site measurements.

D. Review existing drawings as available at the site during the tender period. Become familiar with the condition of the existing drawings and related equipment. Allow for errors and omissions in the existing drawings and ensure that the tender price includes the provisions to make the necessary field reviews, field verifications, field changes, and drawing changes to suit the intent of the modification required.

E. Work which is indicated, but not completely detailed shall be installed by common practice or as directed by the Engineer.

F. Alter, at no additional cost, the location of materials and/ or equipment as directed, provided that the changes are made before installation and do not necessitate additional material.

G. Leave space clear and install work to accommodate future materials and/or equipment as indicated and to accommodate equipment and/or material supplied by other trades. Verify spaces in which work is to be installed. Install conduit and cable runs to maintain headroom and clearances to conserve space.

H. The drawings, specifications, and standards are complimentary to one another, meaning that, that which is called for on one is meant to be called for on all. Where conflict exists between the Sections, Standards and/or Drawings, it shall be referred to the Engineer for clarification and rectification before any material is purchased or electrical work commences. Code requirements shall be considered a minimum standard. When materials shown on drawings as indicated in the specifications exceed code requirements, the plans and specifications shall govern. If, having examined all documents pertaining to Division 16, concerning the nature and extent of the work being performed under other sections, clarification of the item and/or items in question will come from the Engineer.

I. Provide all minor items and work not shown or specified but which are reasonably necessary to complete the Work.

J. If discrepancies or omissions in the drawings or specifications are found, or if the intent or meaning is not clear, advise the Engineer for clarification before submitting tender.

1.6 ELECTRICAL COORDINATION

A. Co-ordination with facility operations:

1. Facility operating staff will perform switching operations required for the de-energization of any operating feeder or equipment.

2. Advise of any special safety and related requirements pertaining to shut down and electrical isolation of any item of equipment.

3. Submit detailed work plan for approval before commencement of work. A minimum of five working days' notice is required. Scheduling Requirements

a. For shutdowns, the contractor shall submit both initial plan and a second fall back date for approval.

b. Obtain approval of the detailed work plan from the engineer before commencement of the work.

B. Facility process systems are to remain in service during the construction.

C. Work provided outside Division 16:

1. Refer to Contract Drawings and Standard Drawings at end of this specification section.

2. Fully co-operate with all trades in the provision and maintenance of electrical power in all areas throughout the period of construction.

1.7 ACTION SUBMITTALS: PERMITS, INSPECTIONS, TEST REPORTS, CERTIFICATES AND FEES

A. Submit to the Contract Administrator all necessary interim and final certificates of inspection and approval required by Inspection Authorities having jurisdiction over the Work, as evidence that the Work installed complies with laws and regulations of the governing authorities.

B. The Contract Administrator will submit copies of plans and Specifications required by the OESC to the Electrical Safety Authority.

C. Submit all shop drawings and purpose made drawings that are required by the Electrical Safety Authority.

D. Notify Inspection Authorities in sufficient time to inspect Work.

E. Submit Inspection Authorities approval certificates.

F. Submit electrical equipment or system warranty certificates.

G. Report breaker trip settings, fuse ratings and sizes of fuses.

H. Report circuit insulation resistance results for all 600 Volt cables

I. Other requirements specified in the Contract Documents.

J. Pay associated fees and costs.

1.8 INFORMATION SUBMITTALS

A. Factory test certification and reports for all major electrical equipment.

B. Site test certification and reports as specified in other Sections of Division16 - Electrical.

C. In the electrical rooms, provide power distribution system single line diagrams in glazed metal frames, Drawings: 600 x 450 mm minimum size. Include information as required by the Inspection Authorities. Submit with shop drawings.

1.9 CONSTRUCTION/SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 01330 – Submittals.

B. Submit data (drawings) for review prior to commencement of manufacturing or installing with the exception of conduit, standard conduit fittings and low voltage wiring.

C. The shop drawings shall show all details of construction, dimensions, footprint, equipment plan/sections, equipment and cabinet faceplates, capacities, weights, ratings and all other relevant performance characteristics.

D. Where identified within individual specification sections, a dimensioned plan shall be included in the submission showing the equipment located within the proposed space in order to satisfy any space constraints that have been identified on the drawings. More specifically, a plan will be required whether or not an equipment line-up consists of either one or multiple equipment manufacturers.

E. Prepare composite construction drawings, fully dimensioned of cables, conduit, cable tray, bus duct, sleeves, clearances, pipes, ducts, etc., and equipment in mechanical and/or electrical equipment rooms, ceiling spaces and all other critical locations to avoid a conflict of trades.

Base drawings on manufacturer's shop drawings. Drawings should be developed from consultation with and agreement of all trades involved.

F. Prepare drawings of equipment bases, anchors, slabs, floor and roof curbs, if needed, for the electrical work.

G. Include, but not necessarily limit to, the following:

1. Single line diagram.

2. Manufacturers' bulletins, leaflets and specifications of major electrical equipment.

3. A checked-off list for all equipment corresponding to the respective specification section.

H. Indicate the number or letter used on the drawings/specifications as an identification symbol on product data for panelboards, light fixtures, instruments and other equipment submitted.

I. Bind one complete set of construction/shop drawings showing "as built" conditions in each operating and maintenance instruction manual.

1.10 AS BUILT DRAWINGS

A. Before commencing work, obtain two sets of electrical drawings for showing "As Built" conditions. As job progresses, mark on field set of prints to indicate accurately all installed work. At completion stage, transfer all information onto master set of drawings and indicate "Contractors Certified Approval of Accuracy" before submitting to Contract Administrator for review and record use.

B. Indicate on record drawings "As Built" stamp.

C. Indicate on record drawings, location of all buried services. This information is to be certified correct by Contract Administrator before backfilling commences.

D. Show on the record drawings as-built, all outlets and equipment such as runs of conduit, locations of pull boxes, outlets, motors, panels, etc., as well as all services entering the building and on the property.

E. Indicate exact location of all services left for future work.

F. Indicate new location for electrical items that have been relocated.

1.11 OPERATIONS & MAINTENANCE MANUALS

A. Comply with requirements for operating and maintenance manuals stated in 01330 – Submittals.

B. In addition to the requirements of 01330 – Submittals., include in the Operations and Maintenance Manuals:

1. Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

2. Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items and parts lists. Advertising or sales literature not acceptable.

3. Wiring and schematic diagrams and performance curves.

4. Names and addresses of local suppliers for items included in Maintenance Manuals.

5. Copy of test data.

6. List of spare parts of all electrical equipment complete with names and addresses of sales, service representatives and suppliers.

7. Copy of final inspection certificate.

8. Copy of the purchase order, showing equipment make and model numbers issued to the manufacturer complete with all addenda. All cost details may be hidden.

9. Copy of all warranty certificates.

10. Set of final reviewed Shop Drawings reflecting as built conditions.

1.12 OPERATING VOLTAGES

A. Operating voltages to CSA/CAN3-C235-83.

B. Distribution devices and equipment to operate satisfactorily at 60Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.13 PERMITS, FEES AND INSPECTIOPN

A. Pay associated fees, for all permits, inspections, and power outages to suit supply authority/utility requirements.

B. Notify the Engineer of changes required by Electrical Safety Authority (ESA) prior to making changes.

C. Furnish Certificates of Acceptance from the Electrical Safety Authority (ESA) on completion of work to the Engineer.

D. Arrange for inspection of all work by the Authorities having jurisdiction over the work. On completion of the work, present to the Township the final unconditional certificate of approval of the Inspection Authorities.

E. Comply with the requirements of the latest edition of the applicable CSA Standards, the requirements of the Authorities, Federal, Provincial and Municipal Codes, the applicable Standards of the Underwriters' Association and all other authorities having jurisdiction. These codes and regulations constitute an integral part of these specifications. In case of conflict, the codes take precedence over the contract drawings. Otherwise follow the standards established by the contract drawings and specifications.

F. Before starting any work, submit the required number of copies of drawings and specifications to the Authorities for their approval and comments. Comply with any changes requested as part of the contract, but notify the Engineer immediately of such changes for proper processing

of the requirements. Prepare and furnish any additional drawing details for information as may be required.

G. Engineer has submitted a copy of the drawings and specifications to the Plan approval section of Electrical Safety Authority

1.14 WORKMANSHIP

A. Install all equipment, bus ducts, cable trays, conduit and cables in a workmanlike manner to present a neat appearance and to function properly.

B. Install exposed systems and equipment neatly and grouped to present a neat appearance, without conflict to other services.

C. Install equipment and apparatus requiring maintenance, adjustment or eventual replacement with due allowance therefore, in terms of space and accessibility.

D. Replace without extra cost work unsatisfactory to the Contract Administrator.

E. Protect all equipment from damage during delivery to the site and during installation. Make good any damage or deterioration whatsoever and have it covered by replacement guarantee.

PART 2. PRODUCTS

2.1 ACCEPTED MATERIALS

A. Materials: Approved by CSA or an independent agency accepted by the Inspection Authorities for use as installed. Where equipment or material is not approved or certified as indicated, obtain and pay for special acceptance from the Inspection Authorities or independent agency accepted by the Inspection Authorities.

B. Standards: Unless otherwise indicated in the Contract Documents, manufacture to the standards of North American Standards Agencies.

2.2 EQUIPMENT FINISH

A. Shop finish all metal enclosure surfaces by application of rust resistant primer and at least two coats of finish enamel all in accordance with the directions of the coating manufacturer.

1. Paint indoor distribution enclosures light grey to ANSI No. 61.

B. Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

C. Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

2.3 WIRING IDENTIFICATION

A. Identify wiring with permanent indelible identifying markings, numbered on both ends of phase conductors of feeders and branch circuit wiring.

B. Maintain phase sequence and colour coding throughout.

C. Colour code: to CSA C22.1, and other sections of the contract documents.

D. Use colour coded wires in communication cables, matched throughout system.

2.4 CONDUIT AND CABLE IDENTIFICATION

A. Colour code conduits, boxes and metallic sheathed cables.

B. Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 10 m intervals.

C. Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	**Auxiliary**
Up to 250V	yellow	
Up to 600V	yellow	green

2.5 NAMEPLATES AND LABELLING

A. To meet the requirements of CSA and Electrical Safety Authority.

B. Supply and install identification nameplates on all equipment such as safety switches, panelboards, pushbutton stations, control panels, etc., and any equipment not so supplied.

C. Non corroding, visible and legible after equipment is installed.

D. Provide “Asbestos Free” labels on switchgear.

E. Disconnects, starters and contactors: indicate equipment being controlled and voltage

F. Terminal cabinets, pull and junction boxes: indicate system and voltage.

G. Nameplates:

1. 3 mm thick laminated plastic engraving sheet, white face, black letters, mechanically attached with stainless steel screws.

Size 1	1 line	3 mm high letters
Size 2	1 line	6 mm high letters
Size 3	2 lines	6 mm high letters
Size 4	1 line	12 mm high letters
Size 5	2 lines	12 mm high letters
Size 6	1 line	25 mm high letters
Size 7	2 lines	25 mm high letters

H. Wording on nameplates to be approved by Contract Administrator prior to manufacture.

I. Allow for average of 25 letters per nameplate.

2.6 EQUIPMENT TAGGING

A. Nameplate wording: to be reviewed by the Contract Administrator during shop drawing review.

2.7 WARNING SIGNS

A. As specified and to meet requirements of Electrical Inspection Department and Contract Administrator.

B. Decal signs, minimum size 175 x 250 mm.

2.8 SINGLE LINE ELECTRICAL DIAGRAMS

A. Submit “as-built” single line diagrams based on Contract drawing to Contract Administrator for review.

B. Contract Administrator will return drawings in ACAD (i.e. *.dwg) format to Contractor.

C. Drawings size: 600 x 450mm.

D. Provide three copies of the single line diagram for the Facilities.

E. At switchboard location, provide framed (with glass) Single Line diagrams.

2.9 LOCATION OF OUTLETS

A. Change location of outlets at no extra cost or credit, providing distance does not exceed 3000mm, and information is given before installation.

B. Remove existing outlets as required to suit building demolition and/or building removals.

2.10 MOUNTING HEIGHTS

A. Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

B. If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

C. Install electrical equipment at following heights unless indicated otherwise.

1. Local switches: 1400mm.

2. Wall receptacles: 1200mm

3. Panel-boards: as required by Code or as indicated.

4. Telephone and interphone outlets: 1200mm.

5. Disconnect switches: 1400mm.

PART 3. EXECUTION

3.1 DOCUMENTATION

A. The Contractor will develop test documentation forms specific for each system and associated equipment items installed under this contract.

3.2 PREPARATION AND PROTECTION

A. Schedule expediting of materials and execution of Work in conjunction with associated work of Other Contractors.

B. Post engraved warning signs to meet the requirements of the Inspection Authorities and the Contract Administrator.

C. Protect those working on, or in the vicinity of, exposed electrically energized equipment from physical danger. Shield and mark live parts "LIVE - ___ VOLTS". Indicate the appropriate voltage.

D. Arrange for installation of temporary doors, barriers and similar items for access to rooms and areas containing electrical equipment. Keep these doors locked at all times, except when under direct supervision.

E. Permanently identify equipment energized from multiple power sources, noting voltages, power source locations, supply disconnect designations and grounding electrode location.

3.3 LOAD BALANCE

A. Drawings and Specifications indicate circuiting to electrical loads and distribution equipment.

B. Balance electrical load between phases as nearly as possible on switchboards, panel boards, motor control centers, and other equipment where balancing is required.

C. When loads must be reconnected to different circuits to balance phase loads, maintain accurate record of changes made, and provide circuit directory that lists final circuit arrangement.

3.4 TESTS

A. Test and check electrical systems for correct operation and compliance with statutory and regulatory authority requirements.

B. Perform tests in presence of the Contract Administrator. Log, tabulate, sign and include test results in Maintenance Data and Operating Instructions.

C. Refer to the appropriate Specification Sections for specific system or equipment tests.

D. Supply calibrated instruments, meters, consumable parts (such as fuses) and equipment. Arrange for qualified personnel to conduct tests.

E. In cooperation with mechanical Subcontractors, take clamp-on ammeter readings with motors operating at full load. Log, tabulate and include readings in Maintenance Data and Operating Instructions.

3.5 TOUCH-UP PAINTING

A. Field touch-up shop painted electrical equipment.

B. Obtain necessary touch-up paint of original type and quality from the equipment manufacturer.

C. Clean surfaces to be painted. Feather out edges of scratch marks. Make patches inconspicuous.

D. Apply one or more coats until the damaged surface has been restored to its original finish condition.

E. Do not paint nameplates, tags, warning plates and operating instructions. Observe field painting of electrical equipment or raceways.

3.6 SUPPORTS AND HANGERS

A. Provide supports, hangers, plates and hardware required for electrical and instrumentation equipment.

B. Hot dip galvanized prefabricated steel supports, such as channels, struts, brackets, hangers, slotted angles and similar items. Bolt or clamp these supports. Do not field weld. Repaint cut sections with zinc rich galvanizing primer.

C. Bond metallic supports to grounding electrode. Do not use metallic supports as ground conductors for electrical equipment.

D. Provide non-corroding, 6mm minimum, nylon or lead spacers for fastening enclosures to masonry walls.

E. Provide expansion anchors, type HKD by Hilti (Canada) Ltd. or Redhead Multi-Set II by Phillips and machine screws or threaded rods and nuts for supporting hangers or straps.

F. Provide UCAN SCRU-IT or TAPCON fasteners, or KWIK-CON II anchors by Hilti (Canada) Ltd. for attaching conduit straps, conduit fittings, boxes, control stations, and similar items to concrete.

G. Do not use power-actuated tools without the prior, written consent of the Contract Administrator.

H. Provide fire retardant, treated plywood backboards.

3.7 CUTTING, PATCHING AND WELDING

A. Where installation of equipment by this section requires cutting or patching of new or existing work, the work shall be performed by, and under direction and supervision of, this section. Make good surface finishes to satisfaction of the Contract Administrator.

B. No cutting or welding of beams, columns or structural surfaces is permitted without approval of the Contract Administrator and all damage to finished or unfinished surfaces shall be made good to the satisfaction of the Contract Administrator.

C. Pay all costs for cutting and patching resulting from failure to co-ordinate timely installation of electrical inserts, sleeves, etc., into masonry structures.

3.8 FIREPROOFING

A. Where sleeves or openings are installed in walls, floors, roof or partitions to accommodate raceways, cables or bus duct, provide all necessary seals, fittings, barriers and fire-resistant materials to restore the installation to its original fire rating to the satisfaction of the governing authorities and the Owner’s insurance underwriters. Minimum two (2) hour fire rating.

3.9 EXCAVATION AND BACKFILL

A. Ensure that route and depth of excavation for underground electrical services is as indicated. Provide protective materials around and over services and be present at all times during excavation and backfilling to supervise work.

B. A danger tape shall be placed ½ way down and cover the width of the trench as required in ESA Bulletin 12-2-14.

3.10 CLEANING

A. Vacuum all construction debris and materials from the inside and outside of enclosures, before final electrical tests.

B. Clean luminaire reflectors, lenses and other surfaces exposed to construction dust and dirt.

3.11 FIELD QUALITY CONTROL

A. General:

1. Comply with requirements of 01762 – Commissioning.

2. All equipment and electrical systems which are provided under this Division shall be performance tested for electrical and mechanical defects and all defects and adjustments made, prior to requesting inspection by the Contract Administrator.

3. Submit original copies of letters from the manufacturers of auxiliary systems indicating that their technical representatives have inspected and tested the respective systems and are satisfied with the methods of installation, wiring and operation.

4. Prior to the Owner's acceptance, all electrical equipment, materials and systems installed shall be subject to an inspection and applicable performance tests supervised by the Contract Administrator to ensure that the operation of the system and components satisfy the requirements of the Contract Documents.

5. Ensure that the system and its components are ready prior to the inspection and test for acceptance.

6. Conduct all testing by fully qualified personnel only. Tests requiring initial power energization of a system shall not be made without notification of the Contract Administrator. Tests, checks and the like carried out by or on behalf of the Contractor shall be documented and certified at no additional cost to the Owner. Submit two copies of the test certificates to the Contract Administrator.

7. Carefully check wiring for each system and/or part of a system to ensure that the system will function properly as indicated by wiring and schematic diagrams, description of operation, etc.

8. Ensure circuit protection devices such as over-current trips, relays and fuses are installed to values and settings as indicated.

9. Replace at no additional cost all fuses, relays, or other devices destroyed during field quality control (testing).

10. Supply all instruments, meters and personnel required for the tests.

11. Clean equipment by vacuum. Clean, wax and polish all new exterior surfaces, check and tighten all electrical connections.

12. All testing shall be scheduled and coordinated through the Contract Administrator. No testing of any kind shall be done without this clearance.

13. Single phase loads shall be connected so that there is the least possible imbalance of the supply. Common neutral shall be used for maximum three (3) single phase circuits, each circuit on a different phase.

14. Furnish labour, materials, instruments and bear all costs for tests as requested by the Contract Administrator.

15. Conduct and pay for tests identified in this Section.

16. Carry out tests in presence of Contract Administrator. Give seven (7) working days notice of proposed tests.

17. Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

18. Submit a copy of test results for Contract Administrator's review in addition to copies included in maintenance data.

3.12 LOW VOLTAGE CABLE –BELOW 1000V

A. Limit all tests on cables in this voltage range to insulation resistance measurements using a megger: 500 V instrument for circuits up to 350 V systems; 1000 V instrument for 351-600 V systems.

B. Record all test results in a log book and submit to the Contract Administrator for reference. Replace or repair all circuits which do not meet minimum requirements specified in the governing Electrical Safety Code. Measure insulation resistance of the following circuits:

1. Power and lighting feeders (with equipment disconnected): phase-to-phase, and phase-to-ground.

2. Control circuits: measure to ground only.

C. Do not perform megger tests on control circuits containing transistorized or solid-state components.

D. Where power factor correction equipment is installed, it may be necessary to disconnect the capacitors from the system prior to testing to avoid overvoltage.

E. Conduct tests in accordance to NETA standards.

3.13 INSTRUMENTATION WIRING

A. Check continuity of each wire using ohm meter or DC buzzer. Megger or 120 V filament lamp testing is not acceptable.

B. Test thermocouple wiring for continuity and polarity in accordance with manufacturer's recommendations.

3.14 DUCTS AND CONDUITS

A. Conduits or ducts which are required to be installed but left empty shall be tested for clear bore using a ball mandrel of approximately 85% of the conduit or duct inside diameter. Any conduit or duct which rejects the ball mandrel shall be cleared at no additional cost to the Township. These tests shall be witnessed by the Contract Administrator. Seven (7) days notice shall be given prior to testing.

3.15 TRIAL USEAGE

A. The Owner and Owner's representatives shall have the privilege of trial usage of the electrical system or parts thereof for the purpose of testing and verifying operational procedures.

B. Trial usage by the Owner shall not waive the Contractor/Sub-Contractor of any responsibility because of trial usage.

C. Trial usage shall not be construed as acceptance by the Owner.

3.16 TESTS

A. All equipment and electrical systems which are provided under this Division shall be performance tested for electrical and mechanical defects and all defects and adjustments to be made prior to requesting inspection by the Engineer.

B. Submit original copies of letters from the manufacturers of auxiliary systems indicating that their technical representatives have inspected and tested the respective systems and are satisfied with the methods of installation, wiring and operation.

C. Insulation resistance tests shall be performed for all wiring and equipment installed under this division. Insulation resistance tests shall be performed with a 500V megger instrument for equipment up to 350V and with 1000V megger for 350 – 600V circuits and recorded in log book for reference. Lighting and power circuit feeders shall be meggered and the insulation resistance between live parts and ground shall not be less than 2 mega ohms. During the performance of the test the neutral conductor shall be disconnected from the ground and reconnected afterwards.

D. Conduits or ducts which are required to be installed but left empty shall be tested for clear bore using a ball mandrel of approximately 85% of the conduit or duct inside diameter. Any conduit or duct which rejects the ball mandrel shall be cleared at no additional cost to the Owner. These tests shall be witnessed by the Engineer. Five (5) days notice shall be given prior to testing.

E. Single phase loads shall be connected so that there is the least possible imbalance of the supply. Common neutral shall be used for maximum 3 single phase circuits, each circuit on a different phase.

F. Furnish labour, materials, instruments and bear all costs for tests as requested by the Engineer.

G. Conduct and pay for all FAT & SAT testing.

H. Carry out tests in presence of Engineer. Give fourteen (14) working days notice of proposed tests. All tests require an approved test plan

I. Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

J. Submit two (2) copies of test results for Engineer's review in addition to copies included in maintenance data.

3.17 EXECUTION

A. The use of permanent electrical system for temporary construction service shall be only with written permission of the Engineer.

B. Maintain at the job site, at all times, qualified personnel and supporting staff, with proven experience in erecting, supervising testing projects of comparable nature and complexity.

C. Expedite the work as follows:

1. Continuously check and expedite delivery of equipment and materials.

2. If necessary, inspect at the source of manufacture.

3. Continuously check and expedite the flow of necessary information to and from all parties involved.

4. Inform the Engineer promptly where information is required.

D. Equipment, conduit, etc., installed but not coordinated with the work of other trades shall be relocated as directed by the Engineer without extra cost to the Township.

E. Install equipment, conduit and cables in a workmanlike manner to present a neat appearance and to function properly to the satisfaction of the Engineer. Install exposed conduit runs parallel and perpendicular to building planes. Install conduit concealed in chases, behind furring, or above ceiling, except in unfinished areas. Install exposed systems neatly and group to present a neat appearance.

END OF SECTION

SECTION 16021 – DEMOLITION OF ELECTRICAL SYSTEMS

PART 1. GENERAL

1.1 GENERAL CONDITIONS

A. Comply with Division 1 - General Requirements and 16010 - General Electrical Requirements.

B. Refer to all other Divisions of the Specifications and these documents to determine their effect upon the work of this section.

1.2 SCOPE OF DEMOLITION OF ELECTRICAL SYSTEMS WORK

A. Refer to the contract drawings to determine the full scope of demolition work.

B. Furnish all labour, materials, equipment, transportation, services, facilities and supervision necessary to demolish all equipment, systems and materials specified herein and on the drawings.

C. Furnish all labour, materials, equipment, transportation, services, facilities and supervision necessary to dispose of all equipment, systems and materials listed for removal from site herein and on the drawings

D. Furnish all labour, equipment and supervision necessary to surrender (hand over) to the Township all equipment, systems and materials specified herein and, on the drawings.

