



## **REQUEST FOR PROPOSAL**

RFP # UTIL-2020-01

for

**East End Sewage Pumping Station  
Standby Power System Upgrades**

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## SECTION A. THE PROJECT AND PROPOSALS

### 1.0 INTRODUCTION

The Town of Gananoque is interested in receiving proposals from qualified contractors to undertake standby power system upgrades at the Town’s main sewage pumping station known as the East End Pumping Station (EEPS). The work will allow for additional standby power capacity for future station upgrades including additional pumping capacity. The work also includes some process and house equipment upgrades and system integration.

The scope of work of the project is defined in Schedule D and Schedule E but generally includes:

1. Automatic Transfer Switch
2. Standby Power Generator
3. Mobile Generator Lugging Panel and MTS.
4. Automatic Load Bank System
5. HVAC motors and controls.
6. Associated process and house equipment upgrades.

### 2.0 TERM OF CONTRACT

**All work must be substantially complete by September 15, 2020.**

### 3.0 RFP SCHEDULE

RFP Released	February 27 <sup>th</sup> , 2020
Deadline for submission of questions	March 4 <sup>th</sup> , 2020
Deadline for responding to questions	March 6 <sup>th</sup> , 2020
RFP Closes	March 12 <sup>th</sup> , 2020 @ 2:00 pm Local Time (Eastern Standard Time)
RFP Approval at Council and Award	March 17 <sup>th</sup> , 2020

The RFP process will be governed according to the above schedule. Although every attempt will be made to meet all dates, the Town reserves the right to modify any or all dates in its sole discretion.

Any successful proponent will be notified subsequent to the acceptance of such proposal by the Town. Such notification will be communicated not later than sixty (60) days from the date set for closing. This period may be extended by mutual consent only. Any proponent not in receipt of such notification of acceptance within the above referenced period may assume that the proposal was not accepted.

#### 4.0 PROJECT AUTHORITY AND INVOLVEMENT

This RFP is administered by the Manager of Public Works for the Corporation of the Town of Gananoque or their designate. All inquiries must be as directed in Section A - 6.0. The award of contract may be subject to Town Council approval.

#### 5.0 PROJECT STAKEHOLDERS

The decision making process with respect to the review or scoring of the submitted RFP's, as well as award decision for entering into a contract with any successful proponent rests entirely with the Town.

#### 6.0 INQUIRIES

Any clarification of this document or request for additional information must be received as indicated in the RFP schedule above, by email to:

**Matthew Morkem, Project Manager**

Email: [mmorkem@jlrichards.ca](mailto:mmorkem@jlrichards.ca)

No officer, agent or employee of the Corporation of the Town of Gananoque is authorized to alter orally any portion of these documents. Any alterations required will be issued to all registered proponents as written addenda. Addenda shall be considered as an integral part of the RFP documents. The proponent shall list in its submission all the addenda that were considered when the proposal was prepared. Although every effort will be made to ensure that proponents receive all the addenda, it is the responsibility of each proponent to ensure all addenda issued have been received.

Addenda will be issued through Biddingo at [www.biddingo.com](http://www.biddingo.com). Should any proponent find discrepancies in, or omissions from the specifications, or should the proponent be in doubt as to their meaning, that proponent must notify the staff contact indicated in this section in order to obtain clarification.

#### 7.0 PROPOSAL CONTENT

Each proposal submitted must include a demonstrated understanding of the objectives, scope and particulars of the services required. Company brochures and statistical information may be included with RFP submissions. Proposals must be completed in type or ink. Erasures and alterations must be initialed in ink by the appropriate signing authority. Proposals which are illegible, incomplete, unbalanced, conditional, obscure or contain irregularities of any kind may be rejected.

Proponents shall be solely responsible for the delivery of their proposals in the manner

and time prescribed.

A complete submission must include the following:

1. Agreement to Bond
2. Signed Irrevocable Offer
3. A current WSIB Clearance Certificate. The successful proponent must provide current WSIB clearance certificates throughout the life of the contract to the Manager of Public Works or designate.
4. Addendum Acknowledgement
5. Technical Proposal
6. Price Proposal
7. Certificate of Insurance. The successful proponent must provide proof of insurance coverage throughout the life of the contract to the Treasurer or designate

**8.0 EVALUATION OF PROPOSALS**

The following scoring system will be used to evaluate each accepted Proposal:

Evaluation Criteria	Maximum Possible Points
<b>Corporate and Financial</b>	15
Years in business	
Annual construction value	
Bonding capability	
Capability to provide insurance coverage	
Financial strength, stability, and resources	
Good standing credit	
Number of previous and active liens	
<b>Experience and Track Record</b>	20
Successful completion of projects of similar size and complexity in municipal pumping station	
Successful completion of a minimum of three (3) projects of similar size and complexity for the Public Sector	
Experience of company within local community and/or area	
<b>Key Engineering and Construction Resources</b>	15
Organizational/Staffing Plan/Staff Experience	
Office support and number of full-time staff on payroll.	
Ability to self-perform construction-related activities.	
Sub-Contractors	
<b>Health and Safety Policy and Record</b>	5
Quality of Health and Safety Manual/Policy	
Number of stop work orders issued by MOL.	
WSIB CAD-7 Workers Compensation	
<b>Overall Impression</b>	5
The overall quality of the proposal	
<b>Subtotal</b>	
<b>Price Proposal (see note below)</b>	40
<b>TOTAL</b>	100

Price will be evaluated by giving the lowest priced bid a score of 40 and bids higher than the lowest will be given correspondingly lower points based on the following formula:

$$\text{Awarded Price Points} = \left( \frac{\text{Lowest Proposal}}{\text{Evaluated Proposal}} \right) * \text{Max Percentage (40\%)}$$

Notwithstanding the fact that there is a ranking/weighting system for the criteria items

noted above, it is recognized that these parameters are qualitative in nature and subject to interpretation. However, it cannot be stressed enough that the Town will utilize the information provided under these headings to satisfy themselves to what extent any/all of the submissions fail/meet/exceed the necessary requirements to undertake the Work. And, notwithstanding that any Proposal may not necessarily be accepted, if the Town is not satisfied that a submission does not adequately address, in whole or in part the requirements of the RFP, their submission will be rejected.

Proponents may be invited, at the sole discretion of the Town, to participate in oral presentations and interviews with members of the evaluation committee. These meetings, if deemed necessary, will give each invited Proponent an opportunity to highlight its technical proposal as well as to answer questions posed by the evaluation committee.

## **9.0 SUBMISSION OF PROPOSALS**

One original signed hard copy, two additional hard copies, and one digital copy (CD or USB thumb drive) of the proposal, in a sealed envelope, clearly marked “Request for Proposal Number UTIL-2020-01 East End Pumping Station Electrical Upgrades” will be received as indicated in section 3, and shall be addressed to the Corporation of the Town of Gananoque, Attention: Penny Kelly, Clerk, 30 King Street East, P.O. Box 100, Gananoque, ON, K7G 2T6.

Proposals received after the above due date and time will not be considered. Complete submissions should include all items outlined in Section A – 7.0. Failure to comply to bid submission requirements may result in the rejection of the proposal. No proposal documents may be withdrawn after closing. Prior to closing, RFPs may be withdrawn only upon written request signed by an authorized officer of the company and submitted to the Treasurer.



## SECTION B. PROPOSAL REQUIREMENTS

### 1.0 INTRODUCTION

The Town of Gananoque is interested in receiving proposals from qualified contractors to undertake standby power system upgrades at the Town's main sewage pumping station known as the East End Pumping Station (EEPS).

### 2.0 TECHNICAL REQUIREMENT

#### Corporate and Financial

Provide a description/profile/organization of the Contractor. Provide an outline of the legal structure of the firm including year established, the type of entity (i.e., corporation, partnership, or sole proprietorship), and the names and titles of all directors, officers, partners, and principals. Include as membership of industrial associations.

The Contractor is to include a fully completed and signed CCDC Document 11 Form – 1996 (R2006) edition. The items evaluated under the CCDC Form 11 are Years in Business, Annual Construction Value, Experience with Similar/Related Projects, and References. The Town reserves the right to consider its own experiences/references with the Contractor when scoring this reference category. The Town will contact any of the names given, at random, to obtain a quality/performance reference. A firm's references which prove unsatisfactory or for whom there is a consistent trend of contract issues through other public agencies or consultants may be rejected.

The Proponents should provide written confirmation from two major suppliers that the Contractor keeps its accounts in good standing and has sufficient credit terms to obtain required goods and has sufficient credit lines to meet contract obligations.