E. Restore all surfaces to pre-construction state, including but not limited to trenching and underground duct work.

1.3 PROCEDURES AND STAGES

A. Demolition and/or removal of equipment must follow the approved sequencing schedules.

B. Perform the demolition of electrical systems such that operations outside of the demolition areas, are not affected.

PART 2. PRODUCTS

2.1 GENERAL

A. Supply and install the necessary temporary bracing, supporting structures, guards, warning signs, etc. necessary to complete the project safely and in accordance with all regulations and/or codes.

PART 3. EXECUTION

3.1 GENERAL

A. Organize the work and provide sufficient labour and equipment to ensure safety at all times.

B. All workers shall be competent in, and trained to perform, the tasks that they perform. Where applicable, workers shall be licensed or otherwise qualified for the tasks that they perform.

C. Prior to starting demolition, the contractor shall inspect with the Township all facilities described to ascertain the limits of the works.

D. When disconnecting, relocating, or re-feeding existing equipment, any abandoned conductors to this equipment must be removed.

E. Co-ordination of work

1. Co-ordinate demolition work with the Contract Administrator, and Township staff to ensure no disruption of station operation.

F. Demolition and disposal

1. Remove the equipment or material from site and dispose in accordance with all applicable regulations and codes. Contractor to pay all associated fees for disposal.

2. The contractor shall take all reasonable steps to ensure that equipment removed from site is reused or recycled.

END OF SECTION

SECTION 16050 – BASIC ELECTRICAL MATERIALS METHODS

PART 1. GENERAL

1.1 REFERENCES

A. CSA C22.1 No. 0 General Requirements – Canadian Electrical Code – Part 2.

B. CAN3-C235 Preferred Voltage Levels for AC Systems, 0-50,000 V.

C. National Electrical Manufacturers Association (NEMA).

D. Institute of the Electrical and Electronic Engineers (IEEE).

E. Insulated Cable Engineers Association (ICEA).

F. Canadian Standards Association (CSA).

G. Underwriters Laboratories Canada (ULC).

H. American National Standards Institute (ANSI).

I. National Fire Protection Agency (NFPA).

J. Ontario Electrical Safety Code (OESC).

K. Comply with the latest editions of CSA C22.1 Canadian Electrical Code – Part 1, Provincial Electrical Authority Safety Codes and Bulletins, and local codes and requirements which govern the installation. Where these regulations conflict, comply with the most stringent condition.

L. Comply with latest editions of the CSA Certification Standards and Bulletins.

M. Underwriters Laboratories Inc. (UL).

1.2 DEFINITIONS

A. The following are definitions used in Division 16. Refer also to Division 1.

1. Inspection Authority means agent of any authority having jurisdiction over construction and safety standards associated with any part of electrical Site Work.

2. Electrical Code or Code means Ontario Electrical Safety Code, latest edition.

1.3 SUBMITTALS

A. Shop Drawings shall be provided for all new equipment and modified components shown on the drawings.

1.4 QUALITY ASSURANCE

A. CSA or ULC Compliance: Materials manufactured within scope of Underwriters Laboratories shall conform to ULC Standards and have an applied ULC listing mark.

1.5 EXTRA MATERIALS

A. Furnish, tag, and box for shipment and storage the following spare parts and special tools:

1. Fuses, 0 to 600Volts: Six of each type and each current rating installed.

PART 2. PRODUCTS

2.1 JUNCTION AND PULL BOXES

A. Outlet Boxes Used as Junction or Pull Box: As specified under subsection 2.1 - Outlet and Device Boxes.

B. Conduit Bodies Used as Junction Boxes: As specified under subsection 2.2 - Fittings in Specification Section 16130 – Raceways and Cable Tray.

C. Large Sheet Steel Box:

1. NEMA Type 1.

2. Box: Code-gauge, galvanized steel.

3. Cover: Full access, screw type.

4. Machine Screws: Corrosion-resistant.

D. Large Cast Metal Box:

1. NEMA Type 4.

2. Box: Cast ferrous metal with drilled and tapped conduit entrances and exterior mounting lugs.

3. Cover: Hinged

4. Gasket: Neoprene.

5. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.

6. Manufacturers and Products, Surface Mounted Nonhinged Type:

a. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds; Series W).

b. O-Z/Gedney; Series Y.

7. Manufacturer and Product, Surface Mounted, Hinged Type: O-Z/Gedney; Series YW.

8. Manufacturers and Products, Recessed Type:

a. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds; Type WJBF).

b. O-Z/Gedney; Series YR.

E. Large Cast Aluminum Box:

1. NEMA Type 4.

2. Box: Cast copper-free aluminum, with drilled and tapped conduit entrances and exterior mounting lugs.

3. Cover: Nonhinged.

4. Gasket: Neoprene.

5. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.

6. Manufacturers and Products, Surface Mounted Type:

   a. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds; Series W-SA).

   b. O-Z/Gedney; Series YS-A, YL-A.

F. Large Stainless-Steel Box:

1. NEMA Type 4X.

2. Box: 14-gauge, ASTM A240, stainless steel with white enamel painted interior mounting panel.

3. Cover: Hinged with clamps.

4. Hardware and Machine Screws: ASTM A167, stainless steel.

5. Manufacturers:

   a. Hoffman Engineering Co.

   b. Robroy Industries Ltd.

G. Large Steel Box:

1. NEMA Type 3R.

2. Box: steel, with white enamel painted interior and gray primed exterior, over phosphated surfaces.

3. Cover: Hinged with clamps.

4. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.

5. Manufacturers:

   a. Hoffman Engineering Co.

   b. Robroy Industries Ltd.

H. Large Non-metallic Box:

1. NEMA Type 4.

2. Box: High-impact, fiberglass-reinforced polyester or engineered thermoplastic, with stability to high heat.

3. Cover: Hinged with clamps.

4. Hardware and Machine Screws: ASTM A167, Type 316 stainless steel.

5. Conduit hubs and mounting lugs.

6. Manufacturers and Products:

   a. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds; Type NJB).

   b. Carlon; Series N, C, or H.

   c. Robroy Industries Ltd.

2.2 WIRING DEVICES

A. Receptacle, Single and Duplex:

1. Heavy duty, specification grade, two-pole, three-wire grounding type with screw type wire terminals suitable for No. 10 AWG.

2. High strength, thermoplastic base colour.

3. Color:

   a. Office Areas: White.

   b. Other Areas: Brown.

4. Contact Arrangement: Contact to be made on two sides of each inserted blade without detent.

5. Type:

   a. Default CR20 Series, Rating:125 volts, CSA Configuration 5-20R, 20 amps.

   b. Other types identified on drawings by their CSA Configuration designation.

6. One-piece mounting strap with integral ground contact (rivetless construction).

7. Manufacturers and Products:

   a. EATON; CR20 Series.

   b. Leviton; CR20 Series.

   c. Hubbell Power Systems; CR20 Series.

B. Receptacle, Ground Fault Circuit Interrupter:

1. Duplex, tripping at 5 mA.

2. Color: Brown.

3. Rating: 125 volts, CSA , Configuration: 5-20R, 20 amps.

4. Size: For 50 mm by 100 mm outlet boxes.

5. Standard Model: CSA, with No. 12 AWG copper USE/RHH/RHW-XLPE insulated pigtails and provisions for testing.

6. Feed-Through Model: CSA , with No. 12 AWG copper USE/RHH/RHW-XLPE insulated pigtails and provisions for testing.

7. Impact resistant nylon face.

8. Manufacturers:

   a. EATON

   b. Hubbell Power Systems.

   c. Leviton

2.3 LOCAL DISCONNECT SWITCH:

A. Quick-make, slow break contact design.

B. Silver alloy contacts.

C. Horsepower rated.

1. 2 horsepower (minimum) single-phase, 15 horsepower (minimum) three-phase, 600 volts.

D. Manufacturers:

1. Rockwell Automation Canada Ltd. (Allen-Bradley Canada Ltd.).

2. Siemens Electric Ltd.

3. Square ‘D’ Canada.

4. Eaton Electric Company (Cutler-Hammer Industrial Controls).

2.4 DEVICE PLATES

A. General: Sectional type plates not permitted.

B. Office Areas:

1. Material: Plastic, specification grade, 2.5 mm minimum thickness, noncombustible, thermosetting.

2. Color: To match associated wiring device.

3. Mounting Screw: Oval-head metal, color matched to plate.

C. Non-office Areas:

1. Material: Metal, specification grade, one-piece, 1 mm nominal thickness stainless steel.

2. Finish: ASTM A167, Type 302/304, satin.

3. Mounting Screw: Oval-head, finish matched to plate.

D. Weatherproof:

1. For Receptacles:

a. Non-metallic, 1-gang, deep cover, “while-in-use” type.

b. Manufacturers and Products:

i. Bryant model : RW57350.

2. For Switches:

a. Gasketed, cast-metal or -aluminum, incorporating external operator for internal switch.

b. Mounting Screw: Stainless steel.

c. Manufacturers and Products:

i. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds; DS-181 or DS-185).

ii. Appleton; FSK-1VTS or FSK-1VS.

E. Raised Sheet Metal: 12-7 mm high zinc- or cadmium-plated steel designed for one-piece drawn type sheet steel boxes.

F. Sheet Steel: Formed sheet steel or Feraloy designed for installation on cast metal boxes.

2.5 LIGHTING AND POWER DISTRIBUTION PANELBOARD

A. Panelboards and Circuit Breakers: Suitable for use with 90 degrees Celsius wire at full OESC, 90 degrees Celsius ampacity.

B. Rating: As noted in the contract drawings.

C. Ground Fault Circuit Interrupter (GFCI): 5 mA trip, 10,000 amps interrupting capacity circuit breakers.

D. Ground Fault Interrupter (GFI): 30 mA trip, 10,000-amp interrupting capacity circuit breaker, for heat tracing equipment.

E. Circuit Directory: Metal frame with transparent plastic face and enclosed card on interior of door.

F. For each panel, provide five Lock On Devices.

G. Cabinet:

1. NEMA Type 12 or as indicated.

2. Material: Code-gauge, hot-dip galvanized sheet steel, with reinforced steel frame.

3. Wiring Gutter: Minimum 100 mm square; both sides, top and bottom.

4. Front: Fastened with adjustable clamps.

   a. Trim Size:

      i. Surface Mounted: Same as box.

      ii. Flush Mounted: 19 mm larger than box on all sides.

   b. Finish: Rust inhibitor prime, with manufacturer's standard baked enamel or lacquer.

5. Interior:

   a. Factory assembled; complete with circuit breakers.

   b. Capable of circuit breaker replacement without disturbing adjacent circuit breakers or without removing main bus.

   c. Spaces: Cover openings with easily removable metal cover.

6. Door Hinges: Concealed.

7. Locking Device:

   a. Flush type.

   b. Doors Over 762 mm in Height: Multipoint.

   c. Identical keylocks, with two milled keys each lock.

8. Circuit Directory: Metal frame with transparent plastic face and enclosed card on interior of door.

H. Bus Bar:

1. Material: Tin-plated copper full sized throughout length.

2. Provide for mounting of future circuit breakers along full length of bus regardless of number of units and spaces shown. Machine, drill, and tap as required for current and future positions.

3. Neutral: Insulated, rated same as phase bus bars with at least one terminal screw for each branch circuit.

4. Ground: Copper, installed on panelboard frame, bonded to box with at least one terminal screw for each circuit.

5. Lugs and Connection Points:

   a. Suitable for either copper or aluminum conductors.

   b. Solderless main lugs for main, neutral, and ground bus bars.

   c. Subfeed or through-feed lugs as shown on the Contract Drawings.

6. Bolt together and rigidly support bus bars and connection straps on molded insulators.

7. Unless indicated otherwise, bus bars shall be rated for 225 Amps

I. Circuit Breakers:

1. Thermal-magnetic, quick-make, quick-break, molded case, of indicating type showing ON/OFF and TRIPPED positions of operating handle.

2. Non-interchangeable,

3. Locking: Provisions for handle padlocking, unless otherwise shown on the Drawings.

4. Bolt-on circuit breakers in all panelboards.

5. Multi-pole circuit breakers designed to automatically open all poles when an overload occurs on one pole.

6. Do not substitute single-pole circuit breakers with handle ties for multi-pole breakers.

7. Do not use tandem or dual circuit breakers in normal single-pole spaces.

8. Ground Fault Interrupter:

   a. Equip with conventional thermal-magnetic trip and ground fault sensor rated to trip in 0.025 second for a 5 mA ground fault (UL 943, Class A sensitivity).

   b. Sensor with same rating as circuit breaker and a push-to-test button.

J. Manufacturers:

1. 208/120 V Panelboards: As noted on the contract drawings.

2.6 CIRCUIT BREAKER, INDIVIDUAL, 0 TO 600 VOLTS

A. Minimum Interrupt Rating: 50,000 amps rms symmetrical at 600 volts.

B. Thermal-magnetic, quick-make, quick-break, indicating type, showing ON/OFF and TRIPPED indicating positions of operating handle.

C. Suitable for use with 90 degrees Celsius wire at full OESC, 90 degrees Celsius ampacity.

D. Locking: Provisions for padlocking handle.

E. Multi-pole breakers to automatically open all poles when an overload occurs on one pole.

F. Enclosure: NEMA Type as indicated in Part 3 of this Specification, unless otherwise shown on the Drawings.

G. Tool Defeatable Interlock: Enclosure and switch shall interlock to prevent opening cover with switch in the ON position.

H. Do not provide single-pole circuit breakers with handle ties where multi-pole circuit breakers are shown on the Drawings.

2.7 NON-FUSED SWITCH, INDIVIDUAL, 0 TO 600 VOLTS

A. NEMA KS 1.

B. Quick-make, quick-break, motor rated, load-break, heavy-duty (HD) type with external markings clearly indicating ON/OFF positions, and where indicated in the Contract Documents, complete with early break auxiliary contacts

C. Suitable for use with 90 degrees Celsius wire at full OESC, 90 degrees Celsius ampacity.

D. Unless indicated otherwise in the Contract Documents, enclosures shall be:

1. NEMA 12 minimum

2. NEMA 3R outdoors

E. Enclosure: NEMA Type as indicated in Part 3 of this Specification unless otherwise shown on the Drawings.

F. Interlock: Enclosure and switch to prevent opening cover with switch in the ON position.

2.8 SUPPORT AND FRAMING CHANNELS

A. Carbon Steel Framing Channel:

1. Material: Rolled, mild strip steel, 12-gauge, ASTM A1011/A1011M, Grade 33.

2. Finish: Hot-dip galvanized after fabrication.

B. Paint Coated Framing Channel: Carbon steel framing channel with electro-deposited rust inhibiting acrylic or epoxy paint.

C. PVC Coated Framing Channel: Carbon steel framing channel with 40-mil polyvinyl chloride coating.

D. Stainless Steel Framing Channel: Rolled, ASTM A167, Type 316 stainless steel, 12-gauge.

E. Extruded Aluminum Framing Channel:

1. Material: Extruded from Type 6063-T6 aluminum alloy.

2. Fittings fabricated from Alloy 5052-H32.

F. Nonmetallic Framing Channel:

1. Material: Fire retardent, fiber reinforced vinyl ester resin.

2. Channel fitting of same material as channel.

3. Nuts and bolts of long glass fiber reinforced polyurethane.

G. Manufacturers:

1. B-Line Systems, Inc.

2. Unistrut Corp.

3. Canstrut

2.9 NAMEPLATES

A. Material: Laminated plastic.

B. Attachment Screws: Stainless steel.

C. Color: White, engraved to a black core.

D. Engraving:

1. Pushbuttons/Selector Switches: Name of drive controlled on one, two, or three lines, as required.

2. Panelboards: Panelboard designation, service voltage, and phases.

2.10 LETTER HEIGHT:

A. Pushbuttons/Selector Switches: 3-mm.

B. Panelboards: 6-mm.

2.11 GENERATOR CONNECTION BOX/LOAD BANK CONNECTION BOX

A. Provide connection box as detailed on the drawings.

B. Enclosure and “Cam-Lock Connectors” shall match the rating of the load bank feeder breaker / MTS.

C. Outdoor connection boxes shall be weatherproof Type NEMA 3R. With in-use weatherproof rating while temporary load bank testing cables are connected.

PART 3. EXECUTION

3.1 GENERAL

A. Install equipment in accordance with the manufacturer’s recommendations.

B. Use appropriate conduit and conductor entry fittings with enclosures to maintain the specified enclosure environmental capability after installation.

C. Electrical Drawings indicate the general location and route to be followed by major raceways and electrical equipment arrangements. They do not show all structural, architectural and

mechanical details. In some cases, conduit or wiring is only shown diagrammatically on Drawings and may not detail exact or complete wiring or raceway requirements.

D. To provide sufficient detail and the maximum degree of clarity on the Drawings, symbols used for various electrical devices, particularly wall mounted devices, take up more space on Drawings than devices physically do. Locate devices with primary regard for convenience of operation and space utilization, rather than stringing devices out so as to comply with scaled locations of electrical symbols.

E. Mount devices on walls and columns near relevant equipment where practicable. At other locations, provide pedestals, supports, and backboards as required. Utilize Unistrut type supports to provide necessary framework for backboards. Backboards to be finished with corrosion-resistant gray paint and sized to suit application.

3.2 JUNCTION AND PULL BOXES

A. Install where shown on the Drawings and where necessary to terminate, tap-off, or redirect multiple conduit runs.

B. Install pull boxes where necessary in raceway system to facilitate conductor installation.

C. Install in conduit runs at least every 150 feet or after the equivalent of three right-angle bends.

D. Use outlet boxes as junction and pull boxes wherever possible and allowed by the OESC.

E. Use conduit bodies as junction and pull boxes where no splices are required and their use is allowed by applicable codes.

F. Installed boxes shall be accessible.

G. Do not install on finished surfaces.

H. Install plumb and level.

I. Support boxes independently of conduit by attachment to building structure or structural member.

J. Install bar hangers in frame construction or fasten boxes directly as follows:

1. Wood: Wood screws.

2. Concrete or Brick: Bolts and expansion shields.

3. Hollow Masonry Units: Toggle bolts.

4. Steelwork: Machine screws.

K. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.

L. Boxes embedded in concrete or masonry need not be additionally supported.

M. At or Below grade:

1. Install boxes for below grade conduit flush with finished grade in locations outside of paved areas, roadways, or walkways.

2. If adjacent structure is available, box may be mounted on structure surface just above finished grade in accessible but unobtrusive location.

3. Obtain the Contract Administrator's written acceptance prior to installation in paved areas, roadways, or walkways.

4. Use boxes and covers suitable to support anticipated weights.

N. Flush Mounted:

1. Install with concealed conduit.

2. Holes in surrounding surface shall be no larger than required to receive box.

3. Make edges of boxes flush with final surface.

O. Mounting Hardware:

1. Noncorrosive Dry Areas: Galvanized.

2. Noncorrosive Wet Areas: Stainless steel.

3. Corrosive Areas: Stainless steel.

P. Location/Type:

1. Finished, Indoor, Dry: NEMA Type 1.

2. Unfinished, Indoor, Dry: NEMA Type 12.

3. Unfinished, Indoor and Outdoor, Wet: NEMA Type 4.

a. Steel Raceway System: Cast metal.

b. Rigid Aluminum Raceway System: Cast aluminum.

4. Unfinished, Indoor and Outdoor, Wet and Corrosive: NEMA Type 4X.

a. PVC-Coated Rigid Galvanized Steel Raceway System: Nonmetallic.

b. Nonmetallic Raceway System: Nonmetallic.

5. Unfinished, Indoor and Outdoor, Wet, Dust, or Oil: NEMA Type 13.

a. Steel Raceway System: Cast metal.

b. Rigid Aluminum Raceway System: Cast aluminum.

6. Unfinished, Indoor and Outdoor, Hazardous: NEMA Type 7.

a. Steel Raceway System: Cast metal.

b. Rigid Aluminum Raceway System: Cast aluminum.

7. Underground Conduit: Concrete.

8. Corrosive Locations: NEMA Type 4X.

9. Outdoor Locations Where Indicated Weatherproof (WP): NEMA Type 3R, Outdoor.

10. Industrial Use in Areas Not Otherwise Classified: NEMA Type 12, unless otherwise shown on the Drawings.

3.3 TERMINAL JUNCTION BOX

A. Install in accordance with subsection 3.3, Junction and Pull Boxes.

B. Label each block and terminal with permanently attached, non-destructible tag.

C. Do not install on finished outdoor surfaces.

D. Location/Type:

1. Finished, Indoor, Dry: NEMA Type 1.

2. Unfinished, Indoor, Dry: NEMA Type 12.

3. Unfinished, Indoor and Outdoor, Wet: NEMA Type 3R.

4. Unfinished, Indoor and Outdoor, Wet and Corrosive: NEMA Type 4X.

5. Unfinished, Indoor and Outdoor, Wet, Dust, or Oil: NEMA Type 13.

3.4 LIGHTING AND POWER DISTRIBUTION PANELBOARD

A. Install securely, plumb, in-line and square with walls.

B. Install top of cabinet 1830 mm above floor, unless otherwise shown on the Drawings.

C. Provide typewritten circuit directory for each panelboard.

D. Cabinet Location/Type:

1. General Use in Finished Areas: NEMA Type 1.

2. Wet or Outdoor: NEMA Type 4X.

3. Industrial Use in Areas Not Otherwise Classified: NEMA Type 12, unless otherwise shown on the Drawings.

3.5 CIRCUIT BREAKER, FUSED SWITCH, AND NONFUSED SWITCH ENCLOSURES

A. Location/Type:

1. Wet: NEMA Type 4.

2. Corrosive: NEMA Type 4X.

3. Wet/Corrosive: NEMA Type 4X.

4. Industrial Use: NEMA Type 12.

5. General Purpose: NEMA Type 1.

6. Where Denoted WP: NEMA Type 3R.

3.6 SUPPORT AND FRAMING CHANNEL

A. Install where required for mounting and supporting electrical equipment and raceway systems.

B. Channel Type:

1. Interior, Wet or Dry (Noncorrosive) Locations:

a. Aluminum Raceway: Extruded aluminum.

b. PVC-Coated Conduit: PVC coated.

c. Steel Raceway and Other Systems Not Covered: Carbon steel or paint coated.

2. Interior, Corrosive (Wet or Dry) Locations:

a. Aluminum Raceway: Extruded aluminum.

b. PVC Conduit: Type 316 stainless steel or nonmetallic.

c. PVC-Coated Steel Conduit and Other Systems Not Covered: Type 316 stainless steel, nonmetallic, or PVC-coated steel.

3. Outdoor, Non-corrosive Locations:

a. Steel Raceway: Carbon steel or paint coated framing channel, except where mounted on aluminum handrail, then use aluminum framing channel.

b. Aluminum Raceway and Other Systems Not Covered: Aluminum framing channel.

4. Outdoor Corrosive Locations:

a. PVC Conduit: Type 316 stainless steel or nonmetallic.

b. Aluminum Raceway: Aluminum.

c. PVC-Coated Steel Conduit, and Other Systems Not Covered: Type 316 stainless steel, nonmetallic, or PVC coated steel.

5. Paint cut ends prior to installation with the following:

a. Carbon Steel Channel: Zinc-rich primer.

b. Painted Channel: Rust-inhibiting epoxy or acrylic paint.

c. Nonmetallic Channel: Epoxy resin sealer.

d. PVC-Coated Channel: PVC patch.

END OF SECTION

SECTION 16060 - GROUNDING

PART 1. GENERAL

1.1 GENERAL

A. Provide a complete grounding system for the modifications made to 600V distribution, 120/208V distribution systems.

B. Bond all non-current carrying metallic equipment to ground bus.

C. Provide bonding conductors for all distribution panel-boards, and electrical equipment. Unless indicated otherwise provide a dedicated ground/bond conductor for each distribution applications, sized in accordance with Table 16 of the Ontario Electrical Safety Code.

D. Provide a dedicated ground/bond conductor for each power distribution, raceway application sized in accordance with Table 16 of the Ontario Electrical Safety Code.

E. Provide a dedicated ground/bond conductor to suit each directly buried cable application sized in accordance with Table 16 of the Ontario Electrical Safety Code. Ground conductor to be buried adjacent to the current carrying conductors.