Provide a letter summarizing all liens and/or litigation registered against or by the Contractor in the last ten (10) years. Provide a summary of active liens and litigation in which the Contractor is involved. Describe briefly the nature of the litigation and identify the other party(s) involved.

#### Experience and Track Record

Provide a list of three (3) references for the purpose of evaluating the Contractor's ability, experience, and track record of success in construction projects involving similar construction in water and/or wastewater pumping facilities.

The reference projects shall have been completed or substantially performed in the last ten (10) years and shall include only projects of similar size, scale, schedule, and

complexity. At least three (3) of the references should be from a public sector owner, and at least three of the projects should be water and/or wastewater projects of a similar complexity and project value.

Each reference shall include the following as a minimum:

- The identity of the project owner.
- A contact name and title, address, and telephone number for the project owner.
- A description of the project stating the type of water/wastewater project being constructed.
- The original contract duration and the actual completion time (clearly state commencement and completion dates) including a brief description of change work orders that impacted the actual completion time.
- The original and final contract values including a brief description of change work orders that impacted the final contract values (Subcontractors to list overall project value and subcontract value along with change work orders that impacted the final contract values).
- A description of the services that were provided by the Contractor.
- The names of key staff that managed and participated in these projects.

In providing references, the Contractor agrees that the Town and/or their Consultant can contact the references provided as part of the evaluation process. The Town will make their own arrangements to contact these references. Substitution of references will not be permitted after the close of the RFP. Project in the local community and area will receive preferred scoring

The completion of the CCDC 11 forms are acceptable for this section.

#### Key Engineering and Construction Resources

Provide the number of full-time employees on the company's payroll. Provide an organizational chart indicating key on-site and office support personnel and reporting relationships specific to the proposed Work. Provide their professional and/or trade qualifications, years of experience, resumes for key personnel (Project Manager, Site Superintendent and Electrical Site Foreman) related project experience of each team member and an indication of their potential roles and responsibilities on the East End Pumping Station Electrical Upgrade Project. If some components of the work are to be completed by sub-contractor(s), list the sub-contractor(s) and their scope of work.

In recognition of the importance of the Project, its complexity, and the schedule, it is the expectation of the Town that the Contractor's key management and site supervisory staff

identified in their Proposal will be available and committed from Project award through completion. The replacement of any of the key management and site supervisory staff identified in the Proposal and/or the addition of any other staff subsequent to the close of the RFP must be approved in writing and in advance by the Town. The Contractor will be required to clearly identify replacement and additional personnel, and provide a rationale for the proposed change or addition which will be evaluated by the Town.

For the Contract related to this RFP, the Contractor will be required to designate a full-time employee who is properly instructed to be in charge of first aid and who shall be in attendance at all times at the Site.

By submitting a proposal, the Contractor acknowledges that it is aware and complies with the provisions, regulations, policies, and guidelines of the Occupational Health and Safety Act (OHSA), the Environmental Protection Act, the Ontario Water Resources Act, the Safe Drinking Water Act, and the Fisheries Act (Canada).

Health and Safety Policies, Procedures, and Track Record

Provide a copy of the Contractor's Health and Safety Manual/Policy. The Town shall evaluate the Contractor's Health and Safety Manual based on inclusion of the following components, as a minimum:

- Health and Safety policy statement that is signed by an authorized signatory of the Contractor. The policy must contain clear statements of responsibility for all levels in the organization. These statements should outline the responsibilities as stated in the Occupational Health and Safety Act (i.e., Owners, Constructors, Supervisors, Workers, Safety Committee/Representative, etc.).
- Hazard assessment procedures including previously completed pre-construction assessments for similar or related projects. Provide documentation describing the methods of identification, communication, and control of identified hazards.
- Documentation for safe work practices and procedures to perform construction activities or use equipment or tools. As a minimum, provide step-by-step written procedures on how to complete a specific task safely, the likely hazards that may be encountered, control measures, and the emergency response plan.
- The Contractor's safety rules.
- The Contractor's disciplinary action processes and procedures for addressing safety violations and/or infractions.
- Written policy on the requirements for both basic and specialized personal protective equipment and applicable CSA standards.

- A written policy on the subject of incident reporting and investigation which includes provisions for the following legislated requirements: personal injury, occupational illness, fire/explosion, property and equipment damage, environmental damage, dangerous occurrences, and right to refuse situations. Provide the Contractor's standardized forms, if available.
- Emergency preparedness and response plans that are appropriate for construction work activities similar or related to those expected for the Dundas St Pumping Station Upgrade Project.

Provide the following for the purpose of evaluating the Contractor's track record on health and safety in construction projects:

- List all Ministry of Labour or other Stop Work Orders issued to the Contractor in the last three (3) years and a list of any other such health and safety infractions and/or charges.
- WSIB CAD-7 Workers Compensation injury frequency for the last three (3) years (or equivalent in other provinces/states accepted at the sole discretion of the Town).

### **3.0 PROJECT COSTS**

The Price Proposal Schedule C must include all costs in Canadian dollars and exclude HST. HST is extra and must be shown as a separate line item on all invoices.

In the event of any discrepancy between any unit price and an extension, the unit price shall govern.

The Proponent will submit a price proposal with unit prices and all applicable appurtenances with a total cost at the bottom of the page.

### **4.0 BACKGROUND OF THE PROJECT**

The Town of Gananoque requires standby electrical system upgrades in order to accommodate present and future electrical needs at the station. These may include future installation of additional pumps with VFDs where current capacity would be exceeded.

### **5.0 AVAILABLE TOWN RESOURCES**

The proponent when developing their proposal should not assume that Town resources, other than the Manager of Public Works or their designate (in the case of Town administration), will be available as a resource to any contract that results from this Request for Proposal.

## 6.0 OBJECTIVES

The objective of this Request for Proposal is to acquire the services of a local qualified and reputable contractor, and ultimately enter into a contract with the contractor over the term specified to supply goods and services for the work described in Schedule D and Schedule E of this RFP.

As noted above in Section A 2.0, all equipment and labour must be substantially complete by the indicated date.

## 7.0 ASSUMPTIONS

Proponents must take into account the following assumptions when preparing and submitting proposals.

### .1 Lobbying

In order to ensure fairness to all Consultants, the Town must endeavor to prevent unfair advantage created by lobbying. Therefore, the Town reserves the right to disqualify, at any time and at its sole discretion, any Contractor engaging in lobbying in connection with a competitive bidding process between a date that is no later than the date of issue of the RFP and the date of signing of a contract between the Town and the Successful Contractor(s). The Town may disqualify a Contractor at any time in the procurement process, including after the selection process has been completed.

### .2 Liquidated Damages

The Town will assess liquidated damages for instances of non-performance. As it is impracticable and extremely difficult to ascertain and determine the actual damages the Town will suffer in the event of non-performance issues, the Consultant shall pay the Town the sum of \$250 dollars per infraction. The sum or sums are hereby agreed upon and fixed as reasonable measures of the Town's costs and determined by the parties hereto as the liquidated damages that the Town will suffer by reason of said delay, non-performance or default, and not as a penalty. The Town may deduct and retain the amounts of such liquidated damages out of the monies payable as provided in Section C.6.5 – Monies Due Town.

### .3 Monies Due Town

In the event that there are any monies payable to the Town by the Contractor under the terms of this Contract, or there are any monies payable by the Town to any other

person, firm or corporation as a result of any default by the Contractor under this contract, such monies shall be deducted from and retained out of any monies due from the Town to the Contractor or may be recovered from the Contractor or the Contractor's surety pursuant to the performance bond as a debt due to the Town. Any and all amounts payable to the Town shall bear interest at the rate of one and one quarter percent (1.25%) per month compounded monthly, after thirty (30) days from the due date.

**.4 Insurance**

Insurance requirements will be as per Information for Proposal section 18.0 – Insurance Requirements.

**.5 Record Keeping**

The Contractor will maintain and keep sufficiently complete and accurate books, payrolls, accounts and records relating to the performance of the Contract to permit their verification and audit and they will have no claim to payment unless such books, payrolls, accounts and records have been so maintained and kept. The Contractor will furnish all the time sheets, records, weigh bills, bills of lading and other vouchers, on request by the Town. The Contractor will cooperate, and make any requested records available to the Town's auditor, upon request.

**.6 Conduct of Employees**

Employees shall be alert, polite and courteous towards the public at all times. The Consultant will employ on the Work, only orderly, competent and skillful workers.

**8.0 RESOURCE REQUIREMENTS**

Proponents must detail any resources they will provide, or will require as part of their proposal. This includes their resources, third party sub-contractors or any other third party.

**9.0 MILESTONES AND RESULTS**

See the RFP document for work requirements and expectations.