1.2 REFERENCES

A. CSA C22.2 No. 0.4 Bonding and Grounding of Electrical Equipment (Protective Grounding).

B. CSA C22.2 No. 41 Grounding and Bonding Equipment.

C. IEEE No. 80 IEEE Guide for Safety in AC Substation Grounding.

D. IEEE No. 837 IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

E. Section 16010 – General Electrical requirements.

1.3 SUBMITTALS

A. Refer to Section 01330 – Submittals.

B. Submit three certified copies of field test results.

PART 2. PRODUCTS

2.1 GROUND CONDUCTORS

A. Conductors: bare, stranded, soft annealed copper wire, size No. 4/0 AWG for ground bus, electrode interconnections, metal structures, gradient control mats, switchgear, motors, ground connections.

B. Conductors: PVC insulated coloured green, stranded soft annealed copper wire, size No. 4 AWG for grounding cable sheaths, raceways, pipe work, screen guards, switchboards.

C. Ground conductors in corrosive environments: Insulated or having tinned copper where in contact with aluminum or corrosive material, soil or atmosphere.

D. Grounding bus in electrical rooms where indicated in the Contract Documents: Copper, minimum 50mm by 8mm or as indicated in the Contract Documents.

2.2 CONNECTORS

A. Exothermic Weld Type:

1. Outdoor Weld: Suitable for exposure to elements or direct burial.

2. Indoor Weld: Utilize low-smoke, low-emission process.

3. Manufacturers:

a. Erico Products, Inc. - Cadweld and Cadweld Exolon.

b. Continental Industries Inc. - Thermoweld.

B. Compression Type:

1. Compress deforming type; wrought copper extrusion material.

2. Single indentation for conductors 6 AWG and smaller.

3. Double indentation with extended barrel for conductors 4 AWG and larger.

4. Barrels pre-filled with oxide-inhibiting and anti-seizing compound and sealed.

5. Manufacturers:

a. Burndy Corp.

b. Thomas and Betts Co.

c. Ilso Corp.

C. Mechanical Type: Split-bolt, saddle, or cone screw type; copper alloy material.

1. Manufacturers:

a. Burndy Corp.

b. Thomas and Betts Co.

2.3 GROUND RODS

A. Copper clad steel 19mm dia by 3.0m long

PART 3. EXECUTION

3.1 GENERAL

A. Interconnect conduits terminating in motor control centres with bare copper conductor. Connect to MCC ground bus.

B. Provide bonding wire on all cable trays.

C. Shielded Control Cables:

1. Ground shield to ground bus at power supply for analog signal.

2. Expose shield minimum 1 inch at termination to field instrument and apply heat shrink tube.

3. Do not ground instrumentation cable shield at more than one point.

3.2 WIRE CONNECTIONS

A. Ground Conductors: Install in conduit containing power conductors and control circuits above 50 volts.

B. Nonmetallic Raceways and Flexible Tubing: Install equipment grounding conductor connected at both ends to noncurrent carrying grounding bus.

C. Connect ground conductors to raceway grounding bushings.

D. Extend and connect ground conductors to ground bus in all equipment containing a ground bus.

E. Connect enclosure of equipment containing ground bus to that bus.

F. Bolt connections to equipment ground bus.

G. Bond grounding conductors to metallic enclosures at each end, and to intermediate metallic enclosures.

H. Junction Boxes: Furnish materials and connect to equipment grounding system with grounding clips mounted directly on box, or with 9.5 mm machine screws.

3.3 CONNECTIONS

A. General:

1. Above grade Connections: Install compression-type connectors

2. Below grade Connections: Install exothermic weld or if connections are accessible compression type connectors are permitted.

3. Remove paint, dirt, or other surface coverings at connection points to allow good metal to-metal contact.

4. Notify the Contract Administrator prior to backfilling ground connections.

B. Exothermic Weld Type:

1. Wire brush or file contact point to bare metal surface.

2. Use welding cartridges and molds in accordance with the manufacturer's recommendations.

3. Avoid using badly worn molds.

4. Mold to be completely filled with metal when making welds.

5. After completed welds have cooled, brush slag from weld area and thoroughly clean joint.

C. Compression Type:

1. Install in accordance with the connector manufacturer's recommendations.

2. Install connectors of proper size for grounding conductors and ground rods specified in the Contract Documents.

3. Install using the connector manufacturer's compression tool having proper sized dies.

D. Mechanical Type:

1. Apply homogeneous blend of colloidal copper and rust and corrosion inhibitor before making connection.

2. Install in accordance with the connector manufacturer's recommendations.

3. Do not conceal mechanical connections.

3.4 METAL STRUCTURE GROUNDING

A. Ground metal sheathing and exposed metal vertical structural elements to grounding system.

B. Bond electrical equipment supported by metal platforms to the platforms.

C. Provide electrical contact between metal frames and railings supporting pushbutton stations, receptacles, and instrument cabinets, and raceways carrying circuits to these devices.

3.5 EQUIPMENT GROUNDING

A. Install grounding connections to typical equipment included in, but not necessarily limited to the following. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, combustion exhaust stacks, starters, control panels, building steel work, generators, fuel tanks, distribution panels, outdoor lighting.

END OF SECTION

SECTION 16130 – RACEWAYS

PART 1. GENERAL

1.1 GENERAL CONDITIONS

A. Refer to all other Divisions of the Specifications and these documents to determine their effect upon the work of this section.

B. All sections of Divisions 1 to 16 inclusive form part of the Contract Documents. Refer to Section 16010 – Basic Electrical Requirements related to this work.

C. All mounting hardware shall be of non-corrosive type material including:

1. Stainless steels

2. Aluminum

3. PVC encapsulated metal

D. All conduit entries into building shall be sealed and water tight such that no water infiltrates the building via the conduit or via the penetration in the building or structure to suit the conduit entry.

1.2 SCOPE

A. All power cabling to be in conduit unless noted otherwise.

B. Supply and install all conduits, fittings, supports, hangers and miscellaneous support materials and hardware required for the complete systems in accordance with the applicable codes and regulations and as specified herein and on the drawings.

1.3 LOCATION OF CONDUIT

A. Drawings do not indicate all conduits, and supporting runs. Those indicated are in diagrammatic form only.

1.4 REFERENCES

A. The following is a list of standards which may be referenced in this Section:

1. Canadian Standards Association:

a. CSA C22.2 No. 45 Rigid Metal Conduit.

b. CSA C22.2 No. 56 Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

c. CSA C22.2 No. 211.2 Rigid PVC (Unplasticized) Conduit.

2. National Electrical Manufacturers Association (NEMA):

a. RN 1, Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

b. TC 2, Electrical Polyvinyl Chloride Plastic Tubing (PVC) and Conduit.

c. TC 3, PVC Fittings for Use with Rigid PVC Conduit and Tubing.

d. Electronic Industry Association (EIA) and Telecommunications Industry Association (TIA): 569-A, Commercial Building Standard for Telecommunications Pathways and Spaces.

1.5 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

a. Manufacturer's Literature:

i. Rigid galvanized steel conduit.

ii. Rigid aluminum conduit.

iii. PVC Schedule 40 conduit.

iv. PVC Schedule 80 conduit.

v. PVC-coated rigid galvanized steel conduit.

vi. Flexible, nonmetallic, liquid-tight conduit.

vii. Conduit fittings.

b. Conduit Layout:

i. Plan and section type, showing arrangement and location of conduit and duct bank required for:

1. Low and medium voltage feeder and branch circuits.

2. Empty conduit for future use.

3. Scale not greater than 1:200.

ii. Equipment and machinery proposed for bending metal conduit.

iii. Method for bending PVC conduit less than 30 degrees.

c. Cable Tray Systems:

i. Submit shop drawings sealed and signed by a professional engineer licensed in the Province of Ontario that cable trays support(s) and anchorage are designed to the requirements of post-disaster facility as per the Ontario Building Code Division B, Part 4, Article 4.1.8.17 for post-disaster structures.

ii. After installation a professional engineer licensed in the Province of Ontario shall complete a site review and then submit a letter, sealed

and signed, stating that the cable trays support(s) and anchorage are designed and installed to the requirements of post-disaster facility as per the Ontario Building Code Division B, Part 4, Article 4.1.8.17 for post-disaster structures.

iii. Dimensional drawings and descriptive information.

iv. CSA Load Class Designations.

v. Support span length and kilograms-per-metre actual and future cable loading at locations, with safety factor used.

vi. Layout drawings and list of accessories being provided.

2. Information Submittals: Submit copy of manufacturers' certification of training for PVC-coated rigid steel conduit installer.

1.6 QUALIFICATIONS

A. PVC-Coated, Rigid Steel Conduit Installer: Must be certified by the conduit manufacturer as having received a minimum of 2 hours of training on correct installation procedures.

PART 2. PRODUCTS

2.1 CONDUIT AND TUBING

A. Rigid Galvanized Steel Conduit (RGS):

1. Meet requirements of CSA C22.2 No. 45.

2. Material: Hot-dip galvanized, inside and outside, with chromated protective layer.

B. Rigid Aluminum Conduit:

1. Meet requirements of CSA C22.2 No. 45.

2. Material: Type 6063, copper-free aluminum alloy.

C. PVC Schedule 40 Conduit:

1. Meet requirements of CSA C22.2 No. 211.2 and NEMA TC 2.

2. Suitable for areas NOT exposed to physical damage, underground direct burial, concealed or direct sunlight exposure, and 90 degrees Celsius (C) insulated conductors.

D. PVC-Coated Rigid Galvanized Steel Conduit:

1. Meet requirements of NEMA RN 1.

2. Material:

a. Meet requirements of CSA C22.2 No. 45.

b. Exterior finish: PVC coating, 40 mils nominal thickness, bond to metal shall have tensile strength greater than PVC.

c. Interior finish: Urethane coating, 2 mils nominal thickness.

3. Threads: Hot-dipped galvanized and factory coated with urethane.

4. Bendable without damage to either interior or exterior coating.

E. Flexible, Nonmetallic, Liquid-Tight Conduit:

1. Material: PVC core with fused flexible PVC jacket.

2. Suitable for:

a. Dry Conditions: 80 degrees Celsius insulated conductors.

b. Wet Conditions: 60 degrees Celsius insulated conductors.

3. Manufacturers and Products:

a. Carlon; Carflex or X-Flex.

b. T & B; Xtraflex LTC or EFC.

2.2 FITTINGS

A. Rigid Galvanized Steel:

1. General:

a. Meet requirements of CSA C22.2 No. 45.

b. Type: Threaded, galvanized. Set screw and threadless compression fittings are not permitted.

2. Bushing:

a. Material: Malleable iron with integral insulated throat, rated for 150 degrees Celsius.

b. Manufacturers and Products:

i. Appleton; Series BU-I.

ii. O-Z/Gedney; Type HB.

3. Grounding Bushing:

a. Material: Malleable iron with integral insulated throat rated for 150 degrees Celsius, with solderless lugs.

b. Manufacturers and Products:

i. Appleton; Series GIB.

ii. O-Z/Gedney; Type HBLG.

4. Conduit Hub:

a. Material: Malleable iron with insulated throat with bonding screw.

b. CSA or ULc listed for use in wet locations.

c. Manufacturers and Products:

i. Appleton, Series HUB-B.

ii. O-Z/Gedney; Series CH.

5. Conduit Bodies:

a. Sized as required by CEC.

b. Manufacturers and Products (For Normal Conditions):

i. Appleton; Form 35 threaded unilets.

ii. Crouse-Hinds; Form 7 or 8 threaded condulets.

iii. Killark; Series O electrolets.

iv. Thomas & Betts; Form 7 or 8.

c. Manufacturers (For Hazardous Locations):

i. Appleton Electric Company.

ii. Crouse-Hinds.

iii. Hubbell Incorporated - Killark.

6. Couplings: As supplied by conduit manufacturer.

7. Unions:

a. Concrete tight, hot-dip galvanized, malleable iron.

b. Manufacturers and Products:

i. Appleton; Series SCC Bolt-On Coupling or Series EC Three-Piece Union.

ii. O.Z./Gedney; Type SSP split coupling or Type 4 Series, three-piece coupling.

c. Conduit Sealing Fitting Manufacturers and Products (For hazardous locations):

i. Appleton; Type EYF, EYM, or ESU.

ii. Crouse-Hinds; Type EYS or EZS.

iii. Killark; Type EY or EYS.

d. Drain Seal Manufacturers and Products:

i. Appleton; Type SF.

ii. Crouse-Hinds; Type EYD or EZD.

e. Drain/Breather Fitting Manufacturers and Products:

i. Appleton; Type ECDB.

ii. Crouse-Hinds; ECD.

8. Expansion Fitting Manufacturers and Products:

a. Deflection/Expansion Movement:

i. Appleton; Type DF.

ii. Crouse-Hinds; Type XD.

b. Expansion Movement Only:

i. Appleton; Type XJ.

ii. Crouse-Hinds; Type XJ.

9. Cable Sealing Fittings:

a. To form watertight nonslip cord or cable connection to conduit.

b. For Conductors With OD of 13 mm or Less: Neoprene bushing at connector entry.

c. Manufacturers and Products:

i. Appleton; CG-S.

ii. Crouse-Hinds; CGBS.

10. Rigid Aluminum Conduit:

a. General:

i. Meet the requirements of CSA C22.2 No. 45.

ii. Type: Threaded, copper-free. Set screw fittings are not permitted.

11. Insulated Bushing:

a. Material: Cast aluminum, with integral insulated throat, rated for 150 degrees Celsius.

b. Manufacturer and Product: O-Z/Gedney; Type AB.

12. Grounding Bushing:

    a. Material: Cast aluminum with integral insulated throat, rated for 150 degrees, with solderless lugs.

    b. Manufacturer and Product: O-Z/Gedney; Type ABLG.

13. Conduit Hub:

    a. Material: Cast aluminum, with insulated throat.

    b. UL listed for use in wet locations.

    c. Manufacturers and Products:

        i. O-Z/Gedney; Type CHA.

        ii. Thomas & Betts; Series 370AL.

14. Conduit Bodies:

    a. Manufacturers and Products (For Normal Conditions):

        i. Appleton; Form 85 threaded unilets.

        ii. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds); Mark 9 or Form 7-SA threaded condulets.

        iii. Killark; Series O electrolets.

    b. Manufacturers (For Hazardous Locations):

        i. Appleton Electric Company.

        ii. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds).

        iii. Hubbell Incorporated - Killark.

15. Couplings: As supplied by the conduit manufacturer.

16. Conduit Sealing Fitting Manufacturers and Products:

    a. Appleton; Type EYF-AL or EYM-AL.

    b. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds); Type EYS-SA or EZS-SA.

    c. Killark; Type EY or EYS.

    d. Drain Seal Manufacturers and Products:

        i. Appleton; Type EYDM-A.

ii. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds); Type EYD-SA or EZD-SA.

e. Drain/Breather Fitting Manufacturers and Products:

i. Appleton; Type ECDB.

ii. Cooper Ind. Canada Inc. Crouse-Hinds Div (Crouse-Hinds); ECD.

17. Cable Sealing Fittings: To form watertight nonslip cord or cable connection to conduit.

a. Bushing: Neoprene at connector entry.

18. PVC Conduit and Tubing:

a. Meet the requirements of NEMA TC-3.

b. Type: PVC, slip-on.

19. PVC-Coated Rigid Galvanized Steel Conduit:

a. Meet the requirements of NEMA RN 1.

b. Fittings: Rigid galvanized steel type, PVC coated by the conduit manufacturer.

c. Conduit Bodies: Cast metal hot-dipped galvanized or urethane finish. Cover shall be of same material as conduit body. PVC coated by the conduit manufacturer.

d. Finish: 40-mil PVC exterior, 2-mil urethane interior.

e. Overlapping pressure sealing sleeves.

f. Conduit Hangers, Attachments, and Accessories: PVC-coated.

20. Flexible, Nonmetallic, Liquid-Tight Conduit:

a. Type: High strength plastic body, complete with lock nut, O-ring, threaded ferrule, sealing ring, and compression nut.

b. Body/compression nut (gland) design to assure high mechanical pullout strength and watertight seal.

c. Manufacturers and Products:

d. Carlon; Type LT.

e. O-Z/Gedney; Type 4Q-P.

f. Thomas & Betts; Series 6300.

21. Watertight Entrance Seal Device:

a. New Construction:

i. Material: Oversized sleeve, malleable iron body with sealing ring, pressure ring, grommet seal, and pressure clamp.

ii. Manufacturer and Product: O-Z/Gedney; Type FSK or WSK, as required.

b. Cored-Hole Application:

i. Material: Assembled dual pressure disks, neoprene sealing ring, and membrane clamp.

ii. Manufacturer and Product:

4. O-Z/Gedney; Series CSM.

5. Linkseal

2.3 CABLE TRAYS

A. Meet requirements of CSA C22.2 No. 126.1

B. Type: Ladder, of welded construction. Ladder rung spacing: 300 mm.

C. Material: Copper free aluminum alloy 6063 T6 finish.

D. Dimensions: As indicated on the Drawings. Fittings are to have a minimum bending radius of 600 mm.

E. Cover Material: Copper free aluminum alloy 6063 T6 finish.

F. Barrier Strip: Vertical, solid type, with horizontal fittings and strip clamps.

G. Fittings of same cross-sectional tray area, and hardware of same material as cable tray.

H. Tray Grounding: Conform to Ontario Electrical Safety Code and CSA C22.2 No. 126.1

I. Provide next higher CSA C22.2 No. 126.1 class designation than required for support of designed span length.

J. Design Loads: Use working load adequate for actual cable installed plus 20 percent additional weight allowance for future cables, with safety factor of 2 in accordance with NEMA VE 1, Table 3 1.

K. Expansion Joints: NEMA VE 1 for 14 degrees Celsius maximum temperature variation.

L. Furnish Cable Tray with no sharp edges, burrs, or weld projections.

M. The Contractor shall provide cable trays support(s) and anchorage to meet requirements of the manufacturer's recommendations and the Ontario Building Code Division B, part 4, Article 4.1.8.17 for post-disaster structures.

N. Manufacturers:

1. Pilgrim Technical Products Ltd.

2. B-Line Systems, Inc.

3. Canstrut Inc.

4. Thomas and Betts Corporation - Electrotray.

5. Pursley Inc.

2.4 MULTI CABLE TRANSITS (MCT) -FIRESTOP

A. At all fire separation as indicated on drawings, provide Multi Cable Transits to seal cables at all cables passing through.

B. Provide type RGB-4 x 4 as used for buildings c/w all stay plates, modular blocks and MCT lubricant as supplied by Speedline Technologies - Electrovert.

C. Control, Data, and Fibre Cables will use self-sealing fire rate pathway such as STI EZ-path or Hilti Speed Sleeve for fire separations.

2.5 ACCESSORIES

A. Identification Devices:

1. Raceway Tags:

a. Material: Permanent, nylon or polyethylene.

b. Shape: Round.

c. Raceway Designation: Pressure stamped, embossed, or engraved.

d. Tags relying on adhesives or taped-on markers not permitted.

2. Wraparound Duct Band:

a. Material: Heat-shrinkable, cross-linked polyolefin, pre-coated with hot-melt adhesive.

b. 50 mm width (minimum).

c. Manufacturer and Product: Tyco Electronics - Raychem; Type TWDB.

PART 3. EXECUTION

3.1 GENERAL

A. Conduit and Tubing sizes shown on the Drawings are based on the use of copper conductors.

B. Diameter: Minimum 21 mm.

C. Crushed or deformed raceways not permitted.

D. Maintain raceway entirely free of obstructions and moisture.

E. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.

F. All enclosures, switches, receptacles, conduit systems, etc. in areas subject to hosedown/splashing shall be waterproof.

G. Aluminum Conduit: Do not install in direct contact with concrete. Install in PVC sleeve or cored hole through concrete walls and slabs.

H. Sealing Fittings: Provide drain seal in vertical raceways where condensate may collect above sealing fitting.

I. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.

J. Group raceways installed in same area.

K. Proximity to Heated Piping: Install raceways minimum 300 mm from parallel runs.

L. Follow structural surface contours when installing exposed raceways. Avoid obstruction of passageways.

M. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes.

N. Block Walls: Do not install raceways in same horizontal course with reinforcing steel.

O. Install watertight fittings in outdoor, underground, or wet locations.

P. Paint threads and cut ends, before assembly of fittings, galvanized conduit or PVC coated galvanized conduit, installed in exposed or damp locations with zinc-rich paint or liquid galvanizing compound.

Q. Remove burrs, ream and clean metal conduit, and clean before installation of conductors, wires, or cables.

R. Do not install raceways in concrete equipment pads, foundations, or beams.

S. Horizontal raceways installed under floor slabs shall lie completely under slab, with no part embedded within slab.

T. Unless otherwise indicated in the Contract Documents, install conduits surface-mounted on walls and ceilings. Conceal or embed conduits only where indicated in the Contract Documents.

U. Install concealed, embedded, and buried raceways so that they emerge at right angles to surface and have no curved portion exposed.

V. Provide drop over conduit protection for all floor mounted conduits.

3.2 CONDUIT APPLICATION

A. Diameter: Minimum 21 mm.

B. Exterior, Exposed:

1. Rigid PVC where allowed by the Ontario Building Code

2. Rigid Galvanized Steel.

C. Interior, Exposed:

1. Rigid Aluminum

D. Interior, Concealed (Not Embedded in Concrete):

1. Rigid Aluminum

E. Aboveground, Embedded in Concrete Walls, Ceilings, or Floors:

1. Rigid Aluminum

F. Under Slabs-On-Grade:

1. Rigid PVC

G. Corrosive Areas:

1. PVC Encapsulated Rigid Metal Conduit

H. Hazardous Areas (Interior and Exterior):

1. **P**VC Encapsulated Rigid Metal Conduit

I. Exterior, Below grade:

1. Rigid PVC, except for applications that require specific continuous conduits types as specified herein. Below grade conduit that transitions above grade to the outdoors shall be PVC Encapsulated Rigid Metal Conduit type.

3.3 CONNECTIONS

A. For motors, wall or ceiling mounted fans and unit heaters, dry type transformers, electrically operated valves, instrumentation, and other equipment where flexible connection is required to minimize vibration:

1. Conduit Size 103 mm or Less: Flexible, liquid-tight conduit.

2. Conduit Size Greater Than 103 mm: Nonflexible.

3. Wet or Corrosive Areas: Flexible, nonmetallic, liquid-tight.

4. Dry Areas: Flexible, metallic liquid-tight.

5. Length: 450 mm minimum, 1500 mm maximum, sufficient to allow for movement or adjustment of equipment.

B. Outdoor Areas, Process Areas Exposed to Moisture, and Areas Required to be Oiltight and Dust-Tight: Flexible non-metallic, liquid-tight conduit.

C. Under Equipment Mounting Pads: Rigid galvanized steel, PVC-coated rigid steel, PVC Schedule 80 conduit.

D. Exterior Light Pole Foundations: Rigid galvanized steel conduit.

3.4 NEW OPENINGS IN EXISTING CONCRETE

A. Make new holes in existing concrete for piping, conduit, cables, or equipment, using either method described below:

1. Chip with a hammer and chisel. Adjust the location of holes as necessary to avoid electrical conduits if encountered. Cut reinforcing steel after permission is received.

2. Core-drill holes after radiograph procedures are followed.

B. Radiograph the existing concrete in the area of each proposed hole for 3 diameters around the centreline of the proposed penetration. If no structural steel, piping or electrical conduits are found, core the hole. If structural steel, piping or electrical conduits are found, select an alternative location and radiograph it, until a suitable coring location is identified. Include up to three (3) sets of Radiographs in base price.

3.5 PENETRATIONS

A. Make at right angles, unless otherwise shown on the Drawings.

B. Notching or penetration of structural members, including footings and beams, not permitted.

C. Fire-Rated Walls, Floors, or Ceilings: Firestop openings around penetrations to maintain fire-resistance rating as specified in Section 07840 - Firestopping.

D. Apply single layer of wraparound duct band to all metallic conduit protruding through concrete floor slabs to a point 50 mm above and 50 mm below concrete surface.

E. Concrete Walls, Floors, or Ceilings (Aboveground): Provide nonshrink grout dry-pack, or use watertight seal device.

F. Entering Structures:

1. General: Seal raceway at the first box or outlet with oakum or expandable plastic compound to prevent the entrance of gases or liquids from one area to another.