**10.0 INTERIM AND FINAL REPORTING**

Invoicing, WSIB clearance certificates, proof of insurance coverage, and other items included in the RFP must be reported in accordance with the RFP.

## SECTION C. INFORMATION FOR PROPONENT

The following terms and conditions are deemed accepted by all submitters of proposals in response to this RFP and are deemed incorporated into every contract resulting from this RFP

### 1.0 IMPROPER DELIVERY

Electronic, telegraphic, telephone, or facsimile submissions in response to this RFP will not be accepted. Late submissions in response will also not be accepted. Proponents

### 2.0 SIGNING REQUIREMENTS

Submissions that are not signed will be rejected. Signing of submissions shall be in the form set out in **Schedule A – Form of Irrevocable Offer** which shall be attached to the proposal. If the submitter of a proposal is an incorporated company, the proposal must be executed by the signing officer(s) of the company with the company seal placed beside the signature(s). If the submitter of a proposal is not an incorporated company, the submitter of a proposal should sign his or her own name in the presence of a witness who should sign beside the submitter of a proposal's name.

### 3.0 APPLICABLE LAW

This RFP, each submission and the Project itself are each subject to the provisions of all applicable law, including:

- The Municipal Freedom of Information and Privacy Act, RSO 1990, c. M54,
- Occupational health and Safety Act, R.S.O. 1990, c.O.1, Each proponent warrants that they have the experience training and equipment to ensure all work performed under the contract is done safely and in accordance with all applicable health and safety legislation and that they have control over the workplace and is fully responsible for the health and safety of all employees and others present on the site. Each proponent also acknowledges that the Town is relying on this warranty in its decision to award the contract to the proponent
- Accessibility for Ontarians with Disabilities Act, 2005, c.11 and the Ontarians with Disabilities Act, 2001, S.O. 2001, c.32, section 13 of which statute states:  
*In deciding to purchase goods or services through the procurement process for the use of itself, its employees or the public, the council of every municipality shall have regard to the accessibility for persons with disabilities to the goods or services.*

### 4.0 TOWN NOT LIABLE FOR RFP COSTS

The Corporation of the Town of Gananoque is not liable for any costs incurred by the submitter of a proposal in responding to this "Request for Proposal".

## 5.0 REQUIRED WARRANTIES

Each submitter of a proposal is deemed to expressly declare and warrant in the proposal that;

- i. The prices in this Proposal have been arrived at independently from those of any other submitter of a proposal,
- ii. The prices in this Proposal have not been knowingly disclosed by the submitter of a proposal, and will not knowingly be disclosed by the submitter of a proposal prior to award, directly or indirectly, to any other submitter of a proposal or competitor,
- iii. No attempt has been made, nor will be made, to induce any other person to submit or not to submit a proposal for the purpose of restricting competition,
- iv. This proposal is in all respects fair and without collusion or fraud.
- v. There has been no violation of copyrights or patent rights in manufacturing, producing or selling the materials and/or services shipped or ordered as a result of this proposal, and the seller agrees to hold the purchaser harmless from any and all liability, loss, expense, action or suit occasioned by any such violation.
- vi. All materials and/or services proposed to be supplied to the Corporation of the Town of Gananoque conform in all respects to the standards set forth by Federal and Provincial agencies.
- vii. The submitter of the proposal is:
  - Competent to perform the work described in this RFP [“the work”];
  - Has the necessary qualifications, including knowledge, skill and experience to perform the work, together with the ability to use those qualifications effectively for that purpose;
  - Shall supply everything necessary for the performance of the work;
  - Shall carry out the work in a diligent and efficient manner;
  - Ensure the work is of proper quality, material and workmanship; is in full conformity with the specifications; and meets all other requirements of this RFP and any subsequent contract.
  - The submitter waives all rights of lien which might arise in relation to any contract from this RFP under section 3(1) of the Repair and Storage Liens Act, R.S.O. 1990, c. R.25.
  - The submitter has and follows a health and safety plan for employees and representatives who will be present on the property of the Corporation of the Town of Gananoque as part of any contract arising from this RFP.
  - The submitter confirms that the price proposed is an upset limit above which the Town is not required to pay and that where there is uncertainty as to the price proposed, the unit price shall govern.



- The Proponent is to clearly detail the conditions of all warranties provided by all products within this RFP and shall have a 2 year minimum warranty.

## **6.0 NO OBLIGATION TO CONTRACT**

Submissions made in response to this Request for Proposals do not constitute the acceptance of a contract with the Town of Gananoque. Submissions constitute offers which the Town may or may not accept on its sole discretion. The Corporation of the Town of Gananoque further reserves the right to accept or reject any or all proposals or parts of proposals, to order additional units at the price submitted, or to accept any proposal considered in its best interest, and to request re-proposals on the required materials and/or services. The Corporation of the Town of Gananoque also reserves the right to waive irregularities and technicalities and to do so in its sole discretion. The Corporation of the Town of Gananoque further reserves the right to award the contract on a split-order basis, lump-sum or individual-item basis, or such combination as shall best serve the interests of the Town in the opinion of the Town. The Town of Gananoque reserves the right to include consideration of any outstanding claims against or by the Town, any record of poor performance with the Town and the appropriateness of any key personnel in evaluation of any proposal and to reject any proposal based on record of past poor quality of service, claims and disputes or difficulties related to proceedings in completed past projects for the Town.

Each submission of a signed proposal is deemed an irrevocable offer which may be accepted, at the sole option of the Corporation of the Town of Gananoque and after negotiation, only by entering into a formal contract upon such acceptance the terms, responsibilities, and specifications as required by the Corporation of the Town of Gananoque including but not limited to those set out herein. The Town reserves the right to reject an offer to supply goods and services presented in response to the Town's procurement processes where the Town determines that the person making the offer is in any way indebted to the Town and in its sole discretion is of the opinion that it is in the Town's best interests that the offer be rejected.

## **7.0 LIMITATION OF LIABILITY**

Unless otherwise agreed, should the Corporation of the Town of Gananoque enter into a contract relating to the Project, the other contracting party shall agree to hold the Corporation of the Town of Gananoque harmless from any and all liability, claim, (including damages, fines, insurance adjuster's fees and legal costs on a full recovery basis), loss, expense, action or suit arising from the Project. Independent of any steps taken by the Town, it shall be the Consultant's responsibility to investigate and handle any and all third party claims arising from the project in a professional manner, within 30 days of receipt, and provide a copy of the response to the Town.

## **8.0 DISPUTE**

In cases of dispute as to whether or not deliverables meet the requirements of the Corporation of the Town of Gananoque, the decision of such agent as the Corporation of the Town of Gananoque may appoint will be final and binding.

## **9.0 NO ASSIGNMENT**

Unless otherwise agreed, should the Corporation of the Town of Gananoque enter into a contract relating to the Project, the other contracting party shall not, without the written consent of the Corporation of the Town of Gananoque, assign or subcontract any aspect of the Project or the deliverables.

## **10.0 FIT FOR USE**

All things supplied under the Project shall be fit for the use specified in the governing documents whether or not detailed specifications on the various components are not set out in the documents.

## **11.0 NO IMPLIED WAIVER**

The failure of either party at any time to require performance by the other party of any provision hereof shall in no way affect his right thereafter to otherwise enforce such provision or to seek damages for the breach thereof.

## **12.0 GOVERNING LAW**

All submitter of proposals, including those outside the Province of Ontario, agree that the rights of all parties shall be governed by the laws of the Province of Ontario and that the venue for dispute shall be within the Province of Ontario. Proponents must be able to demonstrate their ability to perform the work under the law of the Province of Ontario and provide such security as might be required and enforceable under the law of the Province of Ontario.

## **13.0 FORCE MAJEUR**

Neither party shall be held responsible for any remedy arising from delay or failure to perform obligations under this RFP, or any Contract arising from this RFP, when such delay or failure is due to fires, strikes, floods, acts of God or the Queen's enemies, lawful acts of public authorities, or delays or defaults caused by common carriers, which cannot reasonably be foreseen or provided against.

#### **14.0 DEEMED SATISFACTION AS TO SUBMISSION**

The submission of a proposal shall be deemed conclusive proof that the submitter of a proposal has satisfied itself as to all the requirements set out in the RFP, all the conditions which may be encountered, what materials and/or services he/she will be required to supply, or any other matter which may enter into the carrying out of the Project. No claims will be entertained by the Corporation of the Town of Gananoque based on the assertion by the submitter of a proposal that it was uninformed as to any of the requirements of the proposal.

#### **15.0 INSURANCE REQUIREMENTS**

The Bidder shall provide with this RFP, and if successful from time to time thereafter, proof that their personnel are fully covered under Section 9 (3) of the Workers' Compensation Act.

Submit with the RFP, a signed "Undertaking of Insurance" on a standard form provided or as provided by the Insurance Company stating their intention to provide insurance to the Town that their company and workers carry a minimum of \$2,000,000.00 in public liability in accordance with the insurance requirements of the Contract Documents and Standard Construction Document CCDC 2.

The Insurance Policy shall include endorsements for insurance of the Owner and the Consultant.

- Contractor's General Liability Policy Form CCDC 2 – 2008.
- All Risk Property Policy Form CCDC 2 – 2008. The proof of insurance including above endorsements shall be submitted prior to commencement of Work on site.

Include the cost of insurance in the project cost.

Submit a signed and valid Workplace Safety and Insurance Board Clearance Certificate.

#### **16.0 ENFORCEMENT**

Any successful proponent will have to enter into a legally binding agreement with the Corporation of the Town of Gananoque. Where any breach of the terms of that agreement should occur, the Town shall review all legal remedies available to it and use any appropriate remedies to protect the interests of the Corporation of the Town of Gananoque including law suit or application before the appropriate court or tribunal. All submitters of proposals in response to this RFP hereby acknowledge and atone to the jurisdiction of the choice of the Town of Gananoque in any such legal process.

## **17.0 OPENING PROCESS**

Proponents are advised there will be a public opening for this RFP. Submissions received, by the date and time of closing, will be review by the Town and the final results will be communicated to the individual proponents.

## **18.0 PRIVACY AND FREEDOM OF INFORMATION**

All submissions and attached materials received in response to this RFP are deemed to be the property of the Town of Gananoque as of the date of their submission except to the extent they are protected as third party material under applicable privacy law. The Municipal Freedom of Information and Protection of Privacy Act (MFIPPA or the Act) applies to all tenders, quotations and proposals submitted to the Corporation of the Town of Gananoque (the Town). Tenders, quotations and proposals will be received in confidence and are subject to the disclosure requirements of the Act. Pursuant to orders made by the Information and Privacy Commissioner/Ontario, the Town shall not withhold the information from tenders, quotations or proposals, if requested through the MFIPPA process by any person or business

Bidders/proponents should identify any portions of their tender/quotation/proposal which contain a trade secret, scientific, technical, financial, commercial or labor relations information supplied in confidence and which will cause harm if disclosed. The Town of Gananoque cannot ensure that any given portion of any materials received in response will not be ordered released under MFIP.

## **19.0 SECURITY AND BONDING**

Security Deposit:

- RFP's are to be accompanied by security deposit: in the form of a Bid Bond from a surety company licensed to carry on business in the Province of Ontario in amount of 10 percent of Bid price
- Endorse Bid Bond in name of Owner as obligee, signed and sealed by principal (Contractor) and surety.
- Use most current edition CCDC approved bond forms.
- Security deposit will be retained without interest by Owner until the following, whichever comes first:
  - a Contract is entered into and after delivery to Owner of required Performance and Labour and Materials Payment Bond(s) by accepted Bidder, or
  - sixty (60) days after RFP Closing.
- If no contract is awarded, security deposits will be returned.
- Each Proponent understands and agrees that, if their RFP is withdrawn before

Owner considers RFP's, or before they have been notified that the RFP has been accepted by Owner, or if they fail for any reason to execute an Agreement and provide other documents as specified herein, the Owner may retain their security deposit for the Owner's use.

**Consent of Surety/Agreement to Bond:**

- RFP submission must include a clear and unqualified commitment from a surety company licensed to carry on business in the Province of Ontario, to provide Labour and Material Payment and Performance Bonds, in a format acceptable to the Owner, if the Proponent is successful in his submission to the Owner.
- The Consent of Surety/Agreement to Bond must reference:
  - The project and Owner.
  - The monetary value of each of the bonds.
- Include all associated costs of bonds in the Bid Price.
- If no contract is awarded, all security deposits will be returned.
- Required Bonds:
  - The following Bonds are required to be provided by the successful Proponent following execution of the Agreement.
- Labour and Material Payment Bond in the amount of 50 percent of the contract value.
- Performance Bond in the amount of 50 percent of the contract value.

## Schedule A

### FORM OF IRREVOCABLE OFFER

I, hereby offer to provide the requirements under the Request for Proposal, Proposal Number UTIL-2020-01 to the Corporation of the Town of Gananoque according to the terms set out in this proposal as well as in the RFP, including the requirement for an acceptance by a formal contract acceptable to the Corporation of the Town of Gananoque. I also agree that this irrevocable offer shall be open to acceptance by the Town for a period of 120 days from the closing date for the receipt of proposals.

---

Witness

---

Signature

---

Name

---

Title

---

Address

---

City/Province

---

Telephone

---

Fax Number

---

Email

## Schedule B

### PROPOSAL SUBMISSION

RFP NUMBER: UTIL-2020-01

RFP FOR: TOWN OF GANANOQUE  
East End Pumping Station Standby Power System Upgrades

I/We the undersigned have read and understand this Proposal document, and herewith agree to perform the Scope of Work required in accordance with the Proposal document issued by Procurement Services, at the price(s) listed below:

We certify that:

1. The party executing this document is authorized to sign the same.
2. To the best of my/our knowledge and belief the information provided in our Proposal submission is correct.
3. Except as expressly and specifically permitted in the instructions to Proponents, we shall not have any claim for any compensation of any kind whatsoever, as a result of participating in this bid, and by submitting a bid we shall be deemed to have agreed that we have no such claim.
4. To the best of my/our knowledge and belief our bid submission is made without any connection, comparison of figures or arrangement with or knowledge of any other corporation, firm or person submitting a bid for the same work and is in all respects fair and without collusion or fraud.
5. To the best of my/our knowledge and belief no member of the Council and no officer or employee of the Corporation of the Town of Gananoque is, will be, or has, become interested, directly or indirectly, as a contracting party, partner, stockholder, surety or otherwise in, or in the performance of the contract, or in the supplies, work, or business to which it relates, or in any portion of the profits thereof, or in any of the money to be derived therefrom.
6. My/Our bid submission will remain open for acceptance for a period of 60 (sixty) calendar days after opening of the bids and the Corporation of the Town of Gananoque may at any time within this period accept our bid submission.

**PROPOSAL SUBMISSION**

The check boxes below are included as a convenience only to ensure requirements for submission is complete.

<p><b>NUMBER OF COPIES:</b> Three (3) hard copies of the proposal must be submitted, with one originally signed and dated. In addition, one (1) digital copy must be provided on a USB thumb drive.</p>		<input type="checkbox"/>
<p><b>EXPERIENCE OF SIMILAR WORK:</b> The proposal should include a history of the firm as well as experience of similar work and references.  The Proponent shall submit up-to-date resumes for all personnel that will work on the project.</p>		<input type="checkbox"/>
<p>Pursuant to Section 29(1(a) of the <i>Municipal Freedom of Information Act</i>, I _____, authorize the Corporation of the Town of Gananoque to contact any person(s)/companies for the purpose of obtaining reference information.</p>		<input type="checkbox"/>
<p><b>SUBCONTRACTORS:</b> Are there any sub-Contractors being used?</p>	<p><input type="checkbox"/> Yes    No    <input type="checkbox"/> If yes, Please include phone/email information and any other qualifying details as part of submission</p>	<input type="checkbox"/>
<p><b>PROPOSAL BID:</b> The proposal shall include a fixed lump sum price for undertaking the scope of work as described in this RFP. The fee proposal shall include any sub-consultants and all disbursements.</p>		<input type="checkbox"/>
<p><b>ADDENDA:</b> The Proponent is requested to confirm that it has received all addenda by listing the addenda numbers or, if no addenda were issued, "None":  Addenda Numbers: _____</p>		<input type="checkbox"/>
<p><b>SCHEDULES:</b> Schedule "A"    Form of Irrevocable Offer Schedule "B"    Proposal Submission Schedule "C"    Price Proposal</p>		<input type="checkbox"/>
<p><b>SECURITY, BONDING, INSURANCE AND WSIB:</b> Bid Bond Labour and Material Bond Performance Bond Certificates of Insurance WSIB Certificate</p>		<input type="checkbox"/>



**COMMENCEMENT:**

Confirmation Of Earliest Commencement Of Work Upon Award:

Date: \_\_\_\_\_ March 18, 2020 \_\_\_\_\_



**PRICE PROPOSAL**

**TOWN OF GANANOQUE**

**East End Pumping Station Standby Power System Upgrades**

From: .....

.....

.....

.....