2. Concrete Roof or Membrane Waterproofed Wall or Floor:

a. Provide a watertight seal.

b. Without Concrete Encasement: Install watertight entrance seal device on each side.

c. With Concrete Encasement: Install watertight entrance seal device on the accessible side.

d. Securely anchor malleable iron body of watertight entrance seal device into construction with one or more integral flanges.

e. Secure membrane waterproofing to watertight entrance seal device in a permanent, watertight manner.

3.6 SUPPORT

A. Support from structural members only, at intervals not exceeding Canadian Electrical Code requirements, and in any case not exceeding 3.0 metres. Do not support from piping, pipe supports, or other raceways.

B. Multiple Adjacent Raceways: Provide ceiling trapeze. For trapeze-supported conduit, allow 25 percent extra space for future conduit.

C. Application/Type of Conduit Strap:

1. Aluminum Conduit: Aluminum or stainless steel.

2. Rigid Steel or EMT Conduit: Zinc coated steel, pregalvanized steel or malleable iron.

3. PVC Coated Rigid Steel Conduit: PVC coated metal.

4. Nonmetallic Conduit: Nonmetallic or PVC coated metal.

D. Provide and attach wall brackets, strap hangers, or ceiling trapeze as follows:

1. Wood: Wood screws.

2. Hollow Masonry Units: Toggle bolts.

3. Concrete or Brick: Expansion shields, or threaded studs driven in by powder charge, with lock washers and nuts.

4. Steelwork: Machine screws.

5. Location/Type of Hardware:

a. Dry, Noncorrosive Areas: Galvanized.

b. Wet, Noncorrosive Areas: Stainless steel.

c. Corrosive Areas: Stainless steel.5

E. Nails or wooden plugs inserted in concrete or masonry for attaching raceway are not permitted. Do not weld raceways or pipe straps to steel structures. Do not use wire in lieu of straps or hangers.

F. Support aluminum conduit on concrete surfaces with stainless steel or nonmetallic spacers, or aluminum or nonmetallic framing channel.

3.7 BENDS

A. Install concealed raceways with a minimum of bends in the shortest practical distance.

B. Make bends and offsets of longest practical radius. Bends in conduits and ducts being installed for fiber optic cables shall be not less than 20 times the cable diameter, 375 mm, minimum.

C. Install with symmetrical bends or cast metal fittings.

D. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.

E. Make bends in parallel or banked runs from same center or centerline with same radius so that bends are parallel.

F. Factory elbows may be installed in parallel or banked raceways if there is change in plane of run, and raceways are same size.

G. PVC Conduit:

1. Bends 30-Degree and Larger: Provide factory-made elbows.

2. Use manufacturer's recommended method for forming smaller bends.

H. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.

3.8 EXPANSION/DEFLECTION FITTINGS

A. Provide on all raceways at all structural expansion joints, and in long tangential runs.

B. Provide expansion/deflection joints for 14 degrees Celsius maximum temperature variation.

C. Install in accordance with the manufacturer's instructions.

3.9 PVC CONDUIT

A. Solvent Welding:

1. Provide manufacturer recommended solvent; apply to all joints.

2. Install such that joint is watertight.

B. Adapters:

1. PVC to Metallic Fittings: PVC terminal type.

2. PVC to Rigid Metal Conduit: PVC female adapter.

C. Belled-End Conduit: Bevel the unbelled end of the joint prior to joining.

3.10 PVC-COATED RIGID STEEL CONDUIT

A. Install in accordance with the manufacturer's instructions.

B. All tools and equipment used in the cutting, bending, threading and installation of PVC-coated rigid steel conduit shall be designed to limit damage to the PVC coating.

C. Provide PVC boot to cover all exposed threading.

3.11 MULTI CABLE TRANSITS

A. Ensure that larger diameter cables are installed in lower levels and the smaller diameter on top.

B. Ensure all modular blocks be coated with MCT lubricant prior to cable being installed.

C. All spaces not enclosed with cables and modular blocks be sealed with filler blocks to ensure a completely sealed system.

D. For Data, Control and other low voltage cable ensure that there is 100% spare capacity at substantial completion to allow for future cabling to be installed.

3.12 TERMINATION AT ENCLOSURES

A. Cast Metal Enclosure: Provide manufacturer's premolded insulating sleeve inside metallic conduit terminating in threaded hubs.

B. Nonmetallic, Cabinets, and Enclosures: Terminate conduit in threaded conduit hubs, maintaining enclosure integrity.

C. Sheet Metal Boxes, Cabinets, and Enclosures:

1. Rigid Galvanized or Aluminum Conduit:

a. Provide one lock nut each on inside and outside of enclosure.

b. Install grounding bushing.

c. Provide bonding jumper from grounding bushing to equipment ground bus or ground pad; if neither ground bus nor pad exists, connect jumper to lag bolt attached to metal enclosure.

d. Install insulated bushing on ends of conduit where grounding is not required.

e. Provide insulated throat when conduit terminates in sheet metal boxes having threaded hubs.

f. Utilize sealing locknuts or threaded hubs on outside of NEMA 3R and NEMA 12 enclosures.

g. Terminate conduits at threaded conduit hubs at NEMA 4 and 4X boxes and enclosures.

2. Flexible, Nonmetallic Conduit: Provide nonmetallic, liquid-tight strain relief connectors.

3. PVC-Coated Rigid Galvanized Steel Conduit: Provide PVC-coated, liquid-tight, metallic connector.

4. PVC Schedule 40 Conduit: Provide PVC terminal adapter with lock nut.

D. Motor Control Center, Switchboard, Switchgear, and Free-Standing Enclosures:

1. Terminate metal conduit entering bottom with grounding bushing; provide a grounding jumper extending to equipment ground bus or grounding pad.

2. Terminate PVC conduit entering bottom with bell end fittings.

3.13 IDENTIFICATION DEVICES

A. Raceway Tags:

1. Identify origin and destination.

2. Install at each terminus, near midpoint, and at minimum intervals of every 15 metres of exposed raceway, whether in ceiling space or surface mounted.

3. Provide nylon strap for attachment.

3.14 PROTECTION OF INSTALLED WORK

A. Protect Products from the effects of moisture, corrosion, and physical damage during construction.

B. Provide and maintain manufactured watertight and dust-tight seals over all conduit openings during construction.

C. Touch up painted conduit threads after assembly to cover nicks or scars.

D. Touch up coating damage to PVC-coated conduit with patching compound approved by the manufacturer; compound shall be kept refrigerated according to the manufacturers' instructions until the time of use.

E. Provide drop over conduit protection for all floor mounted conduit.

END OF SECTION

SECTION 16180 – AUTOMATIC TRANSFER SWITCHES

PART 1. GENERAL

1.1 SCOPE

.1 Sections 16010 - Electrical General Conditions and 16050 - Basic Electrical Materials and Methods form part of this Section.

.2 A new ATS shall be supplied as a standalone unit with control wiring to the new standby generator.

.3 Related work:

.1 Section 16231 – Standby Diesel Generator

1.2 ACCEPTABLE MANUFACTURERS

.1 Thompson Technology, or

.2 ASCO Electric, or

.3 Eaton Corporation, or

1.3 CODES AND STANDARDS

.1 The automatic transfer switch and accessories shall conform to the requirements of:

.1 CSA C22.2 No. 178-1978 (R2001) Automatic Transfer Switches

.2 OESC Ontario Electric Safety Code

.3 CSA C22.2 No.5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE)

.4 UL 1008 - Standard for Automatic Transfer Switches

.5 NFPA 70 - National Electrical Code

.6 NFPA 110 - Emergency and Standby Power Systems

.7 CAN3-C13-M83(R1998), Instrument Transformers

.8 ANSI/NEMA ICS 2-2000, Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC

.9 IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

.10 NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches

.11 NEC Articles 700, 701, 702

.12 International Standards Organization ISO 9001

1.4 SYSTEM DESCRIPTION

.1 Automatic load transfer equipment to:

.1 Monitor voltage on phases of normal power supply.

.2 Initiate cranking of standby generator unit on normal power failure or abnormal voltage on any one phase below pre-set adjustable limits for

an adjustable period of time; time delay to be adjustable and initially set at 30 seconds.

.3 Transfer load from normal supply to standby unit when standby unit reaches rated frequency and voltage pre-set adjustable limits.

.4 Transfer load from standby unit to normal power supply when normal power restored, confirmed by sensing of voltage on phases above adjustable pre-set limit for adjustable time period.

.5 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.

.6 Allow for testing of the genset in both unloaded and loaded conditions.

1.5 SUBMITTALS

.1 Submit shop drawings and closeout documents in accordance with Division 1, General Requirements. Shop drawings shall be provided for any new components required to provide the additional monitoring outputs.

.2 Include:

.1 Make, model and type

.2 Single line diagram showing controls and relays

.3 Description of equipment operation including

.1 Automatic starting and transfer to standby unit and back to normal power.

.2 Test control.

.3 Manual control.

.4 Automatic shutdown.

.3 Operation and Maintenance Data

.1 Provide operation and maintenance data for automatic load transfer equipment for incorporation into manual.

.2 Detailed instructions to permit effective operation, maintenance and repair.

.3 Technical data:

.1 Schematic diagram of components, controls and relays

.2 Illustrated parts lists with parts catalogue numbers

.3 Certified copy of factory test results.

.4 Copy of reviewed shop drawings.

PART 2. PRODUCTS

2.1 RATINGS

.1 Automatic transfer switch rating: as detailed on contract drawings.

.2 The double throw transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a motor or single-solenoid mechanism, momentarily energized. Main operators which include overcurrent disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

.3 The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

.4 Dead front construction with access to relays and controls for inspection and maintenance, and manual operating lever for transfer switch

.5 Auxiliary contact: to initiate emergency generator start-up on failure of normal power

.6 Where neutral conductors must be switched, the ATS shall be provided with fully-rated neutral transfer contacts.

.7 Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated CU pressure connectors shall be provided.

2.2 CONTROLS

.1 Selector switch - four positions ("Test", "Auto", "Manual", "Engine start").

.1 Test position - Normal power failure simulated. Engine starts and transfer takes place. Return switch to "Auto" to stop engine.

.2 Auto position - Normal operation of transfer switch on failure of normal power; retransfers on return of normal voltage and shuts down engine.

.3 Manual position - Transfer switch may be operated by manual handle but transfer switch will not operate automatically and engine will not start.

.4 Engine start position - Engine starts but unit will not transfer unless normal power supply fails. Switch must be returned to "Auto" to stop engine.

.2 Control transformers: dry type with 120V secondary to isolate control circuits from:

.1 Normal power supply.

.2 Emergency power supply.

.3 Relays: NEMA rated heavy duty, continuous duty, industrial control type, with wiping action contacts rated 10 A minimum:

.1 Voltage sensing: 3 phase for normal power and on one phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2V minimum under voltage and over voltage protection.

.2 Time delay: normal power to standby, adjustable solid state, 0 to 5min.

.3 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 0 to 60s.

.4 Time delay on retransfer from standby to normal power, adjustable 0 to 30min.

.5 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state, 20s intervals to 10 min.

2.3 ACCESSORIES

.1 Pilot lights to indicate power availability normal and standby, switch position, green for normal, red for standby, mounted in panel.

.2 Auxiliary relay to provide 2 sets of Form C contacts for remote alarms.

2.4 ADDITIONAL FEATURES

.1 A set of gold-flashed contacts rated 10 amps, 32 VDC shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.

.2 Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which open to inhibit transfer to emergency and/or retransfer to normal.

.3 Two (2) Form C type auxiliary contacts, rated 10 amps, 250 VAC shall be provided for each position, when the ATS is connected to the normal source and when the ATS is connected to the emergency source.

.4 Indicating lights shall be provided, one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red). Also provide indicating lights for both normal and emergency source availability.

.5 Terminals shall be provided to indicate actual availability of the normal and emergency sources, as determined by the voltage sensing pickup and dropout settings for each source.

2.5 ENCLOSURE

.1 The ATS shall be furnished for installation as shown on the plans.

.2 Controller shall be flush-mounted display with LED indicators for switch position and source availability. It shall also include test and time delay bypass switches.

2.6 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in the form of a fastened lamacoid nameplate, black lettering on a white background of sufficient size to be easily legible from a meter away.

.2 Control panel:

.1 For selector switch and manual switch.

.2 For meters, indicating lights, minor controls.

.3 Refer to drawings for nameplate information.

PART 3. EXECUTION

3.1 INSTALLATION

.1 Locate, install and connect transfer equipment as per manufacturer’s recommendations.

.2 Check relays and solid state monitors and adjust as required.

.3 Install and connect battery.

.4 Provide interconnecting wiring with all distribution equipment as specified on the single line diagrams.

3.2 FACTORY TESTING

.1 The transfer switch shall be factory tested prior to delivery to the Site. The Contractor shall ensure that the following tests will be conducted by qualified factory personnel:

.1 Visual Inspection: Electrical and mechanical inspections to verify installed components are of correct ratings; meet the requirements of the Specifications and to ensure regulatory and quality requirements are met.

.2 Mechanical Tests: At a minimum, the following mechanical test shall be performed on the transfer switch,

.1 Power Conductor Torque Verification

.2 Verification of MTS Mechanical Interlock

.3 Manual ATS Mechanism Operation/Adjustment

.4 All Mechanical Fasteners Wire Connections Tight

.3 Electrical Tests: At a minimum, the following electrical tests shall be performed on the transfer switch,

.2 Verification of Electrical Interlock

.3 Mechanism Adjustment

.4 Dielectric Test

.5 Final Inspection: At a minimum, the following final inspection tasks shall be performed on the transfer switch,

.6 Calibration Label/Equipment labels Installed and Correct.

.7 All safety/warning labels attached.

.8 All wiring straight, nearly bundled and adequately protected.

.9 All options supplied as specified in the Specification.

.10 Enclosure is clean, no paint imperfections.

.11 Final documentation is enclosed (Drawing, O&M Manual).

3.3 SITE TESTING

.1 Refer to Section 01640 – Manufacturers' Services, Section 01650 – Equipment Startup and Performance Testing and Section 01660 –Commissioning.

.2 The transfer switch shall be tested once it has been installed at the Site to confirm proper operation of the system. Fourteen (14) days advance notice shall be provided to schedule witness testing. Witness testing activities shall be coordinated with the Contractor, Consultant and Township as required in advance of the testing. The Contractor shall ensure that qualified local factory-trained field service representatives will conduct the following tests:

.1 Visual Inspection: Electrical and mechanical inspection to verify the installation is correct as recommended by the transfer switch manufacturer and in accordance with OESC requirements.

.2 Mechanical Tests: At a minimum, the following mechanical tests shall be performed on the transfer switch,

.1 Power Conductor Torque Verification

.2 Verification of Mechanical Interlock

.3 MTS Mechanism Operation

.4 All Mechanical Fasteners/Wire Connections Tight

.5 Confirmation of correct transfer switch voltage, current and withstand ratings as required for the application.

.3 Functional Tests:

.1 Check voltage sensing and time delay relay settings.

.2 Check selector switch in modes of operation (Test, Auto, Manual, Engine Start) and record results.

.3 Energize transfer equipment from normal power supply.

.4 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position to ensure standby shuts down.

.5 Set selector switch in "Manual" position and check to ensure proper performance.

.6 Set selector switch in "Engine start" position and check to ensure proper performance. Return switch to "Auto" to stop engine.

.7 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 5 min, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown following cool down time delay.

.3 The Contractor shall ensure that the manufacturer provides certified copies of test reports to the Consultant. Reports shall also be included in the Operating and Maintenance Manuals.

3.4 SERVICE REPRESENTATION

.1 The ATS manufacturer shall maintain a national service organization of company-employed personnel. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.

3.5 WARRANTY:

.1 The manufacturer shall provide base warranty coverage on the material and workmanship of the ATS for a minimum of twenty-four (24) months from registered date of commissioning and start-up.

.2 The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc. during the minimum noted warranty period described above.

.3 The manufacturer of the ATS shall also have a national service organization that is available throughout Canada and is available on call 24 hours a day, 365 days a year.

3.6 TRAINING

.1 The Contractor shall provide five (5) training sessions (at the station site) for the Owner’s representatives. Allow for four (4) hours at the site for each training session. Training sessions shall be scheduled in coordination with the Owner and shall not be on consecutive days.

.2 The Contractor shall ensure that the training session will be conducted by a manufacturer’s qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers and major components within the assembly.

END OF SECTION

SECTION 16231 – STANDBY DIESEL GENERATORS

PART 1. GENERAL

1.1 SUMMARY

A. This specification outlines the requirements for the supply and installation of standby rated 120/208V, 347/600V generators, as specified in the drawings. The generator set will be installed in a weatherproof sound-attenuated skin-tight type enclosure and will meet requirements shown on the plans and drawings and as further specified herein.

B. The generator set engines shall be supplied with fuel tank with sufficient diesel fuel capacity to operate at 100% of nameplate capacity for (16) hours minimum. Provide additional accessories and options as detailed within this specification.

1.2 RELATED SECTIONS

A. Section 16180 – Automatic Transfer Switches

1.3 REFERENCES

A. The generator set shall comply with the latest edition of the applicable requirements of the associations:

B. Canadian Standards Association

C. Electrical Equipment Manufacturers' Association of Canada (EEMAC).

D. National Electrical Manufacturers Association (NEMA).

E. American National Standards Institute (ANSI).

F. Institute of Electrical and Electronic Engineers (IEEE).

G. American Society of Mechanical Engineers (ASME).

H. ASTM International (ASTM).

I. Society of Automotive Engineers (SAE).

J. Canadian General Specifications Board (CGSB).

K. International Standards Organization (ISO).

L. Ministry of Environment Standard Specification for diesel engine generator sets

1.4 SUBMITTALS

A. Shop drawing submittals shall include, but not be limited to:

1. General arrangement drawings including plans and sections.

2. Schematic wiring diagrams.

3. Mechanical Bill of Material and cut sheets.

4. Electrical Bill of Material and cut sheets.

5. Technical Report with modeling results demonstrating compliance of the generator and enclosure with the noise requirements in this specification.

6. Technical Report with modeling results demonstrating compliance of the generator with the air requirements in this specification

7. Refer to Division 1 General Requirements.

1.5 DATA SHALL BE PROVIDED FOR:

A. Air emissions.

B. Noise attenuation

C. Specification sheets showing standard and optional accessories supplied.

D. Dimensional information and weights.

E. Fuel consumption.

F. Spare parts provided by vendor.

G. Recommended spare parts to be purchased by customer.

1.6 OPERATING AND MAINTENANCE MANUALS

A. shall include but not be limited to:

1. Air emissions and noise attenuation data and reports.

2. Product data and instructional brochures.

3. Service manuals including maintenance instructions and troubleshooting chart.

4. Complete parts book that illustrates and lists all assemblies, sub-assemblies, and components.

5. Bills of Material.

6. Spare parts list.

7. Preventative maintenance instructions on the complete system that covers weekly, monthly, semi-annual and annual maintenance requirements, and includes a complete lubrication chart.

8. Show drawings, including drawings of walk-in enclosure, generator set, fuel tank, control panel diagrams and electrical schematics.

9. Certified Factory Test (FAT) Results.

10. Site Acceptance Test (SAT) Results.

11. Copy of Warranty.

12. Supplier's address and contact list.

1.7 TESTING

A. To provide assurance that the generator sets have been designed and built to the highest reliability and quality standards, the manufacturer shall be responsible for three separate tests, namely; design prototype tests, final production tests, and site tests.

B. Refer to Section 01640 - Manufacturers' Services, Section 01650 - Equipment Startup and Performance Testing, and Section 01660 – Commissioning.

C. Design Prototype Tests

1. Components of the standby power duty system such as the diesel engine/generator set and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes and pre-production models shall be subject to the following tests:

a. Maximum power (kW).

b. Maximum motor starting (kVA) at 35% instantaneous voltage dip.

c. Embedded thermocouple and/or resistance method to measure alternator temperature rise as per NEMA MG1-22.40.

d. Governor speed regulation under steady state and transient conditions.

e. Voltage regulation and generator transient response.

f. Harmonic analysis, voltage waveform deviation at no load, ¼ load, ½ load and full load conditions.

g. Alternator cooling air flow.

h. Torsional analysis to verify that the generator set is free of harmful torsional stresses.

i. Endurance testing.

1.8 FACTORY ACCEPTANCE TEST (FAT)

A. Each generator set shall be tested under varying loads with guards and exhaust system in place. When the generator is fully assembled at the supplier's facility, a witnessed test shall be arranged for the engineer and the City Staff to attend. Equipment supplier to provide all necessary diesel fuel. Tests shall include:

1. Single-step load pickup.

2. Transient and steady-state governing. Provide the following transient tests:

a. 0 to 100% rated load

b. 0 to 50% rated load

c. 0 to 25% rated load

d. Provide printed graphs of results.

e. Safety shutdown device testing.

f. Voltage regulation.

g. Rated Power at 0.8 PF.

h. Maximum Power.

3. The FAT shall include all of the above and a full load test at 100% of the generator capacity with a resistive load bank for a total of four (4) hours.

4. Copies of the certified test record shall be sent to the general contractor, the engineer and the City Staff prior to shipment to site.

5. All generator controls, and monitoring signals.

1.9 SITE ACCEPTANCE TEST (SAT)

A. The manufacturer's local representative shall perform an installation check, start-up and a 4-hour full load test with a resistive load bank.

B. The cost of fuel used for the initial fill, commissioning the engine and the 4-hour full load test including any additional or repeat tests shall be borne by the equipment supplier.

C. All tests recommended by the manufacturer shall be performed including the following:

1. Lubricating oil, engine coolant and fuel oil shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.

2. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include enclosure space heaters, engine block heaters, generator strip heaters, battery charger, remote control panel, etc.

3. Start-up under test mode to check for exhaust leaks, cooling air flow, movement during starting and stopping, engine and generator temperatures, vibration during running, normal and emergency line-to-line voltage and frequency, and phase rotation.

4. Automatic start-up by means of simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination.

5. The black start capability of the diesel engine driven generator set shall be demonstrated.

6. Generator supplier to provide a resistive load banks and perform a four (4) hour generator load test for each generator with the generator operating at 100% of the nameplate kW rating. The manufacturer’s representative shall complete a written log of the operating conditions. This test log shall be included in the hand-over package. The

following operating parameters shall be recorded every 15 minutes: Engine coolant temperature, lubricating oil pressure, and fuel oil temperature along with generator set voltage, amperes, and frequency.

1.10 WARRANTY

A. The manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months from registered date of commissioning and start-up.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc. during the minimum noted warranty period described above.

PART 2. PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The diesel engine driven generator shall be new and of the design/build of a current production model and shall have been tested during design verification, production and at the final job site.

B. The equipment supplied and installed shall meet the requirements of the Ontario Electrical Safety Code (OESC), the Technical Safety and Standards Association (TSSA) and all applicable local codes and regulations. All equipment/components must be CSA approved and be labelled accordingly. The generator supplier shall be ISO 9001 certified and be responsible for providing a complete and coordinated system including an electronic control package.

C. The bidder shall provide one source responsibility for manufacture, commissioning, warranty, and service through a local representative with factory-trained service personnel, who are able to provide on-site service within eight (8) hours.

2.2 ACCEPTABLE MANUFACTURERS

A. Cummins

B. Sommers Generator Systems

C. Kohler

D. Or Approved Equal.

1. Whenever an alternate is proposed, the Contractor shall guarantee that such proposed alternate will not adversely affect original intent of design and impact work of other divisions. Requests for approvals shall be accompanied by complete specifications for the equipment demonstrating full equivalency with basis of design. No substitutions or alternates will be allowed after tender close.

2. Equipment by alternate manufacturers shall meet or exceed all standards listed in this specification, operational performance, functionality, system integration, dimensional and weight requirements of the equipment specified in basis of design. Contractor understands and agrees to pay all additional costs incurred to integrate proposed alternate equipment as necessary for an equivalent installation. Acceptable alternates are as follows:

2.3 DESIGN CRITERIA

A. Deviations from this specification must be clearly outlined in a separate section of the bid.

B. The equipment shall be suitable to meet the following criteria:

1. Capacity: As mentioned in the drawings.

2. Voltage: As mentioned in the drawings.

3. Frequency: 60 Hz.

4. Interconnection: 3 Phase, 4 Wire.

5. Rated Power Factor: 0.8

6. Load Harmonic Content: 10% THD.

7. Duty Rating: Standby

8. Performance: Automatic –Standby Power.

9. Elevation Above Sea Level: 270 meters.

10. Ambient Temperature: -25°C to +40°C.

11. Relative Humidity: 80%.

2.4 ENGINE

A. The diesel engine shall deliver the required horsepower and torque to drive the generator at a governed speed of 1800 rpm. The engine shall be equipped with the following:

1. An electronic isochronous governor capable of ± 0.25% steady-state frequency regulation, at all loads from 0% to 100% of rating.