(Name and Address of Tenderer)

To: **The Corporation of the Town of Gananoque**  
**30 King Street East, Box 100**  
**Gananoque, Ontario**  
**K7G 2T6**

**1. Base Bid Price:**

I/We, the undersigned, hereby offer and agree to furnish all required labour, materials, equipment and supervision and to execute the work set out in the RFP Documents, including all Addenda, and including all fees, permits, and taxes, but excluding H.S.T., for the Stipulated Price of:

.....

..... DOLLARS \$(.....)

In addition to the above price, Harmonized Sales Tax will be charged at 13%, totaling:

HST \$(.....)

**2. Addenda Acknowledgement:**

I/We acknowledge receipt of and have included for in our Stipulated Price the requirements of the following Addenda:

Addendum No. .... Dated .....	Addendum No. .... Dated .....
Addendum No. .... Dated .....	Addendum No. .... Dated .....
Addendum No. .... Dated .....	Addendum No. .... Dated .....

3. **Cash Allowances:**

I/We have included the cash allowance amount as noted and as listed in Section 01210 Allowances.

4. **Subsequent Tender Closing Agreement Dates:**

- .1 I/We agree to hold this RFP in full force and effective for a period of sixty (60) days from the closing date of the RFP and agree that if my/our submittal is revoked during this period, my/our Bid Security will be forfeited to the Owner to use for his purposes.
- .2 I/We agree, if this RFP is accepted, to execute the specified Agreement and provide the specified Bonds within seven (7) days of notification by the Consultant to do so.
- .3 I/We agree that within seven (7) days after written authorization from the Town/ Consultant to proceed, I/we will commence the Work, assembling all necessary labour forces and equipment on the site, and will continue the work with the utmost diligence until completion.
- .4 I/We commit to attaining Substantial Performance of the work described in the RFP Documents by the date indicated.

## **Schedule C**

### **GENERAL REQUIREMENTS SPECIFICATIONS (DIVISION 00 AND 01)**

<b>SECTION NUMBER</b>	<b>SECTION TITLE</b>	<b>NO. OF PAGES</b>
<b>Division 00</b>		
<b>PROCUREMENT AND CONTRACTING REQUIREMENTS</b>		
00010	TABLE OF CONTENTS	2
00015	LIST OF DRAWINGS	1
00700	SAMPLE AGREEMENT, DEFINITIONS AND GENERAL CONDITIONS	1
00800	SUPPLEMENTARY CONDITIONS	16
<b>Division 01</b>		
<b>GENERAL REQUIREMENTS</b>		
01017	SUMMARY OF WORK	3
01210	ALLOWANCES	1
01320	PROJECT MEETINGS	3
01330	SUBMITTAL PROCEDURES	4
01355	REGULATORY REQUIREMENTS	2
01400	QUALITY CONTROL	4
01500	TEMPORARY UTILITIES	2
01520	CONSTRUCTION FACILITIES	3
01561	ENVIRONMENTAL PROCEDURES	5
01610	COMMON PRODUCT REQUIREMENTS	4
01705	HEALTH AND SAFETY REQUIREMENTS	3
01740	CLEANING	2
01750	COMMISSIONING	2
01760	TRAINING	2
01770	CLOSEOUT PROCEDURES	2
01780	CLOSEOUT SUBMITTALS	5
01810	MAINTAINING OPERATION DURING CONSTRUCTION	5
<b>Division 16 &amp; 17</b>		
<b>ELECTRICAL</b>		
16010	ELECTRICAL GENERAL PROVISIONS	15
16031	ELECTRICAL INSPECTION AND TESTING	10
16045	GROUNDING	2
16070	DEMOLITION	2
16106	UNDERGROUND DUCTS, CONDUITS AND WIRING	3
16122	WIRES AND CABLES	3
16131	SPLITTERS JUNCTION PULL BOXES AND CABINETS	1
16132	OUTLET BOXES CONDUIT BOXES AND FITTINGS	3
16133	CONDUITS CONDUIT FASTENING AND CONDUIT FITTINGS	4
16151	WIRE AND BOX CONNECTORS	2
16271	DRY TYPE TRANSFORMERS	2
16289	SURGE PROTECTIVE DEVICES	4
16412	MANUAL TRANSFER SWITCH	3
16413	AUTOMATIC TRANSFER SWITCH	6
16431	CUSTOMER DIGITAL METERING SYSTEM	2
16440	DISCONNECT SWITCHES	3
16471	PANELBOARDS	3
16500	LIGHTING	4

16662	STANDBY POWER SYSTEM	17
16622.1	STANDBY POWER SYSTEM RACTOR REPORT SAFETY DEVICE	1
16622.2	STANDBY POWER SYSTEM FACTORY REPORT OPERATIONS	1
16622.3	STANBY POWER SYSTEM SITE REPORT SAFETY DEVICES	1
16622.4	STANDBY POWER SYSTEM SITE OPERATIONAL TEST	2
16622.5	STANDBY POWER SYSTEM SITE FULLY LOAD TESTED	2
16622.6	STANDBY POWER SYSTEM SITE CYCLE CRANK TEST	1
16623	HORIZONTAL AIRFLOW OUTDOOR RESISTVIE LOAD BANK	5
16850	ELECTRICAL HEATING	2
17002	SYSTEM INTEGRATION	4
17500	CONTROL NARRATIVE GENERAL OVERVIEW	2

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**DRAWING NO.    TITLE**

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**1.    CIVIL (SITE)**

C01            CIVIL SPECIFICATIONS  
C02            SITE PLAN

**2.    ARCHITECTURAL**

A01            LOUVRE REMOVAL AND INFILL  
A02            ARCHITECTURAL SPECIFICATIONS

**3.    MECHANICAL**

M01            GENERAL ARRANGEMENT  
M02            MECHANICAL SPECIFICATIONS

**4.    ELECTRICAL**

DME01        GENERATOR PUMPING STATION DEMOLITION DETAILS  
E00            COVER LEGEND AND DETAILS  
E01            NEW INSTALLATIONS SITE PLAN LAYOUT  
E02            NEW AND EXISTING SINGLE LINE DIAGRAM  
E03            NEW BUILDING LAYOUT DRAWINGS  
E04            ELECTRICAL DETAILS  
E05            NEW AND EXISTING PANEL SCHEDULE  
E06            GROUNDING DETAILS  
E07            MTS DETAILS  
I01            NEW AND EXISTING FACILITY

END OF SECTION

- 1  
Contract
- .1 The Form of Agreement that the successful Tenderer, as the Contractor, will be required to execute is Standard Construction Document CCDC 2, Stipulated Price Contract, 2008.
- 2  
General Conditions
- .1 General Conditions (GC) of Standard Construction Document, CCDC 2, Stipulated Price Contract, 2008, Parts 1 to 12 inclusive, govern the work of this Contract and are hereby made a part of these Documents to same extent, as if bound herein.

END OF SECTION



## **PART 1 - GENERAL CONDITIONS**

### **1.1 AMENDMENTS**

- .1 The General Conditions of Contract, as outlined in CCDC 2, 2008, are amended as noted hereafter.
- .2 The Standard Construction Document for Stipulated Price Contract, CCDC 2 2008 English version, consisting of the Agreement between *Owner* and *Contractor*, Definitions, and General Conditions of the Stipulated Price Contract, Parts 1 to 12 inclusive, governing same is hereby made part of these *Contract Documents*, with the following amendments, additions and modifications. Where these amendments, additions, and modifications specifically reference a change to the Agreement, Definitions, or General Conditions, these amendments, additions and modifications shall govern.

### **1.2 ARTICLE A-6 – RECEIPT AND ADDRESSES FOR NOTICES IN WRITING**

- .1 Delete Article A-6.1 and substitute new Article 6.1:
  - 6.1 “Notices in Writing between the parties or between them and the *Consultant* shall be considered to have been received by the addressee on the date of receipt if delivered by hand or by commercial courier or if sent during normal business hours by fax and addressed as set out below. Such Notices in Writing will be deemed to be received by the addressee on the next business day if received (by consultant) by fax after 3:59pm of any day or if sent by overnight commercial courier. Such Notices in Writing will be deemed to be received by the addressee on the fifth Working Day following the date of mailing, if sent by pre-paid registered post, when addressed as set out below. An address for a party may be changed by Notice in Writing to the other party setting out the new address in accordance with this Article.”

### **1.3 DEFINITIONS**

- .1 In list of definitions:
  - .1 “**Owner**” means The Corporation of the Town of Gananoque.
  - .2 “**Consultant**” means **J.L. Richards & Associates Limited**.
- .2 Add the following definitions:
  27. “Submittals”

Submittals are documents or items required by the *Contract Documents* to be provided by the *Contractor*, such as:

    - *Shop Drawings*, samples, models, mock-ups to indicate details or characteristics, before the portion of the *Work* that they represent can be incorporated into the *Work*; and
    - As constructed drawings and manuals to provide instructions to the operation and maintenance of the *Work*.”
  28. “Day”

Shall mean period of time from 4:00pm of the previous calendar day to 3:59pm of the current calendar day, or as defined by the Construction Act.

29. "Proper Invoice"

Shall include all requirements dictated by the Construction Act as follows:

1. The contractor's name and address.
2. The date of the "Proper Invoice" and the period during which the services and/or materials were supplied.
3. Information identifying the authority, whether in the contract or otherwise, under which the services or materials were supplied.
4. A description, including quantity where appropriate, of the services or materials that were supplied.
5. The amount payable for the services or materials that were supplied, and the payment terms.
6. The name, title, telephone number and mailing address of the person to whom payment is to be sent.
7. In addition to the items noted above, a "Proper Invoice" shall include the following procedures and information:
  - .1 Submitted on the first Tuesday of the month following the month for which the invoice period pertains.
  - .2 An updated schedule of values showing the breakdown of the services and/or materials that were supplied.
  - .3 A draft, complete with all requirements of a "Proper Invoice" shall be submitted to the consultant seven (7) days prior to the submission of a "Proper Invoice".

30. "Application for Progress Payment" shall mean "Proper Invoice" as defined above.

31. "Adjudication" shall have the meaning as set out in Part II.1 of the Construction Act..

32. "Construction Act" shall mean the Construction Act, R.S.O. 1990, c. C.30, as amended.

**1.4 PART 1 - GENERAL PROVISIONS**

- .1 Where a General Condition or paragraph of the General Conditions of the Stipulated Price Contract is deleted by these Supplementary Conditions, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused.

**1.5 GC1.1 - CONTRACT DOCUMENTS**

- .1 Add to the end of subparagraph 1.1.2.2:  
"Except where the *Consultant* shall be indemnified as a third party beneficiary as provided in subparagraphs 9.2.7.4, 9.2.8.4, 9.5.2.4 and 9.5.3.4 and in 12.1.1."
- .2 1.1.6 Add:  
"The *Contract Documents* are organized by Division for clarity and to identify the expected standard of trade competence in the finished work. No claims will be considered relating to the division of work

between the *Contractor and/or Subcontractors*, including tie in of the work of different trades, spatial interferences, cutting and patching and the like.”

.3 Add new subparagraph 1.1.7.5:

1.1.7.5“In case of discrepancies, noted materials and annotations shall take precedence over graphic indications in the *Contract Documents*.”

.4 Change 1.1.8 to read:

“The Owner shall provide the Contractor, without charge up to five (5) complete sets of the Contract Documents to perform the work. Two (2) complete sets are to be used for Contractor to record ‘as-constructed’ documents for later submission to the Owner. Three (3) complete sets are to be used for Town of Gananoque - Building Permit Application. The Contractor may obtain additional sets of Contract Documents at the Consultant’s net cost including but not limited to cost of printing, handling and shipping.”

## 1.6 GC 2.2 - ROLE OF THE CONSULTANT

.1 Delete paragraph 2.2.4. in its entirety.

.2 Add the word “schedules” after the word “techniques” in paragraph 2.2.6.

.3 Add to the end of the second sentence of paragraph 2.2.6:

“or to adhere to the construction schedule.”

.4 Add at the end of paragraph 2.2.9:

“The *Owner* and the *Contractor* shall waive any claims against the *Consultant* arising out of the making of such interpretations and findings in accordance with paragraphs 2.2.7., 2.2.8. and 2.2.9”.

.5 Add new sentence to end of paragraph 2.2.11:

“The Consultant’s obligation to make findings on a large claim or large number of claims is subject to the terms and conditions of the Owner/Consultant agreement.”

.6 Add new sentence to end of paragraph 2.2.13:

“Should the Contractor be of the opinion that a change in Contract Price or Contract Time is required, the Contractor shall notify the Consultant in writing prior to commencement of the Work. Should the Consultant be in agreement to a change in Contract Price or Contract Time, the Consultant will prepare a Change Order or Change Directive as provided in GC 6.2 – Change Order or GC 6.3 – Change Directive.”

.7 Delete the comma after the word “submittals” and add the words “which are provided” before the words “in accordance” in paragraph 2.2.14.

## 1.7 GC 2.3 - REVIEW AND INSPECTION OF THE WORK

.1 Add to end of paragraph 2.3.2:

“Should a designated test or inspection fail, the Contractor shall promptly correct and retest the work using the designated testing/inspection agency and be responsible for all costs associated with retesting.”

.2 Add new paragraph 2.3.8:

“The Consultant will conduct periodic reviews of the Work in progress, to determine general conformance with the requirements of the Contract Documents. Such reviews, or lack thereof, shall not give rise to any claims by the Contractor in connection with construction means, methods, techniques, sequences and procedures, nor in connection with construction safety at the Place of the Work, responsibility for which belongs exclusively to the Contractor.”

**1.8 GC 2.4 - DEFECTIVE WORK**

.1 Add new subparagraphs 2.4.1.1 and 2.4.1.2:

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

2.4.1.2 “The *Contractor* shall prioritize the correction of any defective work which, in the sole discretion of the *Owner*, adversely affects the day to day operation of the *Owner*.”

**1.9 GC 3.1 - CONTROL OF WORK**

.1 Add the word “schedules” after the word “techniques” in paragraph 3.1.2.

.2 Add new paragraph 3.1.3:

3.1.3 “Prior to commencing individual procurement, fabrication and construction activities, the *Contractor* shall verify, at the *Place of the Work*, all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the *Work* and shall further carefully compare such field measurements and conditions with the requirements of the *Contract Documents*. Where dimensions are not included or exact locations are not apparent, the *Contractor* shall immediately notify the *Consultant* in writing and obtain written instructions from the *Consultant* before proceeding with any part of the affected work.”

**1.10 GC 3.2 - CONSTRUCTION BY OWNER OR OTHER CONTRACTORS**

.1 Change paragraph 3.2.2.2 to read:

“Assume responsibility for compliance with health and safety legislation at the Place of the Work, as it applies to such work.”

**1.11 GC 3.4 - DOCUMENT REVIEW**

.1 Delete paragraph 3.4.1 in its entirety and substitute new paragraph:

“The *Contractor* shall review the *Contract Documents* and shall report promptly to the *Consultant* any error, inconsistency or omission the *Contractor* may discover. Such review by the *Contractor* shall comply with the standard of care described in paragraph 3.14.1 of the *Contract*. Except for its obligation to make such review and report the result, the *Contractor* does not assume any responsibility to the *Owner* or to the *Consultant* for the accuracy of the *Contract Documents*. The *Contractor* shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the *Contract Documents*, which the *Contractor* could not reasonably have discovered. If the *Contractor* does discover any error, inconsistency or omission in the *Contract Documents*, the

*Contractor* shall not proceed with the work affected until the *Contractor* has received corrected or missing information from the *Consultant*.”

#### 1.12 GC 3.5 - CONSTRUCTION SCHEDULE

- .1 Add new sub-sentences .4 and .5 to paragraph 3.5.1:
  - .4 “Commence Work immediately upon award of the Contract, and provide sufficient labour for the steady progress of the Work including overtime work, if required to meet the scheduled date of completion.”
  - .5 “Carry out the Work to completion as rapidly as possible, or as otherwise agreed with *Owner* and *Consultant* consistent with good practice, safe working conditions and reasonable economy.”

#### 1.13 GC 3.6 - SUPERVISION

- .1 Add to paragraph 3.6.1:  
“and not without prior consultation and agreement by the *Consultant* and *Owner*.”

#### 1.14 GC 3.7 - SUBCONTRACTORS AND SUPPLIERS

- .1 Add to paragraph 3.7.2:
  - .1 After the word “indicate” in the first line delete the words “in writing, if requested by the *Owner*”, and add the words “on the applicable ‘Bid Supplementary Form’ form”.
  - .2 Add the following sentence to the end of the paragraph: “The contractor agrees not to change subcontractors and/or suppliers without the prior written consent of the *Owner* and the *Consultant*.”
- .2 Delete the words “through the *Consultant*” in paragraph 3.7.6.