2. A 24 Volt positive engagement solenoid shift starting motor, of sufficient capacity to crank the engine at starting speed for three complete cranking cycles without overheating.

3. Automatic battery charging alternator with solid-state voltage regulation.

4. An engine driven, mechanical, positive displacement fuel pump and fuel filter(s) with replaceable spin-on canister element(s).

5. Fuel cooler, suitable for operation of the generator set at full rated load in the ambient temperature specified shall be provided for operation due to the design of the engine and the installation.

6. Flexible supply and return fuel lines.

7. Replaceable dry element air cleaner with restriction indicator.

8. Positive displacement, full pressure lubrication oil pump, oil cleaner, cartridge oil filters, dipstick, and oil drain.

9. Dry-type replaceable air cleaner elements for heavy-duty applications.

10. Liquid cooling system through a unit-mounted radiator, blower fan, water pump, and thermostats. This system shall properly cool the engine at full load conditions at an ambient temperature up to 40 degrees C.

11. Engine mounted, thermostatically controlled coolant heater(s) sized to maintain manufacturers recommended engine coolant temperature to meet the start-up and load pick-up requirements.

12. Vibration isolation provided between the engine-alternator and heavy-duty steel base. The engine manufacturer shall comment on alternative methods of attenuating vibration.

2.5 GENERATOR

A. The generator shall be brushless, 12-lead re-connectable, self-ventilated of drip-proof construction.

B. The insulation shall meet the NEMA standard (MG1-1.65) for Class H and be insulated with epoxy varnish to be fungus resistant per MIL 1-24092.

C. Temperature rise of the rotor and stator shall be limited to 125 °C at full load (MG1-22.40).

D. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within ± .25% at any constant load from 0% to 100% of rating.

E. The generator set shall meet the transient performance requirements of ISO 8528-5, level G3.

F. The alternator excitation shall be of a permanent magnet exciter design.

G. The generator shall be supplied with a 120V, 1 ph, strip heater to prevent the accumulation of moisture in the generator windings.

H. The generator shall be inherently capable of sustaining at least 300% of rated current for at least 10 seconds, under a 3-phase symmetrical short circuit without the addition of separate current support devices.

I. Two output circuit breakers (moulded case) – with full capacity set of lugs for generator feeder and local load bank connection for testing purposes.

2.6 FUEL SYSTEM

A. The engine shall be fuelled with No. 2 diesel and be supplied with a fuel tank approved by TSSA.

B. The fuel tank shall provide a minimum of 16 hours of fuel of operation at 100% load. Allow for 10% overfill and minimum capacity of 5% below the suction pipe.

C. The double-walled fuel tank shall be listed under ULC 142 Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids.

D. The tank shall bear a permanent nameplate indicating the standard used as a basis for design.

E. The double-walled fuel tank shall meet the requirements of CAN/CSA-B139-00 Installation Code for Oil Burning Equipment. The double-walled tank shall be approved by local authority having jurisdiction.

F. Engine shall have an engine-driven or electric fuel transfer pump capable of lifting fuel from the base tank. The fuel system shall include flexible fuel lines, inlet line dual fuel filter/water separators and electric solenoid shut-off valve.

G. Flexible fuel lines shall be rated a minimum of 300°F and 100 psi.

H. The fuel fill line shall be oriented towards the parking lot for fueling accessibility.

I. Provide fuel spillage containment at fueling point.

J. Provide mechanical fuel gauge near the fuel inlet of the generator tank, showing the amount of fuel present in the tank. Provide additional fuel gauge inside the enclosure.

K. Provide access for all electric cabling to engine controls incoming from below through fuel tank, without compromising tank and containment.

L. Tank shall be equipped with a level indicating transmitter (LIT) which shall generate a 4-20 mA signal to indicate fuel level. Provide terminal blocks in the generator control panel for connection to remote indication system.

M. Provide four level switches. Provide terminal blocks in the generator control panels as follows:

1. Low fuel level switch to shut off engine.

2. Low fuel level switch for low level alarm.

3. Level switch to indicate 50% tank level.

4. High level alarm.

N. Except as permitted in CSA B139.1.1, the fuel tank shall be located and operated so that the temperature of the oil in the tank will not exceed 38°C (100°F). Provide a fuel cooler and lightly coloured fuel tank as required to achieve the temperature limitation with regards to required clearance to adjacent building and property line.

2.7 STARTING SYSTEM

A. Batteries - A lead acid storage battery set of the heavy-duty diesel starting type of sufficient capacity to provide a minimum of five full cycle starts for ten seconds cranking with a ten second rest period between cranks. The battery shall be capable of delivering the manufacturer's recommended minimum cold-cranking Amps required at 0°F (-18°C), per SAE Standard J-537. Provide for adequate battery ventilation.

B. Battery Tray - A battery tray shall be provided for the batteries. It shall be constructed and so treated as to be resistant to deterioration by battery electrolyte. Further, construction shall be such that any spillage or boil-over of battery electrolyte shall be contained within the tray to prevent a direct path to ground. A separate tray shall be provided for each battery bank and placed on each side of the engine on all dual starter motor equipped units.

C. Battery Charger - A 120 VAC current limiting, automatic DC battery charger shall be furnished to automatically recharge the batteries. The charger shall be dual charge rate with automatic

switching to the increased rating when required. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppresser, DC ammeter, DC voltmeter, and have both AC and DC circuit breaker protection. The float and equalize rates of the charger shall be potentiometer adjustable in the field. The output current shall limit at 110% of full load and shall have ¼ of 1% regulation with a 10% AC line fluctuation. The enclosure shall be sealed and gasketed, drip-proof aluminium cabinet. Amperage output shall not be less than ten (10) amperes. The charger shall be mounted and hard wired within the generator set enclosure. The battery charger shall provide four (4) dry contacts for each of the following alarms: loss of AC, low DC volts, overvoltage, general alarm.

2.8 EXHAUST SYSTEM

A. Interior Silencer - A low profile, internally insulated exhaust silencer and flexible, stainless steel exhaust bellows properly sized shall be furnished and installed according to the manufacturer's recommendations by the enclosure manufacturer. The silencer shall be mounted, such that its weight is not supported by the engine. The exhaust system growth due to thermal expansion load shall not be imposed on the engine. Exhaust pipe sizes shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer. Insulation blankets shall be provided for the stainless steel flex and exhaust elbow assemblies located inside the enclosure.

B. Exhaust Outlet - Each silencer shall be fitted with a 90° elbow terminating in a vertical position and shall be fitted with a weighted rain cap.

C. Rain Skirt - At the point where the exhaust pipe penetrates the roof of the enclosure, a suitable "rain skirt" and collar shall be provided. It shall be designed to prevent the entrance of rain yet allow for expansion and vibration of the exhaust piping without chafing or stress to the exhaust system.

D. The exhaust silencer and its coupling shall be made of rust-resistant material.

2.9 OUTDOOR ENCLOSURE

A. The generator set shall be provided with an outdoor enclosure. The package shall comply with the requirements of the Ontario Electrical Safety Code for all wiring materials and component spacing. The total assembly of generator set, enclosure, and sub-base fuel tank shall be designed to be lifted into place using spreader bars.

B. Enclosure shall provide ample airflow for generator set operation at rated load in an ambient temperature of 100°F. The enclosure shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable and include retainers to hold the door open during service. Enclosure roof shall be designed to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.

C. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a powder coat paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. Provide touch up paint (minimum 500mL) with shipment of generator assembly.

D. Enclosure material shall be steel, minimum 12 gauge steel for framework and 14 gauge steel for panels. All enclosure hardware and hinges shall be stainless steel.

E. The entire enclosure except for the louvered openings shall have sound attenuation material mechanically attached to the interior surfaces of the unit. Sound absorbing material shall be held in place with a perforated mill finish galvanized liner that forms an easily removed section for maintenance. The sound attenuation material and fastening system shall apply to the enclosure roof as well as side panels and doors as required to limit sound emissions to 70dB(A) at a distance of 7 metres from the engine generator set.

F. A factory-mounted exhaust silencer shall be installed inside the enclosure and insulated as necessary to allow generator set to operate at rated load in the maximum specified ambient temperature. Exhaust connections to the generator set shall be through seamless flexible connections.

G. The enclosure shall include the following maintenance provisions:

1. Flexible coolant and lubricating oil drain lines, that extend to the exterior of the enclosure, with internal drain valves

2. External radiator fill provision.

H. Provide motorized louvers to minimize air flow through the enclosure when generator set is not operating. Louvers shall include provisions to prevent accumulation of ice or snow that might prevent operation.

I. Inlet ducts shall include rain hoods.

J. Provide a mounted and wired electrical distribution panel to serve the generator set and enclosure. The provisions required include:

1. 60-amp distribution panelboard connected to a 120/208VAC electrical service by the installer.

2. Two duplex GFI receptacles, one inside the enclosure, and a weatherproof receptacle on the outside of the enclosure.

3. Two three-way switches controlling AC lamps (LED) mounted in vapor tight and gasketed fixtures.

4. Normal AC service from the panelboard to the engine coolant and alternator heaters, and battery charger.

2.10 ENGINE CONTROLLER

A. Local Engine Controller

1. Provide a fully solid-state, microprocessor based generator set controller capable of performing all operating, monitoring, control and annunciating functions for the genset.

2. The set must be designed to meet the following Environmental conditions:

a. -40°C to +70°C operating temperature range.

b. 5-95% humidity, non-condensing.

3. The controller shall have a lighted display with a minimum of two lines of alphanumeric characters for messages and a sealed keypad for menu selection and data entry. For ease of use, an operating guide must be on the controller faceplate.

4. The electronic engine controller shall be mounted on the generator set and shall include the following operator control features:

   a. Operation mode (Auto/Off/Run)

   b. Programming

   c. Fault Reset

   d. Alarm horn silence pushbutton

   e. Lamp test pushbutton.

   f. Emergency Stop

2.11 GENERATOR SET AC OUTPUT METERING

A. The generator set shall be provided with a metering set including the following features and functions:

1. Analog voltmeter, ammeter, frequency meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Ammeter and KW meter scales shall be color coded in the following fashion:

   a. Readings from 0 - 90% of generator set standby rating: green

   b. Readings from 90 - 100% of standby rating: amber

   c. Readings in excess of 100%: red.

2. Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW hours, and power factor. Generator output voltage shall be available in line to line and line to neutral voltages, and shall display all three phase voltages (line to neutral or line to line) simultaneously.

2.12 WIRING AND CONNECTIONS

A. Wiring – Conduits, wire, cables, interconnections, etc., entering or exiting the generator enclosure shall be furnished and installed by the installing contractor. Wiring shall be copper Teck90 cabling sized in accordance with the Ontario Electrical Safety Code. Cable routing and raceways per design drawings. Control wiring shall be standard type THHN-THWN copper. Power and control wiring shall be installed for a complete and operating system.

B. Internal wiring – All the wiring inside the generator enclosure shall be done by the Generator supplier.

2.13 GENERTAOR SIZING CRITERIA

A. The generator shall be selected to accommodate the rated connected load in one step without exceeding 80% of rated capacity.

B. Voltage drop must not exceed 20%. Total harmonic distortions must be within acceptable limits for emergency power situation. Frequency dip shall not exceed 10%.

2.14 SPARES

A. Provide a standard set of engine manufacturer's spare parts. Include as a minimum:

1. Two fuel filter elements,

2. Two lubricating oil filter elements,

3. Two air cleaner elements.

PART 3. EXECUTION

3.1 INSTALLATION

A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL/ULC listed products.

B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

C. Equipment shall be installed on concrete housekeeping pad. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.

D. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as instructed by the manufacturer.

E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

F. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer's recommended practice.

3.2 TESTING

A. Provide testing in accordance with Section 1.9, Site Acceptance Testing.

B. Provide all fuel required for commissioning and testing at the site. Upon completion of testing and commissioning provide additional fuel as required to leave the tank at full capacity.

3.3 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

END OF SECTION

SECTION 16440 – DISCONNECT SWITCHES FUSED AND NON FUSED UP TO 600V

PART 1. GENERAL

1.1 DESCRIPTION

A. Provide disconnect switches for 347/600 volt and 120/208 volt distribution as indicated on the drawings.

PART 2. PRODUCTS

2.1 DISCONNECT SWITCHES

A. Ratings: 600 Volts for 347/600 volt distribution, 240 volts for 120/208 volt distribution. Unless otherwise shown, 3 pole for 3 phase, 3 wire distribution, 3 pole and solid neutral for 3 phase 4 wire distribution. Ampere ratings as shown on the drawings or to suit load requirements. For motors, use disconnect switches with HP ratings at least equal to motor HP.

B. Acceptable Manufacturers: Schneider Electric, Eaton Canada, Siemens.

C. Enclosures: As noted on drawings. NEMA 12 at a minimum.

D. Switch mechanisms: Quick make and quick break action with self wiping contacts, solderless pressure lug connectors. For switches 100 amperes and over, provide non-tracking arc shrouds. All switch poles to operate together from a common operating bar. Provide for padlocking disconnect switches in "Off" position. Doors to be interlocked and complete with defeat mechanism, to prevent opening when handle in ON position.

E. Neutral Bars: Where distribution system has grounded neutral conductor, provide neutral bar where required with ampere rating equal to switch rating, in enclosure. Provide ground bar for terminating ground conductors.

F. Fuse Holders: Provide fuse holders (relocatable and suitable without adapters) on load side of switches, ampere rating equal to switch ratings, suitable for fuses specified.

G. Auxiliary Contacts: Early break auxiliary contacts to be provided where required for interconnection with motor controls.

2.2 FUSES

A. All fuses to be 100,000 ampere (minimum) interrupting capacity of the current limited type. Provide one full set of spare fuses, three for each different ampere rating used, stored in suitable enclosure.

PART 3. EXECUTION

3.1 DISCONNECT SWITCHES

A. Mounting: Provide supports independent of conduits. Wall mount where possible, otherwise provide Unistrut frame support. Where switches are grouped mount in uniform arrangement.

B. Wiring: Connect line and load cable to all switches.

C. Fuse Rating: Install so that rating is visible.

D. Identification: Provide lamacoid plate in accordance with Section 16010 - Electrical General Requirements, on each switch showing voltage, source of supply and load being fed, for example:

1. Door Controller

2. 120/208 Volts

3. Fed from PPA

END OF SECTION

SECTION 16441 – LOW VOLTAGE PANELBOARDS

PART 1. GENERAL

1.1 DESCRIPTION

A. Labour, Products, equipment and services necessary for panelboard Work in accordance with the Contract Documents.

1.2 REFERENCES

A. ASTM A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

B. CSA C22.2 No. 29, Panelboards and Enclosed Panelboards.

1.3 SUBMITTALS

A. Product data:

1. Submit copies of manufacturer's Product data in accordance with Township requirement indicating:

a. Performance criteria, compliance with appropriate reference standard, characteristics, limitations.

b. Product transportation, storage, handling and installation requirements.

B. Shop drawings:

1. Submit shop drawings in accordance with Section 01330 – Submittals, and indicating:

a. Elevations, sections and details of components, dimensions, gauges, finishes and relationship to adjacent construction.

C. Other submittals:

1. Submit the following for incorporation into Operations and Maintenance Manuals, in accordance with Section 01330 – Submittals.

a. Identification: Manufacturing name, type, year, serial number, number of units, capacity and identification of related systems.

b. Functional description detailing operation and control of components.

c. Performance criteria and maintenance data.

d. Safety precautions.

e. Operating instructions and precautions.

f. Component parts availability including names and addresses of spare part suppliers.

g. Maintenance and troubleshooting guidelines/protocol and recommended equipment for analysis and repair.

h. Final tests and commissioning reports.

PART 2. PRODUCTS

2.1 MATERIALS

A. Steel sheet: ASTM A653, Z275 coating designation; galvanized steel sheet.

B. Expanding type metallic anchors: Cinch two-unit threaded anchorages.

C. Bolts: 10 mm diameter to suit anchors.

2.2 PANELBOARDS

A. Panelboards: To CSA C22.2 No. 29 and Canadian Electrical Code requirements, including barriers.

B. Panelboard interiors factory assembled, with bolt-on circuit breakers and designed for circuit breaker replacement without disturbing adjacent devices and without removing main bus connectors.

C. Panelboards with tin plated copper buses and connectors. 100% Neutral bus of ample length and capacity for connections and equipped with as many neutral terminals as branch circuit breakers and spaces on panelboard.

D. Connections with solderless lugs on main and neutral busbars and at circuit breaker load terminals.

E. Cabinets of steel sheet, thickness equal to code gauge for similar steel cabinets, fabricated in C form type style and having spot-welded seams.

F. Flush mounted enclosures in finished areas with galvanized steel painted trim and primed galvanized steel box.

G. Finish galvanized cabinets and trim in accordance in accordance with CSA, OESC, ESA and this Section.

H. Fabricate cardholder for circuit designation cards (panel circuit schedules), consisting of heavy white paper under transparent cover and mounted in suitable metal frame, supplied on back of each panel door.

I. Panelboard trims surface-mounted, with dimensions not greater than cabinet. Equip trims with doors mounted on heavy gauge stainless steel hinges. Fasten trims to cabinets with non-corroding clamps.

J. Panelboard door with latch and flush cylinder type lock operated with Corbin WEM-1 key. Supply one key for each lock. Doors in panelboard trims to provide access to circuit breaker handles but cover live parts.

K. Solidly bonded copper ground bus shall be provided.

2.3 CIRCUIT BREAKERS

A. Automatic fuseless moulded case toggle switch operated type with quick-make, quick-break action, bolted into panel assemblies of buses and connectors. Trip ratings as shown on Contract Drawings but not less than 10 kAIC.

B. One, two or three-pole, as required, equipped with thermal magnetic trip units having inverse time current characteristics. Two-pole and three-pole breakers to have common trip action between individual trip elements for each pole. Automatic tripping indicated by breaker handle assuming distinctive position from manual "on" and "off" positions.

C. Ground fault interrupter (GFI) type circuit breakers where required by OESC, ESA and shown on Contract Drawings.

D. Circuit breakers: Moulded Case Circuit Breakers; CSA C22.2 No. 5.

2.4 SUPPORT CHANNELS AND FASTENERS

A. Support channels: In accordance with Section 16010 – Electrical General Requirements.

B. Fasteners: As recommended by panelboard manufacturer for particular substrate.

2.5 IDENTIFICATION

A. Identify panelboards with nameplates.

2.6 CABINETS

A. Cabinets: Constructed from galvanized steel sheet, of thickness equal to code gauge for similar steel cabinets, fabricated by forming up and having spot-welded seams. NEMA rating as shown on the drawings.

B. Finish on cabinet and trim:

1. High quality metal prime coat to CAN/CGSB 1.81, Type 1, filler and body coats applied on inside and outside surfaces.

2. Finish coats: Alkyd base enamel conforming to CAN/CGSB 1.40 colour conforming to CGSB 1-GP-12c, Section 5, Code 501-211, Grey Semi-gloss, type 11. Dry and rub each enamel coat before following coat applied.

3. Cardholder for circuit designation cards, consisting of heavy white paper under transparent cover and mounted in suitable metal frame, supplied on back of each panel door.

2.7 TRIM

A. Trim: Galvanized steel sheet.

B. Panelboard trim: Of surface-mounted type, with dimensions not greater than cabinet. Equip trim with doors mounted on heavy-duty stainless-steel hinges. Each door with latch and flush cylinder type lock operated with Corbin WEM-1 key. Supply one key for each lock. Fasten trim to cabinets by means of approved non-corroding clamps.

PART 3. EXECUTION

3.1 INSTALLATION

A. Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

B. Where no mounting surface available, install steel supports for mounting of panelboard cabinets. Steel supports to be hot dipped galvanized drilled before galvanization, use cold zinc paint for touch-ups.

C. Install panelboards to support channels and steel supports in locations shown on Contract Drawings and in accordance with manufacturer's written instructions. Use minimum of 4 fasteners for each panel.

D. Make electrical connections, including grounding, as shown on Contract Drawings and as specified in Section 16060 - Grounding.

E. Panel circuit schedule:

1. After panelboards are phase balanced, fill in panel circuit schedule and insert it into cardholder provided on back of panel door. Type schedule and indicate which loads are fed by each circuit.

END OF SECTION

SECTION 16120 – WIRE AND CABLES 0-1000V

PART 1. GENERAL

1.1 REFERENCES

A. CSA C22.2 No. 131 Type TECK 90 Cables.

B. CSA C22.2 No. 38 Thermoset Insulated Wires and Cables.

C. CSA C68.3 Power Cables with Thermoset Insulation.

D. CSA C21.1 600 V Control Cable.

E. CSA C21.2 300 V Control Cable.

F. ICEA S-66-524.

G. All power cables must be CSA approved for application.

1.2 DESIGN REQUIREMENTS

A. Number and sizes of wires (and associated raceways) indicated are a guide only and are not necessarily the exact number and sizes required. Wire or cable sizes smaller than indicated are not acceptable.

B. No loose wiring or wire ends are accepted. Use manufacturer recommended connectors when installing cables. Use TECK cable connectors terminated in grounded steel plate for all TECK cable terminations. Grounding and attachment to unistrut not acceptable.

1.3 STORAGE

A. Cap or seal cable ends to prevent water penetration into cable. Reseal after cutting length of cable.

B. Cables stored with ends unsealed will be immediately removed from site at contractors cost. At no extra cost to the Township, replace cables to the satisfaction of the Contract Administrator.

PART 2. PRODUCTS

2.1 MANUFACTURED PRODUCTS

A. Comply with standards listed in 1.1, References.

B. Low Voltage Unarmoured Wire and Cable (1000 V and Below)

1. Construction: Stranded, annealed copper conductors, 600 V minimum rating for conductors #10 AWG and smaller and 1000 V rating for conductors larger than #10 AWG, RW90 cross-linked polyethylene (XLPE) insulation, suitable for handling at minus 40°C ambient, 90C maximum conductor temperature, limited flame spread FT4, jacketed.

2. Direct buried installations or installation in direct buried PVC conduit: Cross-linked polyethylene (XLPE), RWU90 insulation, 1000 V minimum rating, jacketed.

3. Standard: CSA C22.2 No. 38.

4. Minimum conductor sizes: Unless otherwise indicated, #12 AWG for power and current transformer circuits; #14 AWG for control circuits.

5. Multi-conductor cables: PVC flame retardant black jacket overall, suitable for handling at minus 40°C, flame test rated FT4.

6. Lighting wiring: GTF wire, 600 volt, 125°C, flexible copper conductor for connections between luminaire and outlet boxes.

7. Colour coding: For insulated conductors, conform to the following:

   a. 1-conductor power - Black (Phase Conductors)
      - White (Neutral)

   b. 1-conductor control - Red

   c. 2-conductor power - Black, White

   d. 3-conductor power - Red, Black, White (Neutral)
      - Red, Black, Blue

   e. 4-conductor power - Red, Black, Blue, White

   f. Multi conductor cables - Manufacturer's standard

8. Insulated ground conductors forming part of a multi-conductor cable assembly: Inspection Authority colour coding.

C. Low Voltage Armoured Wire and Cable (1000 V and Below)

1. Power cabling: TECK construction, 1000 Volts. non shielded, complete with inner jacket, aluminum armor, and outer jacket and suitable for installing in duct bank

   a. Approved cable manufacturer: Nexans, General Cables, Prysmian, Aetna

   b. Cable manufacturer to provide cable pulling plan for the cables in duct banks and cable trays.

2. VFD Cables between Variable Frequency Drives and relevant motor,

   a. Nexans Drive RX cables or approved equal.

3. Lighting and receptacle branch wiring in office areas: BX construction.

4. Minimum conductor size: Unless otherwise indicated, #12 AWG for power and current transformer circuits and #14 AWG for control circuits.

5. Grounding conductor: Stranded, soft, bare copper conductor in multiconductor cables, concentric copper wires over insulation in single conductor cable.

6. Multi-conductor cables: With inner jacket of suitable PVC (minus 40°C).

7. Interlocking armour: Flexible, galvanized steel or aluminum for multi-conductor cables and aluminum for single conductors, spirally wound over inner jacket.