#### 1.15 GC 3.8 - LABOUR AND PRODUCTS

- .1 Change paragraph 3.8.3 to read:
  - 3.8.3 “The *Contractor* shall maintain good order and discipline among workers engaged on the Work and shall not employ or permit to be employed anyone not skilled in the tasks assigned.”
- .2 Add new paragraph 3.8.4:
  - 3.8.4 “The *Contractor* is responsible for the safe on-site storage of *Products* and their protection (including *Products* supplied by the *Owner* and other contractors to be installed under the *Contract*) in such ways as to avoid dangerous conditions or contamination to the *Products* or other persons or property and in locations at the *Place of the Work* to the satisfaction of the *Owner* and the *Consultant*. The *Owner* shall provide all relevant information on the *Products* to be supplied by the *Owner*.”
- .3 Add new GC 3.8.5 to 3.8.11:

- 3.8.5 "Products which are specified by their proprietary names, or by parts or catalogue number, shall form the basis for the Specification and Contract. No substitutes for these may be used without the Consultant's approval in writing. Substitutes will be considered only when submitted as described within during the tender period in sufficient time to permit proper investigation by the Consultant. In applying for permission to use substitutes, the Contractor shall prove, to the Consultant's satisfaction, that the substitute is equal to or better than the specified product. Each application shall be accompanied by a list of properties of the specified product and the proposed substitute. No application to use substitutes will be considered unless formally requested as prescribed within."
- 3.8.6 "The Contractor shall use all products in strict accordance with the manufacturer's directions except where specified otherwise. Whenever specific reference to manufacturer's directions or instructions is made in Specifications, submit copies of said instructions or directions, or both, for approval before commencing such work."
- 3.8.7 "Whenever more than one product is specified for one use, the Contractor may select for this use any of the products so specified unless the Specification or the Drawings indicate otherwise."
- 3.8.8 "Products are sometimes specified by reference to brand names, propriety names, trademarks or catalogue number or catalogue designation or symbols. In such cases, the name of a manufacturer, distributor, supplier or dealer is sometimes given to assist the Contractor to find a source of supply. The naming of a source of supply does not relieve the Contractor from his responsibility for finding his own source of supply even if the source named no longer supplies the products specified. If the Contractor is unable to obtain the specified product, he shall supply a substitute product equal to or better than the specified product, as approved by the Consultant, with no extra compensation. Should the Contractor be unable to obtain a substitute product equal or superior to the specified product and the Owner accepts an inferior product, the Contract Price shall be adjusted accordingly, as approved by the Consultant."
- 3.8.9 "The Contractor shall use Canadian made products where the price and quality thereof are comparable to corresponding foreign made products."
- 3.8.10 "Unless otherwise indicated in the *Contract Documents*, provide all products that are noted and /or illustrated graphically as required to be consistent with the *Work*."
- 3.8.11 "The Contract Price is to include any and all overtime rates as may be required by the Contractor and / or Subcontractor to perform the *Work*."

#### 1.16 GC 3.9 - DOCUMENTS AT THE SITE

- .1 Add to paragraph 3.9.1:

After the word "reports", insert the words "including any reports or orders by authorities having jurisdiction".

#### 1.17 17GC 3.10 - SHOP DRAWINGS

- .1 Add the words "AND OTHER SUBMITTALS" to the Title after SHOP DRAWINGS.
- .2 Add "and *Submittals*" after the words "*Shop Drawings*" in paragraphs 3.10.1, 3.10.2, 3.10.4, 3.10.7, 3.10.8, 3.10.8.2, 3.10.9, 3.10.10, 3.10.11, and 3.10.12.
- .3 Delete 3.10.3 in its entirety and substitute new paragraph 3.10.3

3.10.3 "Prior to the first application for payment, the *Contractor* shall prepare a schedule of the dates for provision, review and return of *Shop Drawings* and *Submittals* and submit it to the *Consultant* for review."

.4 Delete the last sentence in paragraph 3.10.9

.5 Delete the words "with reasonable promptness so as to cause no delay in the performance of the Work" and replace with "within 10 business days or such longer period as may be reasonably required" in paragraph 3.10.12.

.6 Add new paragraph 3.10.13:

3.10.13 "Reviewed shop drawings shall not authorize changes as per GC 4.1.9 Contract Price or Contract Time."

#### 1.18 GC 3.11 - USE OF WORK

.1 Add new paragraph 3.11.3:

3.11.3 "The Owner shall have the right to enter upon the Work for the purpose of placing furniture, fitments and equipment prior to Substantial Performance, provided such entry does not, in the Consultant's opinion, interfere with the Contractor's ability to perform the Work in accordance with the stipulated Contract Time. Such entry shall not be considered as acceptance of the Work, nor shall it in any way relieve the Contractor of his responsibility to complete the Work of the Contract or in any way relieve his role as the 'Constructor'."

#### 1.19 GC 3.14 - PERFORMANCE BY CONTRACTOR

.1 Add new General Condition 3.14.1 and 3.14.2

3.14.1 "In performing its services and obligations under the *Contract*, the *Contractor* shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The *Contractor* acknowledges and agrees that throughout the *Contract*, the *Contractor's* obligations, duties and responsibilities shall be interpreted in accordance with this standard. The *Contractor* shall exercise the same standard of due care and diligence in respect of any *Products*, personnel, or procedures which it may recommend to the *Owner*."

3.14.2 "The *Contractor* further represents, covenants and warrants to the *Owner* that:

- .1 The personnel it assigns to the *Project* are appropriately experienced;
- .2 It has a sufficient staff of qualified and competent personnel to replace its designated supervisor and project manager, subject to the *Owner's* approval, in the event of death, incapacity, removal or resignation."

#### 1.20 GC 4.1 - CASH ALLOWANCES

.1 Amend GC 4.1.2 to read:

"Cash Allowances cover the net cost to the Contractor of services, products, construction machinery and equipment, freight, unloading, handling, storage, installation / labour unless otherwise indicated, and other authorized expenses incurred in performing the work stipulated under the cash allowances, but do not include any Value Added Taxes (HST) payable by the Owner to the Contractor."

- .2 Delete paragraph 4.1.4 in its entirety and substitute new paragraph 4.1.4:  
4.1.4 "Where the actual cost of the *Work* under any cash allowance exceeds the amount of the allowance, any unexpended amounts from other cash allowances shall be reallocated, at the *Consultant's* direction, to cover the shortfall, and, in that case, there shall be no additional amount added to the *Contract Price* for overhead and profit. Only where the actual cost of the *Work* under all cash allowances exceeds the total amount of all cash allowances shall the *Contractor* be compensated for the excess incurred and substantiated, plus an amount for overhead and profit on the excess only, as set out in the *Contract Documents*."
- .3 Delete paragraph 4.1.5 in its entirety and substitute new paragraph 4.1.5:  
4.1.5 "The net amount of any unexpended cash allowances, after providing for any reallocations as contemplated in paragraph 4.1.4, shall be deducted from the *Contract Price* by *Change Order* without any adjustment for the *Contractor's* overhead and profit on such amount."
- .4 Delete paragraph 4.1.7 in its entirety and substitute new paragraph 4.1.7.  
4.1.7 "At the commencement of the *Work*, the *Contractor* shall prepare for the review and acceptance of the *Owner* and the *Consultant*, a schedule indicating the times, within the construction schedule referred to in GC 3.5, that items called for under cash allowances and items that are specified to be *Owner* purchased and *Contractor* installed or hooked up are required at the site to avoid delaying the progress of the *Work*."
- .5 Add new paragraph 4.1.8 and 4.1.9:  
4.1.8 "Where a cash allowance covers a sub-contract, the *Owner* or the *Consultant* will call tenders for that part of the *Work*. Alternatively, the *Owner* or the *Consultant* may elect to have the *Contractor* call tenders and submit the results to the *Consultant*, with *Contractor's* recommendations for *Owner* approval. In either case, the invited bidders shall be mutually approved by the *Contractor* and the *Consultant*, and the *Contractor* shall then enter into a sub-contract with the selected bidder."  
4.1.9 "If requested by the *Consultant*, applications for payment from allowances shall be substantiated by, certified copies of all invoices and statements from suppliers or Sub-Contractors furnishing products, etc., purchased under a cash allowance."

## 1.21 GC 4.2 - CONTINGENCY ALLOWANCE

- .1 Delete entire section.

## 1.22 GC5 5.2 - APPLICATION FOR PAYMENT

- .1 Paragraph 5.2.2, first line: change "dated the last day" to "dated as of the last day".
- .2 Change paragraph 5.2.7 to read:  
"Application for payment for Products manufactured but not yet delivered to the Place of the Work will not be considered. Applications for payment for Products delivered to the Place of the Work but not yet incorporated into the work, provided such Products are project specific and cannot readily be used elsewhere, may be considered for payment on an individual basis and shall be supported by such evidence as the *Consultant* may reasonably require to establish the value of delivered Products."