8. Outer jacket: PVC (minus 40°C), flame-retardant, FT4 flame test rated, low acid gas evolution, black outer jacket extruded over the armour.

9. Colour coding: For insulated conductors, conform to the following:

   a. 1-conductor power - Black (Phase Conductors)

   b. 1-conductor control - Red

   c. 2-conductor cable - Black, White

   d. 3-conductor cable - Red, Black, White (Neutral)
   - Red, Black, Blue

   e. 4-conductor cable - Red, Black, Blue, White

   f. Multi conductor cables - Manufacturer's standard

D. Wiring Accessories

1. Wire markers: Plastic slip-on, black letters on white background. Cable markers: For cables or conductors greater than 13 mm diameter, strap-on type, semi rigid PVC carrier strip.

2. Terminal blocks: 600 V, 25 A minimum rating, modular, 35 mm DIN rail mounted, provision for circuit number labelling, individually removable, sized to accommodate conductor size and circuit current. Sak Series by Weidmuller Ltd., UK Series by Phoenix Terminal Blocks Ltd., WK Series by Wieland Electric Inc., Entrelec.

3. Field wiring terminations: Where screw-type terminal blocks are provided, supply insulated fork tongue terminals. Sta-Kon by Thomas & Betts Ltd., Scotchlok by 3M Canada Inc.

4. Splice connectors for equipment pig-tail, lighting and receptacle circuits: For wire sizes #12 and #10 AWG inclusive, twist-on compression spring type. Wing-Nut by Ideal., Marrette Type II by Marr Electric Ltd.

5. Moisture and waterproofing: In wet locations, with Liquid Tape by Ideal.

6. Equipment pig-tail power circuit connections: For wire sizes #8 AWG minimum, split-bolt type, sized to suit number and size of conductors. Low voltage (1000V and lower) motor terminations: heat shrinkable connection kit, including sleeves, caps and sealant. Cable ties: Nylon, one-piece, self-locking type, by Thomas & Betts Ltd., Burndy Inc., Wieland Electric Inc.

7. TECK cable connectors in wet or outdoor areas: Watertight type.

8. Cable pulling lubricant: Compatible with cable covering and not to cause damage or corrosion to conduits or ducts.

PART 3. EXECUTION

3.1 COORDINATION

A. Prior to installation of wiring, compare Contract Drawings with latest issue of Vendor shop drawings.

B. Report discrepancies promptly to Contract Administrator.

3.2 INSTALLATION

A. Provide wires of number and size (including corresponding raceways) required, with spare conductors as indicated. Provide adequate wiring for actual equipment installed.

B. Provide wire and cable according to the Drawings and electrical system requirements.

C. Pull cable into ducts, conduits and cable trays in accordance with cable manufacturer's recommendations. Use patented cable grips suitable for cable type, or pulling eyes fastened directly onto cable conductors.

D. Limiting pulling tension and minimum bending radii to those recommended by manufacturer.

E. Prevent damage to cable jackets by utilizing adequate lubricant when pulling cables through ducts and conduits.

F. Support cables in manholes and utility tunnels on cable trays or cable racks.

G. Arrange cables in parallel rows on cable trays. Maintain cable spacing by fastening cables, with “P” clips, every 2000 mm minimum on straight horizontal runs and to each rung at bends, including two rungs of adjoining straight sections. Fasten cables on vertical tray runs every 1000 mm maximum.

H. Connect cables to electrical boxes and equipment enclosures located in wet or sprinkled areas with watertight cable connectors.

I. Provide cable grips for vertical and catenary cable suspension installations to reduce cable tension at connectors and at cable bends.

J. Install through wiring in junction and pull boxes having no connection within the box. Leave 150 mm minimum of slack inside box.

K. Facilitate making of joints and connections by leaving sufficient slack in each conductor at panelboards, outlet boxes and other devices.

L. Do not connect more than three lighting circuits for three phase panels and two lighting circuits for single phase panels to a common neutral.

M. Use #10 AWG minimum for home runs to lighting panels exceeding 25 m.

N. Install instrumentation signal and thermocouple extension wires in separate raceways from power and control wiring.

O. Provide mechanical protection for cables within 1500 mm of the floor in buildings and within 2000 mm above grade outdoors.

P. Identify each cable by attaching a cable marker at each end, in all intermediate manholes, junction boxes and pull boxes.

Q. Provide cable grips on vertical and horizontal catenary cable suspensions.

3.3 WIRING TERMINATIONS

A. Insulate equipment pig-tail power circuit connections with wire sizes #8 AWG and larger, with heat shrink sleeving termination kits.

B. Terminate armoured cables with accepted connectors suitable for application, size and type of cable.

C. Except where pulling tensions exceed allowable cable limits or where tap connections are required, only install splices in power, control and instrumentation cable runs with written permission of Contract Administrator. Where unavoidable, install splices in junction boxes only.

D. Make power (1000 V and below), control and instrumentation wiring taps, splices and terminations in junction boxes with labelled terminal blocks, securely fastened to avoid loosening under vibration or normal strain. Terminate lighting circuits and 120 V convenience receptacle circuits with twist on or split-bolt type connectors and insulating tape.

E. Terminate control, signal and instrumentation circuit conductors, including spares, on terminal blocks. Label terminal blocks with unique alphanumeric designation or as indicated.

F. Identify each conductor, including spares, by wire markers at each termination. Indicate circuit designation or unique wire number. Identify spare conductors as 'SP1', 'SP2', etc.

3.4 INSPECTION AND TESTING

A. Follow all applicable NETA standards and procedures.

B. Cable and Wire - 1000 Volt and Below

1. Conduct insulation resistance measurements using a "Megger" (500 V instrument for circuit up to 350 V systems, 1000 V instrument for 351-600 V systems).

2. Record test results in a log book and submit to Contract Administrator for reference. Replace or repair circuits which do not meet Inspection Authority requirements. With equipment disconnected, measure insulation resistance of the following circuits:

a. Power, lighting, heater and motor feeders: Phase-to-phase, phase-to-ground.

b. Control circuits: To ground only.

3. Do not perform "Megger" tests on equipment containing solid-state components.

4. Disconnect power factor correction capacitors from system prior to testing.

3.5 WIRING IDENTIFICATION

A. Identify wiring including fibre optic cabling, with wire markers.

B. Colour code power, feeder and branch conductors at both ends with coloured plastic tapes. Tapes are not required where conductors are identified by jacket colour. Maintain phase and colour sequence throughout.

C. Identify each conductor, including spares, with a unique alphanumeric designation to facilitate troubleshooting and maintenance.

END OF SECTION

Last Plotted: 2024-01-08
Filename: \\NA.AECOMNET.COM\LFS\AMER\LONDON-CALON1\DCS\PROJECTS_BDL\60672834_CHAPLEAU_EMERG_BACKUPPWR\900_CAD_GIS\910_CAD\60672834-SHT-30-E0.1.DWG

Project Management Initials: Designer: _____ Checked: _____ Approved: _____ ANSI D 864mm x 559mm

DRAWING INDEX

DRAWING No.	DRAWING TITLE
GENERAL	
E0.1	COVER SHEET AND DRAWING INDEX
E0.2	LEGEND AND GENERAL NOTES
E0.3	TYPICAL DETAILS
CIVIC CENTRE	
E-1.1	ELECTRICAL SITE PLAN AND SCOPE OF WORK
E-1.2	FLOOR PLAN
E-1.3	SINGLE LINE DIAGRAM
RECREATION CENTRE	
E-2.1	ELECTRICAL SITE PLAN AND SCOPE OF WORK
E-2.2	FLOOR PLAN
E-2.3	SINGLE LINE DIAGRAM

ISSUED FOR TENDER JANUARY 09, 2024

TOWNSHIP OF CHAPLEAU STANDBY POWER
CIVIC CENTRE AND RECREATION CENTRE

CIVIC CENTRE - 20 PINE ST, CHAPLEAU, ON P0M 1K0

RECREATION CENTRE - 4 MAPLE ST, CHAPLEAU, ON P0M 1K0

Chapleau

AECOM

60672834

ELECTRICAL ABBREVIATIONS

1PH	SINGLE-PHASE
1P	1 POLE (2P,3P,4P, ETC.)
2/C	2 CONDUCTOR (3/C, 4/C, ETC.)
2W	2-WIRE (3W, 4W, ETC.)
3PH	THREE-PHASE
A	
AC	ALTERNATING CURRENT
A/C	AIR CONDITIONING
ACT	ACTUATOR
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
A,AMP	AMPERE
AODA	ACCESSIBILITY FOR ONTARIANS WITH DISABILITIES ACT
ASM	AMBIENT SENSING MICROPHONE
AUTO	AUTOMATIC
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
B	
BAC	BUILDING AUTOMATION CONTROL
BAT	BATTERY
BKR	BREAKER
C	
C	CONDUIT
CB	CIRCUIT BREAKER
cd	CANDELA
CL	CEILING
CU	COPPER
D	
DC	DIRECT CURRENT
DG	DIESEL GENERATOR
DM	DIGITAL METERING
DN	DOWN
DO	DOOR OPENERS
DS	DOOR SWITCH
E	
E	EXISTING DEVICE/EQUIPMENT TO REMAIN
E/R	EXISTING DEVICE/EQUIPMENT TO BE RELOCATED OR REPLACED (AS NOTED)
EC	EMPTY CONDUIT
EF	EXHAUST FAN
ELEC	ELECTRICAL
ELEV	ELEVATION
EXP	EXPLOSION PROOF
F	
FA	FIRE ALARM
FC	FAN CONTROL
FCP	FAN CONTROL PANEL
FU	FUSE
FPP	FIBER PATCH PANEL
G	
GEN	GENERATOR
GFI	GROUND FAULT INTERRUPTING
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
GRS	GALVANIZED RIGID STEEL
H	
HH	HAND HOLE
HT	HEIGHT
HTR	HEATER
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HZ	HERTZ
I	
INST	INSTANTANEOUS
J	
JB	JUNCTION BOX
K	
kA	KILO AMPERE
KAIC	KILO AMPERE INTERRUPTING CAPACITY
kcmil	THOUSAND CIRCULAR MILS
kV	KILO VOLTS
kVA	KILOVOLT-AMPERES
kVAR	KILOVOLT-AMPERES REACTIVE
L	
LP	LIGHTING PANEL
LS	LIGHT STANDARD
M	
MTG	MOUNTING
MTD	MOUNTED
N	
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN OR NUMBER
NTS	NOT TO SCALE
NCP	NETWORK CONTROL PANEL
O	
OBC	ONTARIO BUILDING CODE
OESC	ONTARIO ELECTRICAL SAFETY CODE
OL	OVERLOAD
P	
P	POLE
PH	PHASE
PL	PLUG LOAD
PR	PAIR
PVC	POLYVINYL CHLORIDE
Q	
QTY	QUANTITY
R	
R	EXISTING DEVICES/EQUIPMENT TO BE REMOVED
REC	RECEPTACLE
S	
SB	SOLAR LIGHT BOLLARD
SN	SOLID NEUTRAL
SW	SWITCH
T	
TL	TWIST LOCK
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
TW	TWISTED
TYP	TYPICAL
U	
UG	UNDERGROUND
ULC	UNDERWRITERS LABORATORIES OF CANADA
V	
V	VOLTS
W	
W	WIRE
WG	WIRE GUARD
WP	WEATHER PROOF
X	
XFMR	TRANSFORMER

LIGHTING

A #	CEILING MOUNTED LED FIXTURE. 'A' DENOTES TYPE, REFER TO SCHEDULE. '#' INDICATES CIRCUIT NUMBER
A #	CEILING MOUNTED LED FIXTURE. 'A' DENOTES TYPE, REFER TO SCHEDULE. '#' INDICATES CIRCUIT NUMBER
A #	BARE FLUORESCENT STRIP. 'A' DENOTES TYPE, REFER TO SCHEDULE. '#' INDICATES CIRCUIT NUMBER
A #	WALL MOUNTED LED FIXTURE. 'A' DENOTES TYPE. REFER TO SCHEDULE. '#' INDICATES CIRCUIT NUMBER
A #	WALL MOUNTED LIGHT FIXTURE. 'A' DENOTES TYPE, REFER TO SCHEDULE. '#' INDICATES CIRCUIT NUMBER
A #	STEP LIGHT. 'A' DENOTES TYPE, REFER TO SCHEDULE. '#' INDICATES CIRCUIT NUMBER
A #	CEILING MOUNTED LIGHT FIXTURE. 'A' DENOTES TYPE, REFER TO SCHEDULE. '#' INDICATES CIRCUIT NUMBER
WP #	WALL PACK OUTDOOR LIGHTING FIXTURE, 'WP' DENOTES TYPE, REFER TO SCHEDULE. '#' INDICATES CIRCUIT NUMBER
A A A	FIXTURE CONNECTED TO EMERGENCY LIGHTING CIRCUIT
A A A A A	POLE MOUNTED LIGHT FIXTURE STANDARD TYPE, SINGLE, DOUBLE, THREE AND FOUR HEADS. 'A' DENOTES TYPE , REFER TO SCHEDULE
PC PC	PHOTOCELL - CEILING, WALL MOUNTED
$XX	120V, 20AMP SINGLE POLE TOGGLE SWITCH. XX INDICATES THE FOLLOWING: 3 = 3 WAY SWITCH 4 = 4 WAY SWITCH F = FAN SWITCH K = KEY SWITCH L = LOW VOLTAGE SWITCH M = MASTER SWITCH P = PROJECTION SCREEN SWITCH T = TIMER SWITCH DIM = DIMMER MB = MOTORIZED BLINDS SWITCH OR = OVERRIDE 15 = 15 AMP EF = EXHAUST FAN SWITCH WITH RED PILOT LIGHT OS = OCCUPANCY SENSOR OSD = OCCUPANCY SENSOR WITH DIMMING WP = WEATHER PROOF
$ $ $	SWITCH - TWO, THREE & FOUR GANG
LC	LIGHTING CONTACTOR
	WALL MOUNTED EMERGENCY LIGHTING C/W SINGLE REMOTE HEAD CONNECTED TO EMERGENCY BATTERY UNIT AS INDICATED.
	WALL MOUNTED EMERGENCY LIGHTING C/W DOUBLE REMOTE HEADS CONNECTED TO EMERGENCY BATTERY UNIT AS INDICATED.
	EMERGENCY BATTERY UNIT C/W HEADS AS INDICATED
BU-1	EMERGENCY BATTERY UNIT C/W HEADS AS INDICATED & RECEPTACLE
	EMERGENCY BATTERY UNIT C/W HEADS AS INDICATED & RECEPTACLE & EXIT SIGN
	RECESSED CEILING MOUNTED EMERGENCY LUMINAIRES SINGLE REMOTE HEAD.
	EXIT SIGN, SINGLE FACE, WALL MOUNTED
	EXIT SIGN, SINGLE FACE, CEILING MOUNTED, C/W DIRECTIONAL ARROWS
	EXIT SIGN, DUAL FACE, WALL MOUNTED, C/W DIRECTIONAL ARROWS
	EXIT SIGN, DUAL FACE, CEILING MOUNTED, C/W DIRECTIONAL ARROWS
	CEILING MOUNTED EXIT LIGHT SIGN, WITH EMERGENCY HEADS. ARROWS DENOTE DIRECTION

DIGITAL LIGHTING CONTROL

$XX	DIGITAL MANUAL SWITCH. XX INDICATES THE FOLLOWING: D = DIGITAL MANUAL SWITCH DDIM = DIGITAL MANUAL DIMMING SWITCH S = DIGITAL MANUAL SCENE SWITCH
$D	WALL MOUNTED DIGITAL SWITCH AND OCCUPANCY SENSOR
$DIM	WALL MOUNTED DIGITAL DIMMING SWITCH AND OCCUPANCY SENSOR
LC LO	C INDICATES - CLOSED LOOP SINGLE ZONE DIGITAL PHOTOSENSOR O INDICATES - OPEN LOOP SINGLE ZONE DIGITAL PHOTOSENSOR
PL2	DIGITAL LIGHT MANAGEMENT PLUG LOAD CONTROLLER, 2 = TWO RELAY CIRCUITS
RC3-1 D	DIGITAL LIGHTING ROOM CONTROLLER RC1 = 1 RELAY CIRCUITS RC2 = 2 RELAY CIRCUITS RC3 = 3 RELAY CIRCUITS D = DIMMING CAPABILITY
OSx OSx	WALL, CEILING MOUNTED OCCUPANCY SENSOR. X INDICATES: D = DUAL TECHNOLOGY DIGITAL OCCUPANCY SENSOR IR = INFRARED SENSOR US = ULTRASONIC
ZC	DIGITAL LIGHT MANAGEMENT ZONE CONTROLLER PANEL

LIGHTNING PROTECTION & GROUNDING

OR G	20mm X 3000mm GROUND ELECTRODE
	GROUND ROD IN TEST WELL
	GROUND ROD W/C INSPECTION WELL
G	GROUNDING CONDUCTOR, SIZE AS INDICATED
	GROUNDING CONNECTION (TYPE AS SHOWN OR NOTED)
	GROUND BONDING POINT TO STEEL STRUCTURE, REBAR, PIPE, ETC.
	GROUND BAR
NGR	NEUTRAL GROUNDING RESISTOR
	DOWNLEAD CONDUCTOR
	LIGHTNING TERMINAL

POWER

A A	PANELS, RECESSED OR SURFACE MOUNTED. 'A' DENOTES PANEL NAME.
	CONNECTION TO EQUIPMENT AS NOTED C/W DISCONNECT SWITCH
	DIRECT CONNECTION TO EQUIPMENT
	THREE PHASE DIRECT CONNECTION TO EQUIPMENT
	DISCONNECT SWITCH
	COMBINATION MAGNETIC LOOSE STARTER
F	FUSED DISCONNECT
	COMBINATION MAGNETIC STARTER
	MANUAL STARTER
	LOOSE MOTOR STARTER
M	1-PHASE MOTOR CONNECTION
M	3-PHASE MOTOR CONNECTION
DO	ELECTRIC DOOR OPERATOR PUSHBUTTON
JB	JUNCTION BOX
JB	ARROW INDICATES CONDUIT & WIRING "HOME RUN". REFER TO SINGLE LINE OR SCHEMATIC
PB	PULL BOX
XX	15A, 120V, DUPLEX RECEPTACLE (CSA 5-15R) OR AS NOTED. XX INDICATES THE FOLLOWING: A ABOVE COUNTER TOP AC HVAC CONTROL CONNECTION ABOVE CEILING DW DISHWASHER M MICROWAVE MB MOTORIZED BLIND (HEIGHT TO BE CONFIRMED WITH THE BLINDS CONTRACTOR) P PRINTER REF REFRIGERATOR TV TELEVISION V VENDING XP EXPLOSION PROOF
XX	20A, 120V, GROUND FAULT INTERRUPTING DUPLEX RECEPTACLE (CSA 5-15R) OR AS NOTED. XX INDICATES THE FOLLOWING WP WEATHER PROOF EEMAC TYPE 4 ENCLOSURE
20	20A, 120V, DUPLEX RECEPTACLE (CSA 5-20R)
	240V RECEPTACLE
	15A, 120V, DUPLEX RECEPTACLE, SPLIT CIRCUIT (CSA 5-15R) OR AS NOTED
	15A, 120V, QUAD RECEPTACLE (2X CSA 5-15R) OR AS NOTED
	WALL MOUNTED SINGLE RECEPTACLE. AMPS, VOLTS AND CSA CONFIGURATION AS NOTED
CLNG	CEILING MOUNTED DUPLEX RECEPTACLE
	FLOOR MOUNTED QUAD RECEPTACLE
	FLOOR MOUNTED DUPLEX RECEPTACLE
	FLOOR MOUNTED DUPLEX RECEPTACLE
	WALL FEED FOR POWER AND COMMUNICATIONS TO SYSTEM FURNITURE
	RACEWAY COMPUTER RECEPTACLE
	RECEPTACLE IN 3 COMPARTMENTS RACEWAYS
	BASEBOARD OR FAN-FORCED WALL HEATER
T	THERMOSTAT
	DIGITAL CLOCK
	DIGITAL CLOCKS (BACK TO BACK)
HP	HYDRO POLE
	MANHOLE
HH	HANDHOLE. PROVIDE Oldcastle FRP 1324Flare (600mmH x 584mmW x 346mmD) OR APPROVED EQUAL
	HYDRO UTILITY METER
	UNDERGROUND CONDUIT
	TRANSFORMER

TV / COMMUNICATION

	TELEPHONE OUTLET - WALL, FLOOR, CEILING MOUNTED. PROVIDE 27mmC (1"C) FROM WALL 1G OUTLET BACKBOX TO ACCESSIBLE CEILING SPACE UNLESS OTHERWISE NOTED.
	DATA OUTLET - WALL, FLOOR, CEILING MOUNTED. PROVIDE 27mm C (1"C) FROM WALL 1G OUTLET BACKBOX TO ACCESSIBLE CEILING SPACE UNLESS OTHERWISE NOTED.
	DATA / TELEPHONE OUTLET - WALL, FLOOR, CEILING MOUNTED. PROVIDE 27mm C (1"C) FROM WALL 1G ANG OUTLET BACKBOX TO ACCESSIBLE CEILING SPACE UNLESS OTHERWISE NOTED.
	CABLE TELEVISION OUTLET
	TELECOMMUNICATION CABLING TRAY
	TELECOMMUNICATION CABLING 'J-HOOKS' (INSTALLED AT MAXIMUM 1220mm O/C)

SECURITY

	SURVEILLANCE CAMERA (PTZ = PAN TILT ZOOM)
	PTZ CCTV CAMERA
SWITCH	ETHERNET SWITCH
KP	KEY PAD
CR	CARD READER
DC	DOOR CONTACT
ES	ELECTRIC STRIKE
IC	INTERCOM UNIT
C	CONTACTOR
MD	MOTION DETECTOR
TS	24HR, 7-DAY ELECTRONIC TIME SWITCH, 20A, 120V
WAP	WIRELESS ACCESS POINT
S S	PUBLIC ADDRESS SPEAKER - CEILING, WALL MOUNTED

SINGLE LINE DIAGRAM

	FUSE
	FUSED DISCONNECT
	DISCONNECT SWITCH
	CIRCUIT BREAKER
	DRAW-OUT CIRCUIT BREAKER
	TRANSFORMER
	PT - POTENTIAL TRANSFORMER
	CT - CURRENT TRANSFORMER
	GROUND CONNECTION
XXX	PANEL BOARD / TRANSFER SWITCH
G	GENERATOR
AS VS	AMMETER & VOLTMETER SWITCHES
K E M	INTERLOCK: E = ELECTRIC INTERLOCK K = KIRK KEY INTERLOCK M = MECHANICAL INTERLOCK
M	UTILITY METER

FIRE ALARM

THIS IS A STANDARD LEGEND. NOT ALL DEVICES MAY APPEAR ON THE DRAWINGS. MTG HTG AS SHOWN UNLESS OTHERWISE NOTED.

		MTG HT.
	MANUAL PULL STATION	1200
	FIRE ALARM BELL	
	FIRE ALARM HORN	2300
	FIRE ALARM STROBE	2300
	FIRE ALARM HORN/STROBE	2300
	FIRE ALARM SPEAKER	
	FIRE ALARM COMBINATION SPEAKER / STROBE	
	SMOKE DETECTOR	
m	SMOKE DETECTOR - DUCT TYPE	
	SMOKE DETECTOR - BEAM TYPE	
	HEAT DETECTOR - 135°F RATE OF RISE TEMPERATURE TYPE	
	HEAT DETECTOR - 190°F FIXED TEMPERATURE TYPE	
	HEAT DETECTOR - 285°F RATE OF RISE TEMPERATURE TYPE	
FACP	FIRE ALARM CONTROL PANEL	
ANNUN	REMOTE FIRE ALARM ANNUNCIATOR PANEL	
SV	SPRINKLER SYSTEM SUPERVISED VALVE	
FS	SPRINKLER SYSTEM FLOW OR PRESSURE SWITCH AS NOTED	
SD	SMOKE DAMPER	

COMMON SYMBOLS

	EQUIPMENT OR DEVICE AS NOTED
BBB CCCC	INSTRUMENTATION TAG, (SEE INSTRUMENTATION LEGEND FOR IDENTIFICATION TABLE)
1 & 1 & 1	ELECTRICAL NOTE TAGS
3 E03	DETAIL No.3 ON DRAWING E03

SITE SERVICE

TC TC	TELECOM
IT IT	DATA
O/H O/H	OVER HEAD UTILITY POWER FEED
PWR-600V PWR-600V	600V POWER FEED
PWR-120V PWR-120V	120V POWER FEED
PWR-347V PWR-347V	347V POWER FEED
PWR-PF PWR-PF	TRANSFORMER PRIMARY FEED
PWR-SF PWR-SF	TRANSFORMER SECONDARY FEED
120V-CTRL 120V-CTRL	120V CONTROL WIRING

GENERAL NOTES

1. CONFORM TO THE ONTARIO BUILDING CODE (OBC), NATIONAL BUILDING CODE (NBC), AND CANADIAN STANDARDS ASSOCIATION (CSA) FOR MATERIAL AND OTHER REGULATORY AGENCIES THAT MAY AFFECT THE WORK.
2. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED IN THE FIELD. REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
3. THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE SITE CONDITIONS AND ASSUME RESPONSIBILITY FOR EXISTING SERVICES (WATER, POWER, SEWAGE, GAS, ETC.) THAT POTENTIALLY EXIST AT SITE.
4. ANY DAMAGE DONE TO THE EXISTING STRUCTURE DURING REMOVALS OR RECONSTRUCTION SHALL BE REPAIRED TO THE SATISFACTION OF THE OWNER.
5. PROVIDE ALL NECESSARY SHORING AND SUPPORT FOR EXISTING BUILDING AND PROTECTION FOR SAFE COMPLETION OF THE WORK.
6. MAKE GOOD ALL SURFACES AFFECTED BY WORK TO MATCH EXISTING ADJACENT SURFACES.
7. UPON COMPLETION OF EARTHWORKS, RETURN SOIL TO ITS ORIGINAL CONDITION OR BETTER.

GENERATOR INSTALLATION NOTES

1. GENERATOR INSTALLATION SHALL BE ACCORDING TO THE LATEST EDITION OF CSA B149.1.
2. ALLOW SUFFICIENT ROOM ON ALL SIDES OF THE GENERATOR FOR MAINTENANCE AND SERVICING.
3. GENERATOR ORIENTATION AND LAYOUT SHALL ALLOW FOR SUFFICIENT INTAKE OF AIR AND EXHAUST OF GASES.
4. BOTTOM OF GENERATOR SET MUST BE ENCLOSED TO PREVENT PEST INTRUSION AND RECIRCULATION OF EXHAUST DISCHARGE AIR AND EXHAUST GASES.
5. PRIOR TO START OF WORK, COORDINATE AND CONFIRM WITH MANUFACTURER INSTALLATION DETAILS INCLUDING BOLTS AND STUDS USED TO MOUNT UNIT TO PAD, TORQUE SETTINGS, ETC., AND MAKE ALL PROVISIONS FOR A COMPLETE INSTALLATION PER CODES AND MANUFACTURER RECOMMENDATIONS.
6. PROVIDE PROTECTION BOLLARDS NOT BLOCKING GENSET DOOR SWING.
7. CATALYST COOLING CHIMNEY MUST BE UNOBSTRUCTED. MINIMUM 1FT CLEARANCE FROM TOP OF CHIMNEY TO ANY ITEM.

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PROJECT

TOWNSHIP OF CHAPLEAU STANDBY POWER - CIVIC CENTRE AND RECREATION CENTRE

CLIENT

TOWNSHIP OF CHAPLEAU
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REGISTRATION

ISSUE/REVISION

I/R	DATE	DESCRIPTION
1	2024/01/09	ISSUED FOR TENDER
0	2023/11/27	ISSUED FOR 75% REVIEW

PROJECT NUMBER

60672834

SHEET TITLE

ELECTRICAL — SERIES 000

LEGEND AND GENERAL NOTES

SHEET NUMBER

E0.2

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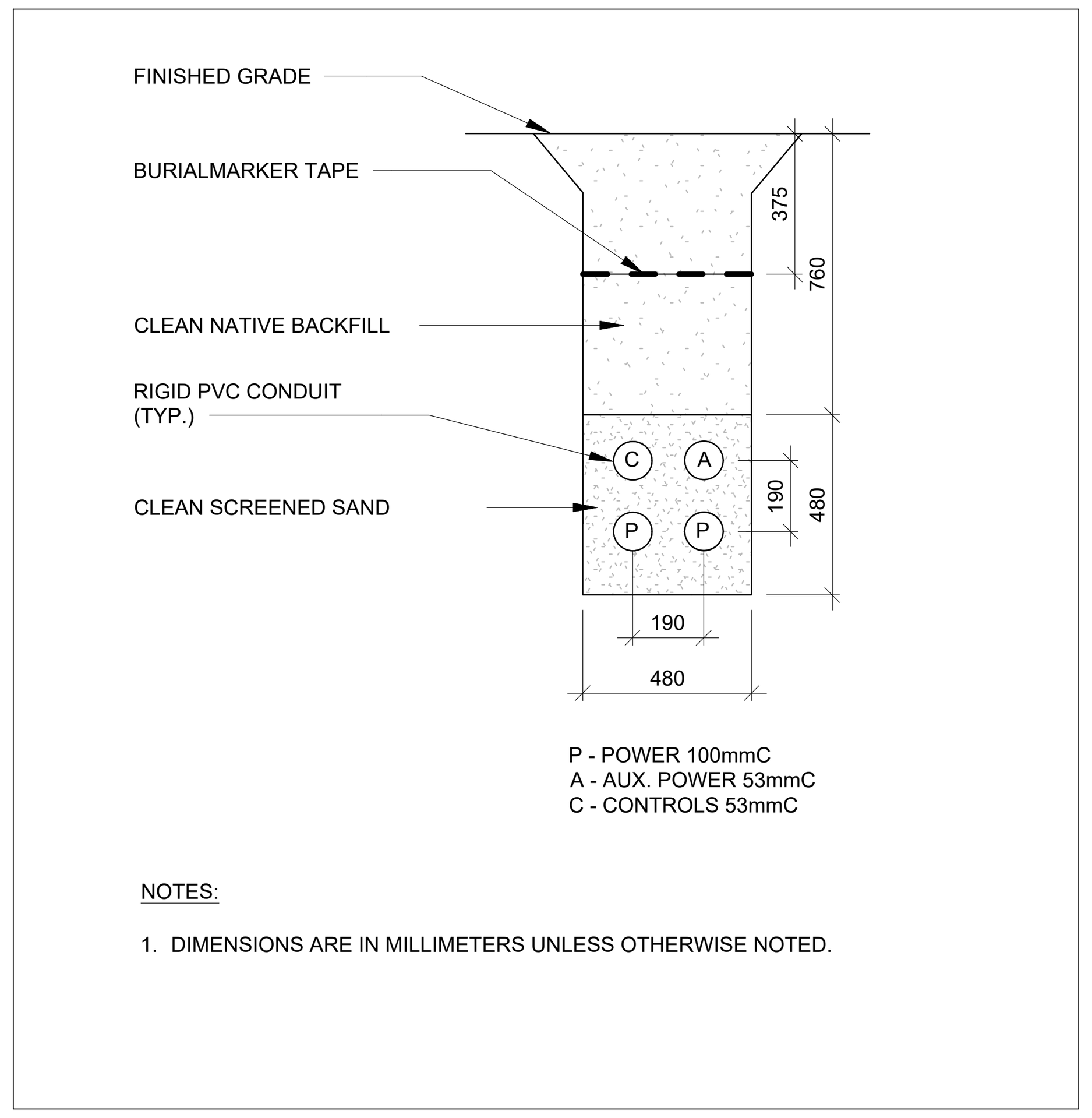
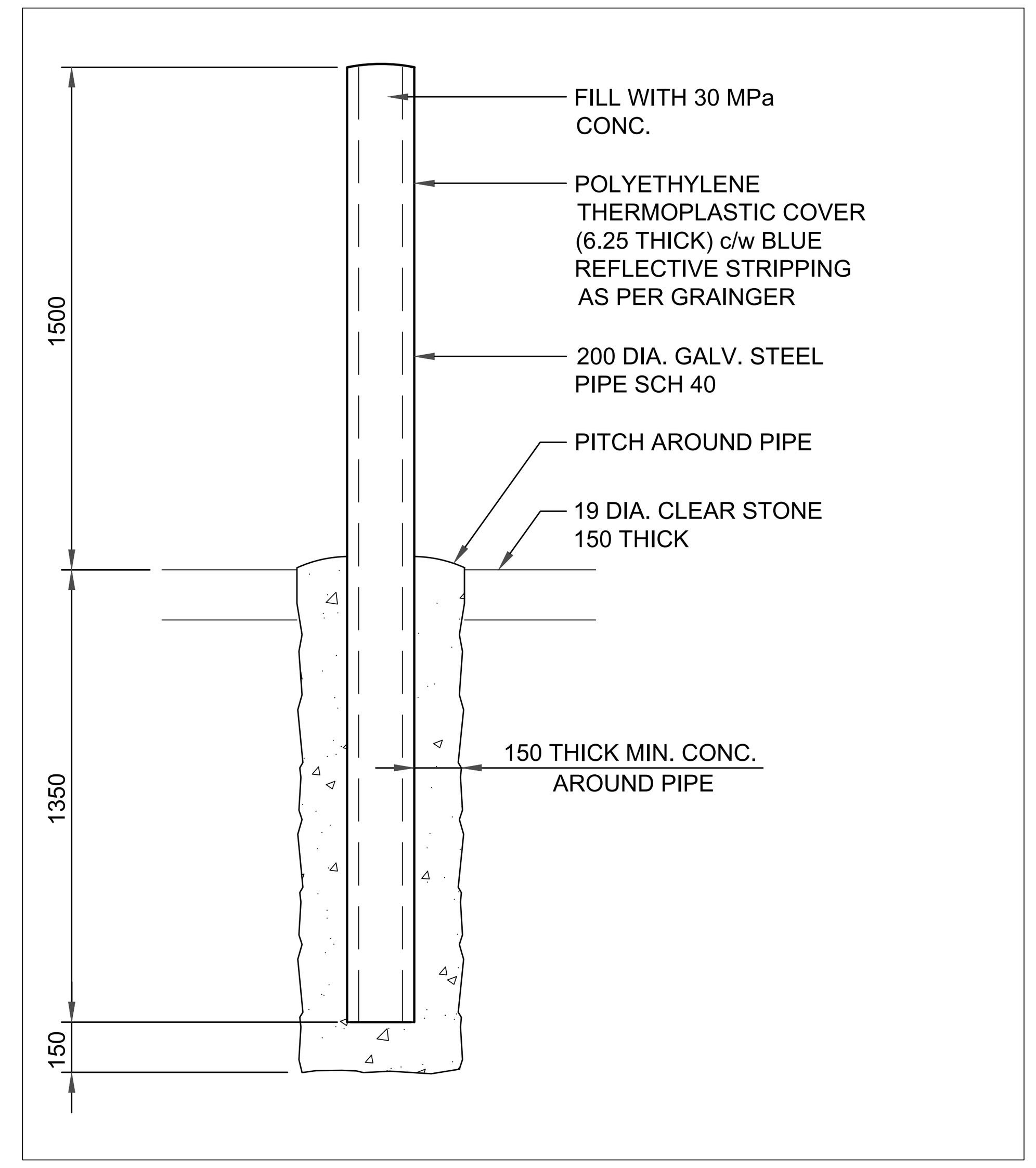
Project Management Initials: Designer: Checked: Approved: ANSI D 864mm x 559mm



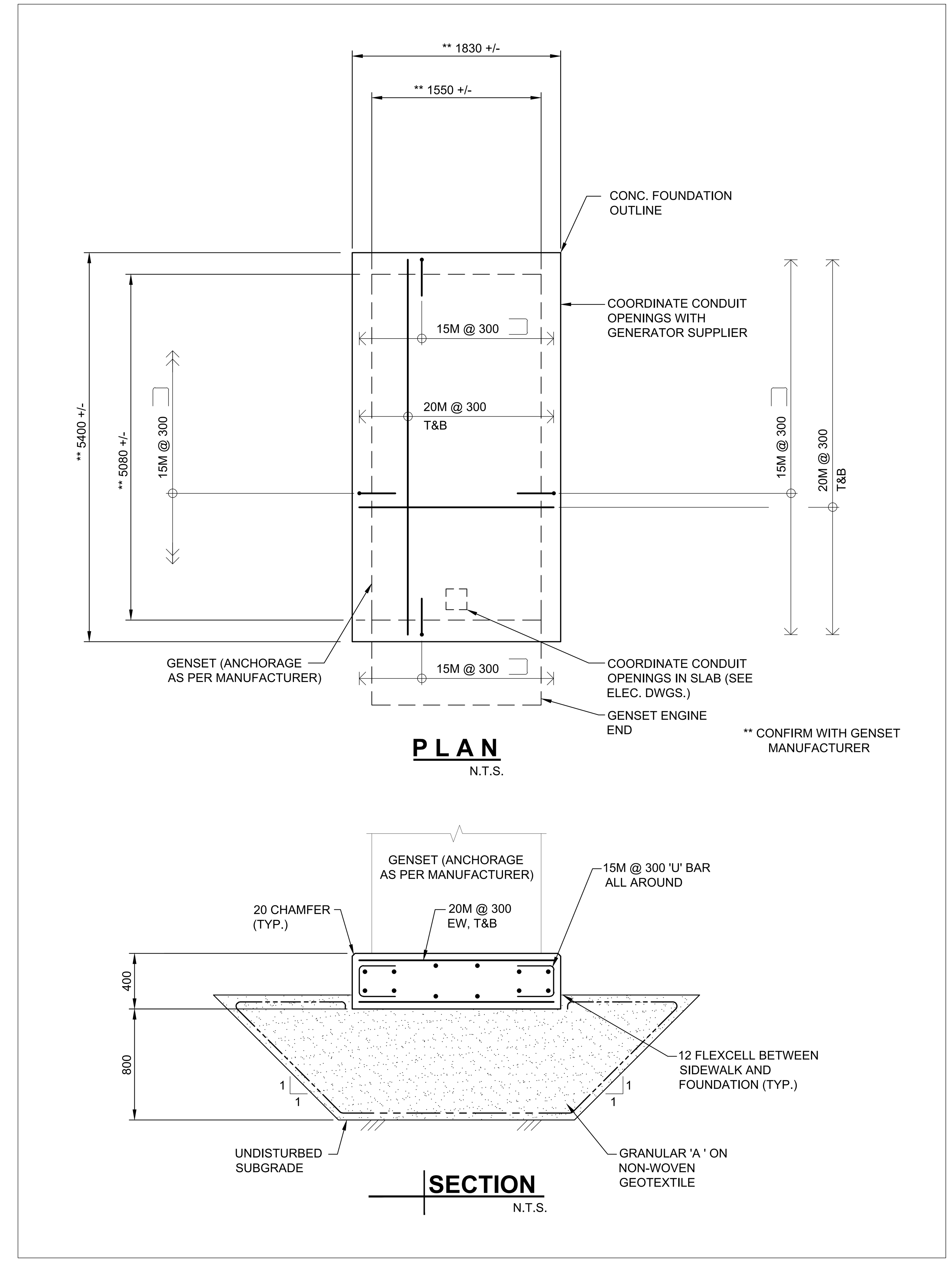
1 | E0.3

UNDERGROUND TRENCH DETAIL
TYP. FOR CIVIC AND REC CENTRES N.T.S.



2 | E0.3

BOLLARD DETAIL
TYP. FOR CIVIC AND REC CENTRES N.T.S.



3 | E0.3

GENERATOR FOUNDATION DETAIL
TYP. FOR CIVIC AND REC CENTRES N.T.S.

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ELECTRICAL SERIES 000

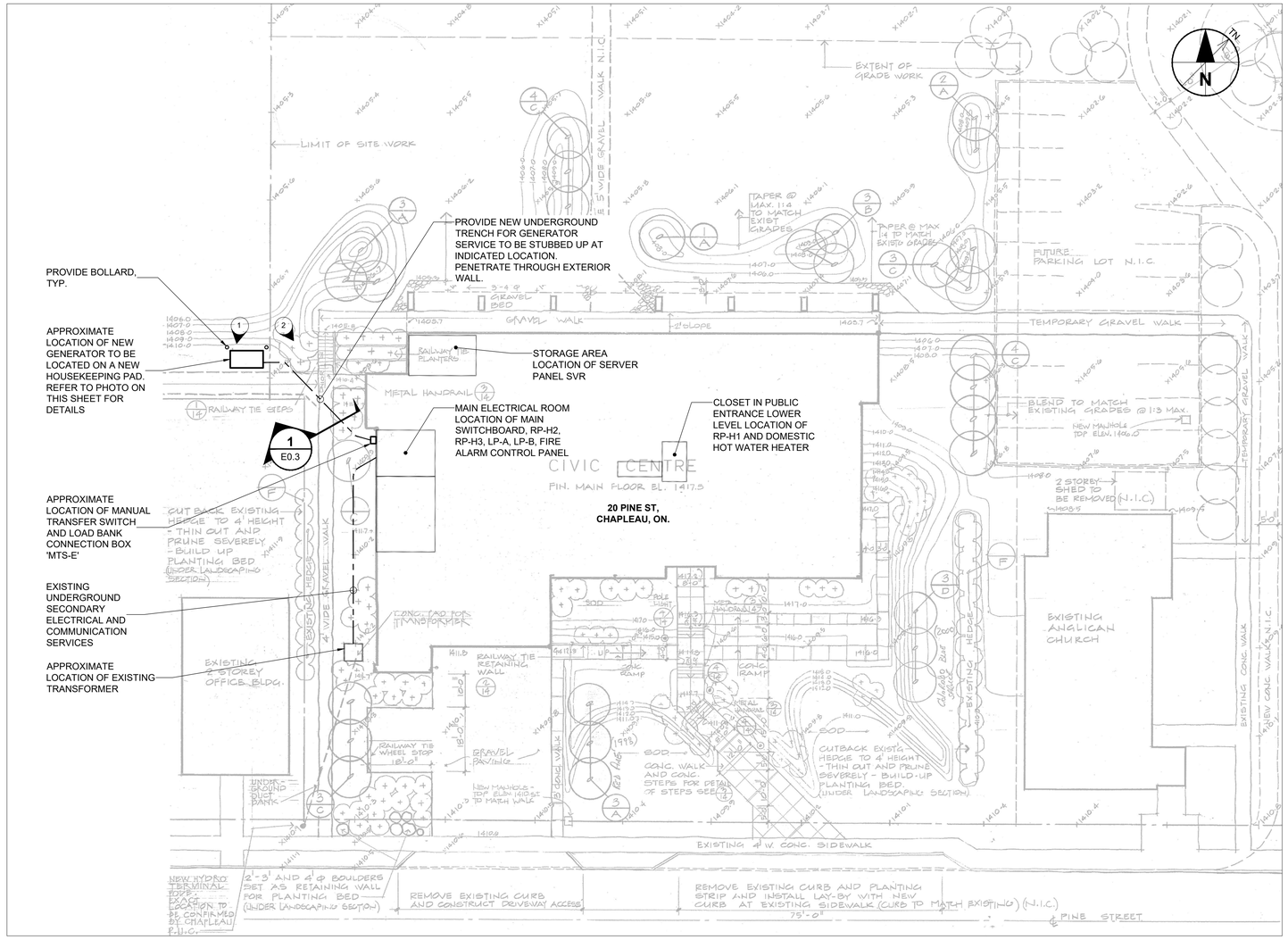
TYPICAL DETAILS

SHEET NUMBER

E0.3

1 **VANTAGE V1**

2 **VANTAGE V2**



1 SITE PLAN

E1.1

N.T.S

ELECTRICAL SCOPE OF WORK

1. PROVIDE A NEW FIXED STANDBY BACKUP POWER DIESEL GENERATOR TO BE LOCATED AS INDICATED ON PLANS ON A HOUSEKEEPING PAD. PROVIDE ALL NECESSARY EARTHWORKS, INCLUDING RETAINING BARRIERS, EXCAVATION, COMPACTION, ETC. REQUIRED FOR THIS INSTALLATION.
2. PROVIDE MODIFICATION TO THE EXISTING ELECTRICAL SYSTEM REQUIRED TO ACCEPT GENERATOR BACKUP POWER AS DETAILED HEREIN.
3. PROVIDE ALL BACKUP POWER ANCILLIARY DEVICES AND SYSTEMS AS DESCRIBED HEREIN.
4. PROVIDE GENERATOR TESTING AND COMMISIONING AS DETAILED IN DRAWINGS AND SPECIFICATIONS.
5. PRIOR TO REMOVAL OF DISTRIBUTION EQUIPMENT, COORDINATION IS REQUIRED WITH THE TOWNSHIP OF CHAPLEAU. THIS WORK IS TO BE DONE AFTER REGULAR WORKING HOURS WHICH COULD INCLUDE AFTERNOON SHIFT, NIGHT SHIFT AND/OR ON THE WEEKEND. SHUTDOWN DURATION TO BE LIMITED TO 48 HOURS MAXIMUM. TO MAINTAIN OPERATIONS, CRITICAL EQUIPMENT WILL REQUIRE TEMPORARY FEEDS. LP- A, SVR PANEL, RP-B ALL CONTAIN CRITICAL CIRCUITS. DEMAND LOAD TO BE VERIFIED. SEQUENCING TO BE REVIEWED PRIOR TO THE COMMENCEMENT OF SHUTDOWN WORK.

ELECTRICAL SITE WORK NOTES

1. CONDUCT AREA LOCATES AND THOROUGH SURVEY OF THE SITE AREA OF WORK. CONFIRM THAT THERE ARE NO CONFLICTS WITH PROPOSED UNDERGROUND SERVICES. SPLASH PAD WATER LINE IN AREA.
2. ALL CONDUIT TRENCHING SHALL BE REINSTATED AND COMPACTED. RESTORE IMPACTED AREA TO ITS ORIGINAL CONDITION OR BETTER. RESOD AS REQUIRED.
3. MAINTAIN A MINIMUM CLEARANCE OF 300mm FROM ANY UNDERGROUND UTILITY CROSSINGS. PROVIDE SUPPORTS AS REQUIRED.

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PROJECT NUMBER

60672834

SHEET TITLE

CIVIC CENTRE SERIES 100

ELECTRICAL SITE PLAN AND SCOPE OF WORK

SHEET NUMBER

E1.1

Project Management Initials: ____ Designer: ____ Checked: ____ Approved: ____ ANSI D 864mm x 559mm

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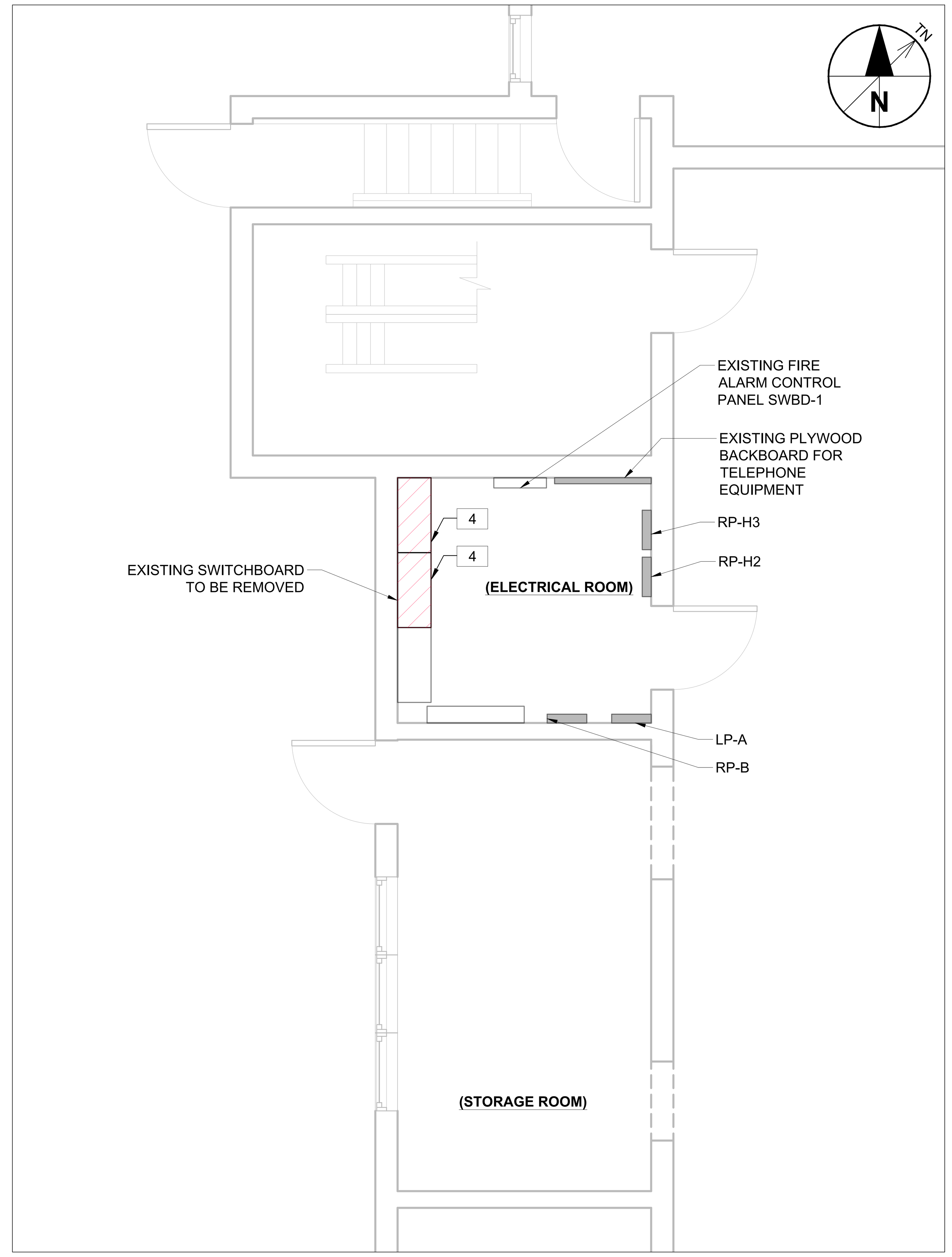
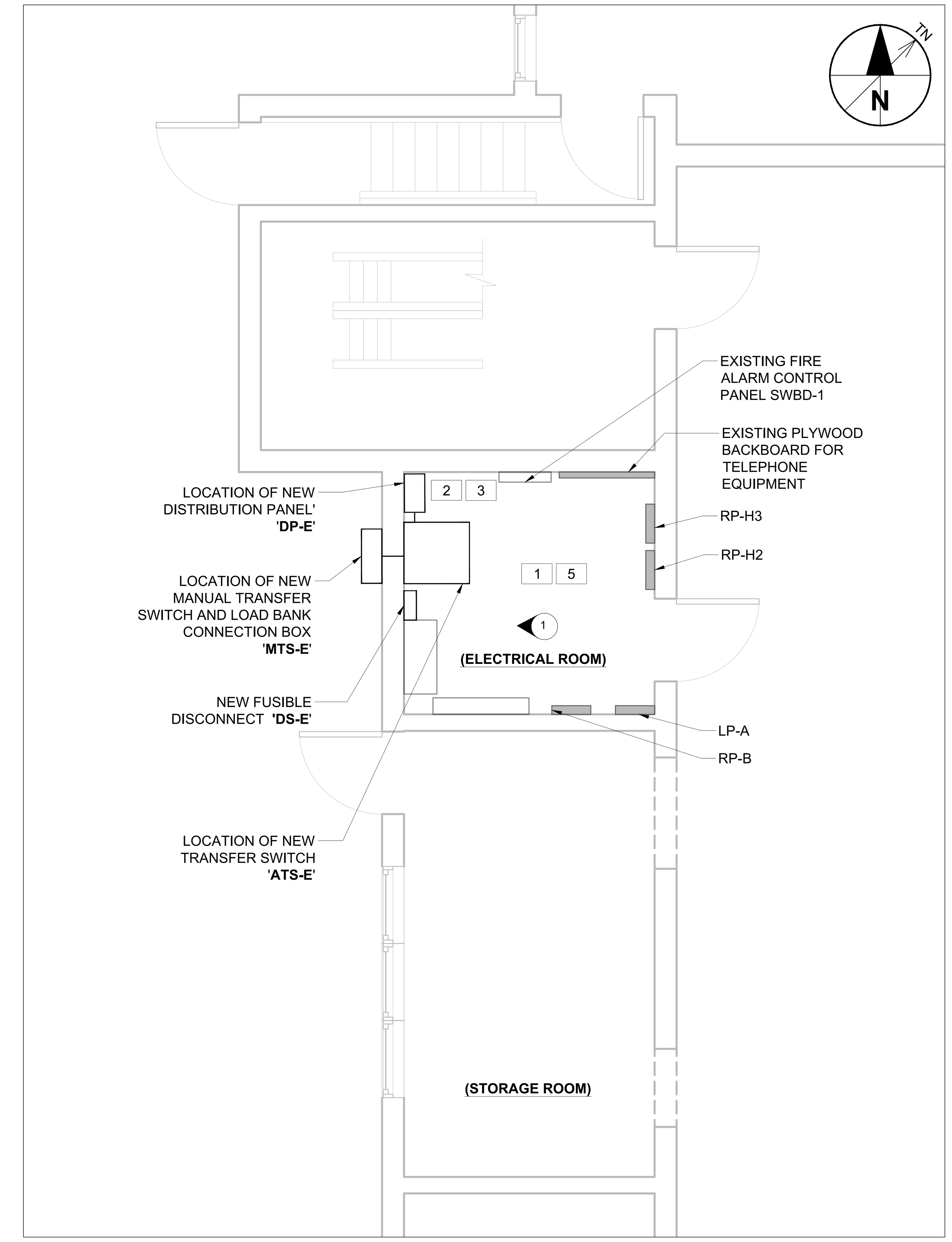
1 VANTAGE V1



1 | E1.2 | PARTIAL FLOOR PLAN - DEMOLITION — N.T.S



1 | E1.2 | PARTIAL FLOOR PLAN — N.T.S

REFER TO KEYNOTE # 3

DRAWING NOTES:

1. COORDINATE ALL WORK AREA PREPARATION WITH THE TOWNSHIP'S REPRESENTATIVE.
2. TRANSFER LOADS FROM EXISTING SWITCHBOARD ONTO NEW DP-E AS DESCRIBED ON SINGLE LINE DIAGRAM.
3. UPON REMOVAL OF DISTRIBUTION SECTIONS, ALL UNDER SLAB CONDUTORS ARE EXPECTED TO LOOK SIMILAR TO THE REFERENCE PHOTO. CONTRACTOR TO EXTEND CONDUITS AND REPURPOSE CONDUCTORS WHERE POSSIBLE. CONTRACTOR TO REPLACE RATHER THAN SPLICE PANEL FEEDS FOR PANELS IN THE ELECTRICAL ROOM.
4. DISASSEMBLE, DISCONNECT, REMOVE, MAKE SAFE AND DISPOSE SWITCHBOARD DISTRIBUTION SECTIONS MADE REDUNDANT BY LOAD TRANSFER. RHS SHEET METAL COVER TO BE REPURPOSED FOR ENCLOSURE OF MAIN INCOMING AND METERING SECTION.
5. GROUNDING AND BONDING FOR EXISTING PANELS TO BE TO CURRENT OESC STANDARDS.

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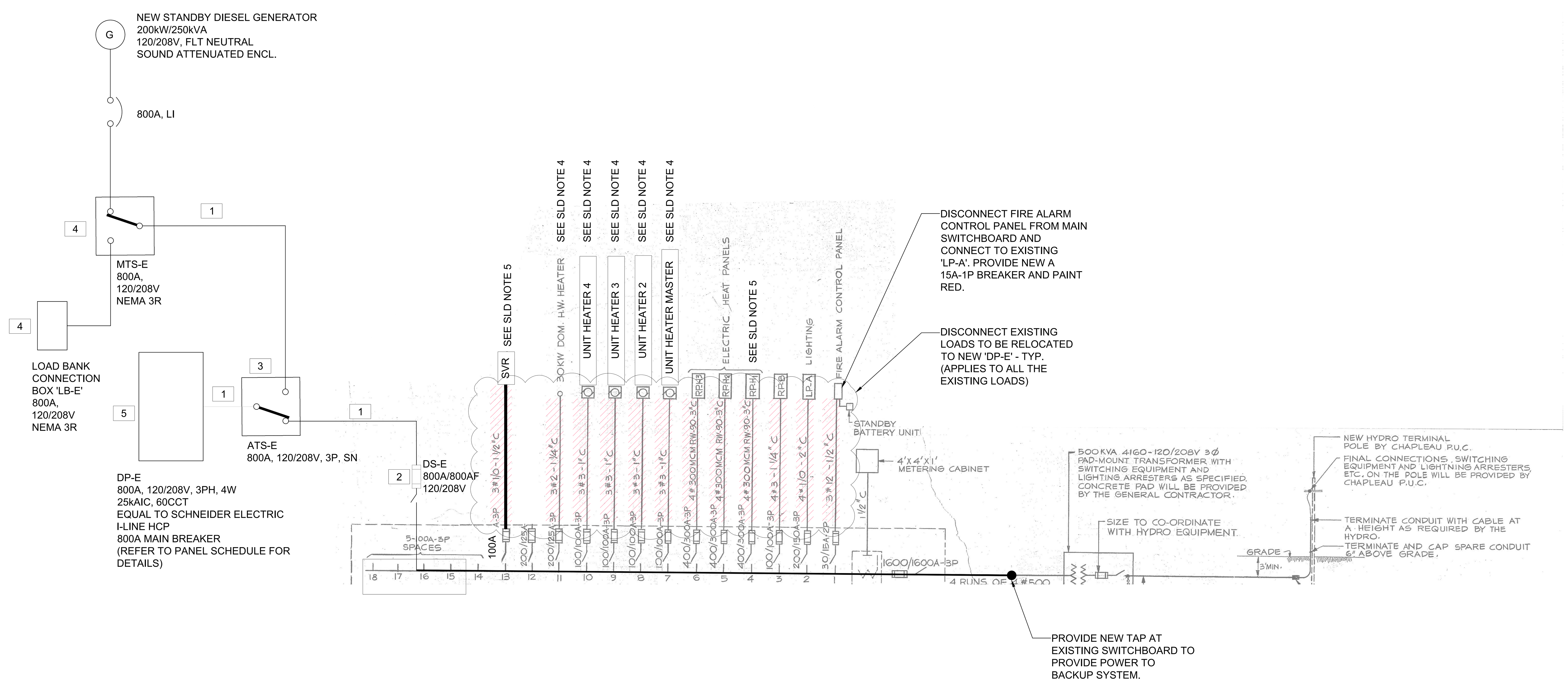
60672834

SHEET TITLE
CIVIC CENTRE SERIES 100
ELECTRICAL PARTIAL FLOOR PLAN

SHEET NUMBER
E1.2

KEYNOTES:

1. 2 RUNS OF 750MCM CU IN 100mmC EACH
2. NEW FUSED DISCONNECT
3. NEW AUTOMATIC TRANSFER SWITCH
4. NEW MANUAL TRANSFER SWITCH WITH LOAD BANK CONNECTION BOX EQUAL TO FOXFAB FFCC-S1
5. NEW DISTRIBUTION PANEL



PANEL:	DP-E
VOLTAGE:	120/208V
PHASE:	3PH/4W
MAINS:	800A, 800A MAIN BREAKER
LOCATION:	STORAGE ROOM
KAIC:	25

DESCRIPTION	VA	BREAKER	CCT	PH	CCT	BREAKER	VA	DESCRIPTION
			1	A	2			
LIGHTING PANEL 'LP-A'		200A-3P	3	B	4	100A-3P		UNIT HEATER 3
			5	C	6			
			7	A	8			
HEATING PANEL 'RP-H1'		300A-3P	9	B	10	100A-3P		UNIT HEATER 4
			11	C	12			
			13	A	14	30A-2P		DOMESTIC HOT WATER HEATER
HEATING PANEL 'RP-H2'		300A-3P	15	B	16			
			17	C	18			
			19	A	20			
HEATING PANEL 'RP-H3'		300A-3P	21	B	22	100A-3P		PANEL RP-B
			23	C	24			
			25	A	26			
UNIT HEATER MASTER		100A-3P	27	B	28	100A-2P		SVR
			29	C	30			
			31	A	32			
UNIT HEATER 2		100A-3P	33	B	34			
			35	C	36			
			37	A	38			
			39	B	40			
			41	C	42			

NOTES:
1. ALL WIRING SHALL BE AS PER OESC, #12 AWG RW90 XLPE CU MIN., OR AS INDICATED ON SCHEDULE AND RISER DIAGRAM.
2. FINAL CONNECTIONS TO MOTORS OR OTHER VIBRATING EQUIPMENT SHALL BE BY MEANS OF FLEXIBLE CONDUIT.

SINGLE LINE DIAGRAM NOTES:

1. GROUND ALL NON-CURRENT CARRYING ELECTRICAL SYSTEMS TO GROUND.
2. ALL WIRING SHALL BE XLPE RW90 CU UNLESS NOTED OTHERWISE.
3. PROVIDE NEW STANDBY POWER DEVICES AND SYSTEMS. DISCONNECT EXISTING LOADS FROM THEIR CURRENT SOURCE AND RELOCATE TO NEW 'DP-E'
4. FOR DOMESTIC HOT WATER TANK AND ELECTRIC UNIT HEATERS IN THE FIRE HALL: CONDUITS TO BE REWORKED AND EXTENDED AS NEEDED. CONDUCTORS TO BE REPURPOSED IF POSSIBLE.
5. VERIFICATION OF SVR PANEL AND RPH1 PANEL FEEDS AND SPLICE TO EXTEND IF NECESSARY IN ACCORDANCE TO OESC.

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Project Management Initials: ____ Designer: ____ Checked: ____ Approved: ____ ANSI D 864mm x 559mm

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PROJECT

TOWNSHIP OF CHAPLEAU STANDBY POWER - CIVIC CENTRE AND RECREATION CENTRE

CLIENT

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60672834

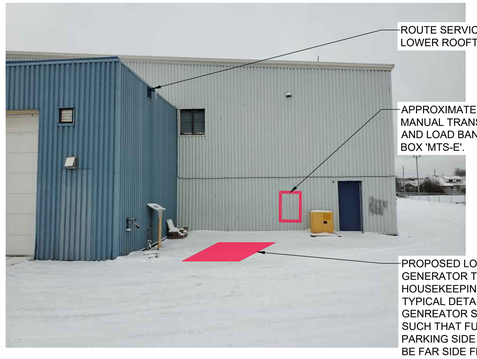
SHEET TITLE

CIVIC CENTRE SERIES 100

ELECTRICAL SINGLE LINE DIAGRAM

SHEET NUMBER

E1.3



1 ▶ **VANTAGE V1**

1 SITE PLAN

E2.1

N.T.S

ELECTRICAL SCOPE OF WORK

1. PROVIDE A NEW FIXED STANDBY BACKUP POWER DIESEL GENERATOR TO BE LOCATED AS INDICATED ON PLANS ON A HOUSEKEEPING PAD. PROVIDE ALL NECESSARY EARTHWORKS, INCLUDING RETAINING BARRIERS, EXCAVATION, COMPACTION, ETC. REQUIRED FOR THIS INSTALLATION.
2. PROVIDE MODIFICATION TO THE EXISTING ELECTRICAL SYSTEM REQUIRED TO ACCEPT GENERATOR BACKUP POWER AS DETAILED HEREIN.
3. PROVIDE ALL BACKUP POWER ANCILLIARY DEVICES AND SYSTEMS AS DESCRIBED HEREIN.
4. PROVIDE GENERATOR TESTING AND COMMISIONING AS DETAILED IN DRAWINGS AND SPECIFICATIONS.

ELECTRICAL SITE WORK NOTES

1. CONDUCT AREA LOCATES AND THOROUGH SURVEY OF THE SITE AREA OF WORK. CONFIRM THAT THERE ARE NO CONFLICTS WITH PROPOSED UNDERGROUND SERVICES.
2. ALL CONDUIT TRENCHING SHALL BE REINSTATED AND COMPACTED. RESTORE IMPACTED AREA TO ITS ORIGINAL CONDITION OR BETTER. RESOD AS REQUIRED.
3. MAINTAIN A MINIMUM CLEARANCE OF 300mm FROM ANY UNDERGROUND UTILITY CROSSINGS. PROVIDE SUPPORTS AS REQUIRED.
4. GENERATOR PAD AND FOOTPRINT TO BE KEPT AS CLOSE TO THE BUILDING AS POSSIBLE AS PERMITTED BY LOCAL AREA CODES AND REGULATIONS. GENERATOR FOOTPRINT MUST BE KEPT WITHIN THE GENERAL SPACE IN ORDER TO PROVIDE PROTECTION FROM TRAFFIC AND SNOW REMOVAL EQUIPMENT.

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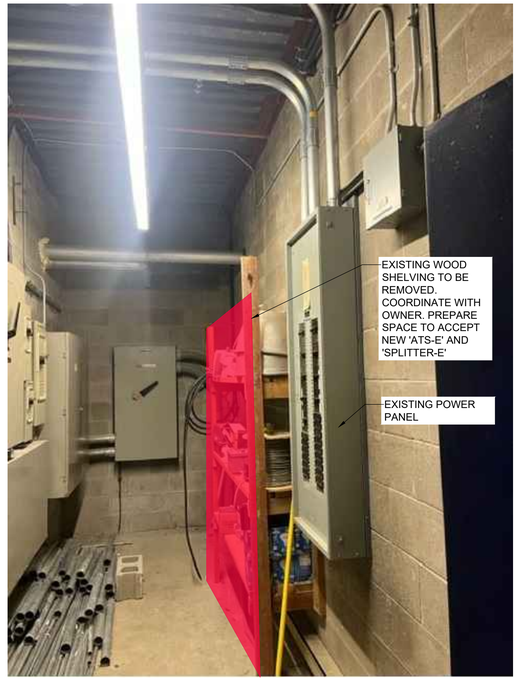
SHEET TITLE

RECREATION CENTER **SERIES 200**

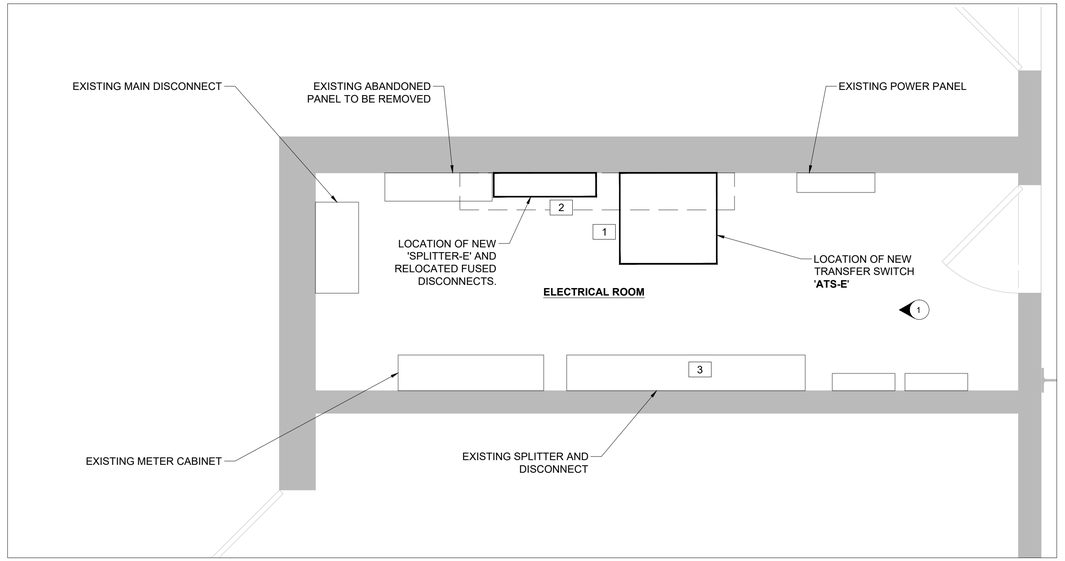
ELECTRICAL SITE PLAN AND SCOPE OF WORK

SHEET NUMBER

E2.1



1 **VANTAGE V1**



1 PARTIAL FLOOR PLAN

E2.2 N.T.S

KEYNOTES:

1. COORDINATE ALL WORK AREA PREPARATION WITH THE TOWNSHIP'S REPRESENTATIVE.
2. TRANSFER LOADS FROM EXISTING MAIN SPLITTER TO NEW 'SPLITTER-E'
3. MODIFY EXISTING DISTRIBUTION AS DESCRIBED IN SINGLE LINE DIAGRAM. LOCATE NEW DISCONNECT 'DS-E' IN SPACE MADE AVAILABLE BY RELOCATING EXISTING FUSED DISCONNECTS

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SHEET TITLE

RECREATION CENTRE **SERIES 200**

ELECTRICAL PARTIAL FLOOR PLAN

SHEET NUMBER

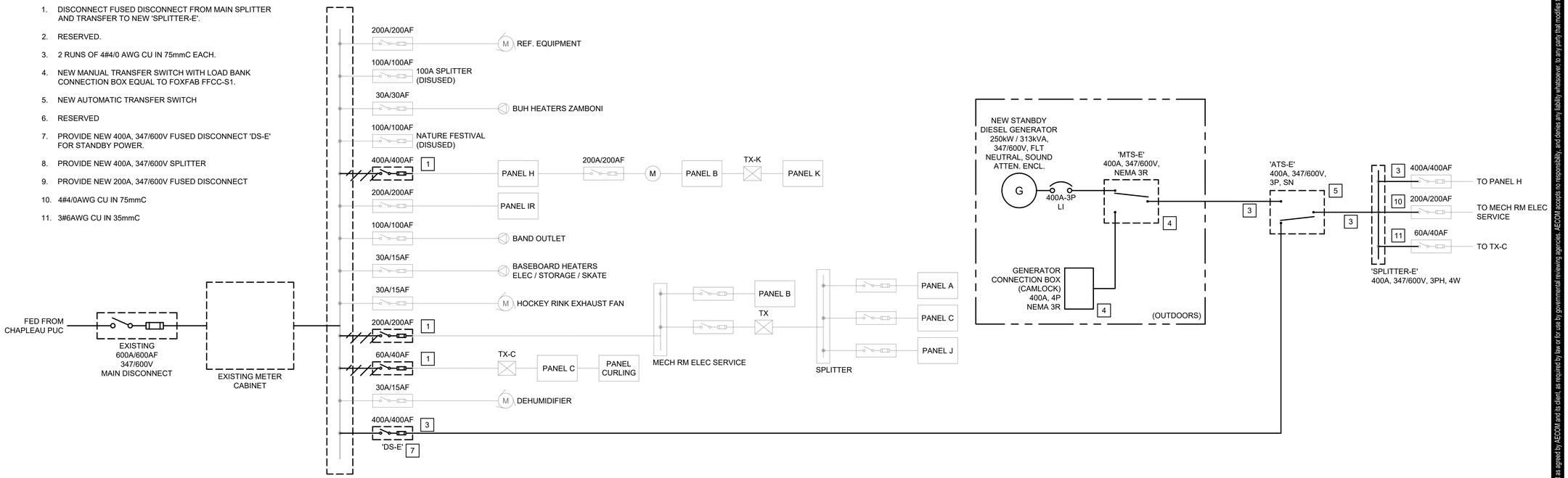
E2.2

SINGLE LINE DIAGRAM NOTES:

1. ALL GROUNDING AND BONDING METHODS SHALL BE AS PER THE ONTARIO ELECTRICAL SAFETY CODE.
2. ALL WIRING SHALL BE XLPE RW90 CU UNLESS NOTED OTHERWISE.

DRAWING KEYED NOTES:

1. DISCONNECT FUSED DISCONNECT FROM MAIN SPLITTER AND TRANSFER TO NEW 'SPLITTER-E'.
2. RESERVED.
3. 2 RUNS OF 4#4/0 AWG CU IN 75mmC EACH.
4. NEW MANUAL TRANSFER SWITCH WITH LOAD BANK CONNECTION BOX EQUAL TO FOXFAB FFCC-S1.
5. NEW AUTOMATIC TRANSFER SWITCH
6. RESERVED
7. PROVIDE NEW 400A, 347/600V FUSED DISCONNECT 'DS-E' FOR STANDBY POWER.
8. PROVIDE NEW 400A, 347/600V SPLITTER
9. PROVIDE NEW 200A, 347/600V FUSED DISCONNECT
10. 4#4/0AWG CU IN 75mmC
11. 3#6AWG CU IN 35mmC



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RECREATION CENTRE **SERIES 200**

ELECTRICAL SINGLE LINE DIAGRAM

SHEET NUMBER

E2.3