- .3 Add new paragraph 5.2.8 and 5.2.9:
- 5.2.8 "Include with each application for payment except the first, A statutory declaration in the form CCDC Document 9a, and such additional supporting documents as the Consultant may reasonably require".
- 5.2.9 "Products delivered to the site significantly in advance of their being required for installation in the orderly process of construction will not be eligible for payment, unless approved in writing by the Consultant prior to delivery."
- 5.2.10 "Application for payment shall meet the definition of a proper invoice."

### 1.23 GC 5.3 - PROGRESS PAYMENT

- .1 Delete subparagraph 5.3.1.1 in its entirety.
- .2 Paragraph GC 5.3.1.3:  
.1 Delete all wording after the words "Agreement – PAYMENT", and replace with "as per the Construction Act."
- .3 Add new paragraph 5.3.2 as follows:  
"5.3.2 In the event a construction lien is registered against the *Place of the Work* in circumstances where the *Owner* is not in breach of its payment obligations under this *Contract*, then the *Contractor* shall, within seven (7) days of receiving notice of the construction lien, have the lien removed by way of discharge, settlement, or by posting security to vacate the registration of the lien. In the event that the *Contractor* fails to see to the removal of the construction lien, then without prejudice to any other right or remedy it may have, the *Owner* may see to the removal of the construction lien by payment into court or otherwise, and the costs of so doing shall be to the *Contractor's* account."
- .4 Add new paragraph 5.3.3 as follows:  
"5.3.3 All progress payments are not conclusive as to the value or quality of services provided and are subject to further evaluation and readjustment on future and final progress payments. The submission of monthly draw amounts by the *Contractor* and *Subcontractors* must reflect accurate valuations for *Work* completed and installed. The *Contractor* shall review and evaluate all *Subcontractors Work* and be responsible for verifying the monthly draw amounts claimed."

### 1.24 GC 5.5 - PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

- .1 Delete paragraph 5.5.3.
- .2 Add new paragraph 5.5.6 as follows:  
"5.3.3 The *Owner* may refuse to pay some or all of the holdback amount if:  
(a) The *Owner* publishes a notice of non-payment in accordance with the Construction Act specifying the amount of the holdback that the *Owner* refuses to pay, and the notice is published in a construction trade newspaper no later than forty (40) days after the date on which,  
i. The applicable certification or declaration of substantial performance is published in a construction trade newspaper, or

- ii. If no certification or declaration of substantial performance is published, the date on which this contract is completed, abandoned or terminated; and.
- (b) The *Owner* notifies the *Contractor* of the publication of the notice no later than three (3) days after the publication.”

## 1.25 GC 5.6 - PROGRESSIVE RELEASE OF HOLDBACK

- .1 Delete entire section.

## 1.26 GC 5.8 - WITHHOLDING OF PAYMENT

- .1 Add new paragraph 5.8.2:
  - 5.8.2 “In addition to any rights the *Owner* has pursuant to the Construction Act, if a lien is registered or an action commenced against the *Owner*, the *Owner* shall have the right to withhold, from any money otherwise due to the *Contractor*, the full amount claimed in the lien action plus an additional sum sufficient to satisfy all of the *Owner*’s expenses relating to such lien actions, including legal and consulting costs. These funds held back, less expenses incurred, shall be released to the *Contractor* upon the full discharge of all liens and dismissal of all actions against the *Owner*.”

## 1.27 GC 6.2 - CHANGE ORDER

- .1 Change Paragraph 6.2.2:

“immediately and shall be recorded in a Change Order” to read “when recorded in a Change Order and signed by both the Owner and Contractor”

to read

“when recorded in a Change Order and signed by both the Owner and Contractor”.
- .2 Add new paragraph 6.2.3:

“The costs for the following items shall be considered to be included in the allowance for overhead and profit:

  - .1 Contractor’s head office expenses.
  - .2 Wages of project managers, superintendents, assistants, watchpersons and administrative personnel.
  - .3 Temporary site office expenses, including costs for telephone and facsimile machine.
  - .4 Small tools.
  - .5 Insurance and bonding premiums.
  - .6 As constructed drawings.
  - .7 Time for estimating changes in the Work.
  - .8 Clean up and disposal of waste materials.
  - .9 Extension in schedule.”
- .3 Add new Paragraphs 6.2.5:

“The value of a change shall be determined in one or more of the following methods:

- (a) by estimate and acceptance in a lump sum;
- (b) by unit prices set out in the Contract or subsequently agreed upon;
- (c) by cost and a fixed or percentage fee in accordance with GC 6.3 Change Directive.

- .1 For methods (a) as described in paragraph above apply maximum markups in accordance with paragraph 6.2.6
- .2 For method (b) unit prices shall include all mark-ups and overhead, and shall be full compensation for the described substitutions regardless of the quantity substituted. Unit prices shall be used to establish costs for additional or deleted Work for an agreed upon change. Unit prices do not include the Applicable Value Added Tax."

.4 Add new paragraph 6.2.6:

- .1 "For adjustments to the *Contract Price* carried out by way of a *Change Order* or *Change Directive*, maximum markups for overhead and profit will be limited to:

- .1 Contractor
  - .1 Maximum total of 10% on own work.
  - .2 Maximum total of 5% on Subcontractor work.
- .2 Subcontractor
  - .1 Maximum total of 10% on own work.

- .2 For adjustments greater than \$10,000.00:

- .1 Contractor
  - .1 Maximum total of 10% on own work.
  - .2 Maximum total of 5% on Subcontractor work.
- .2 Subcontractor
  - .1 Maximum total of 5% on own work.

**1.28 GC 6.3 - CHANGE DIRECTIVE**

- .1 Add new subparagraph between 6.3.2 and 6.3.3:

6.3. "No claim for extra payment will be considered if submitted subsequent to the Work of an occurrence or instruction being performed, or which is not initiated in writing within fourteen (14) days of the occurrence or instruction which constitutes the reason for the claim."

- .2 Paragraph 6.3.6.3:

.1 Change "in the Contract Documents" to read "in the Contract Documents as described under GC 6.2 Change Orders".

- .3 Paragraph 6.3.11:

.1 Delete Paragraph 6.3.11 in its entirety.

**1.29 GC 6.4 - CONCEALED OR UNKNOWN CONDITIONS**

- .1 Add new subparagraph 6.4.5:

6.4.5 "The *Contractor* confirms that, prior to bidding the *Project*, it carefully investigated the *Place of the Work* and applied to that investigation the degree of care and skill described in paragraph 3.14.1, given the amount of time provided between the issue of the bid documents and the actual closing of bids, the degree of access provided to the *Contractor* prior to submission of bid, and the sufficiency and completeness of the information provided by the *Owner*. The *Contractor* is not entitled to compensation or to an extension of the *Contract*

*Time* for conditions which could reasonably have been ascertained by the *Contractor* by such careful investigation undertaken prior to the submission of the bid.”

### 1.30 GC 6.5 - DELAYS

- .1 Paragraph 6.5.1, Insert the word "or" between the words "Owner" and "Consultant" in the first sentence and delete the words "or indirectly".
- .2 Delete the period at the end of paragraph 6.5.1, and add the following words:  
“, but excluding any consequential, indirect or special damages.”
- .3 Delete the period at the end of paragraph 6.5.2, and add the following words:  
“, but excluding any consequential, indirect or special damages.”
- .4 Paragraph 6.5.4, first line: after “Consultant” add:  
“and simultaneously to the Owner”.
- .5 Add new subparagraph 6.5.6:  
6.5.6 “If the *Contractor* is delayed in the performance of the *Work* by an act or omission of the *Contractor* or anyone employed or engaged by the *Contractor* directly or indirectly, or by any cause within the *Contractor*’s control, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may decide in consultation with the *Contractor*. The *Owner* shall be reimbursed by the *Contractor* for all reasonable costs incurred by the *Owner* as the result of such delay, including all services required by the *Owner* from the *Consultant* as a result of such delay by the *Contractor* and, in particular, the cost of the *Consultant*’s services during the period between the date of *Substantial Performance of the Work* stated in Article A-1 herein as the same may be extended through the provisions of these General Conditions and any later, actual date of *Substantial Performance of the Work* achieved by the *Contractor*.”

### 1.31 GC 6.6 - CLAIMS FOR A CHANGE IN CONTRACT PRICE

- .1 Delete paragraph 6.6.5. in its entirety and substitute new paragraph 6.6.5:  
“6.6.5 The *Consultant*’s findings, with respect to a claim made by either party will be given by *Notice in Writing* by the *Consultant* to both parties within reasonable time after receipt of the claim information noted in paragraph 6.6.3.”
- .2 Add new paragraph 6.6.7:  
“6.6.7 The *Owner* may make claims arising out of the costs incurred for additional services provided by the *Consultant* resulting from the *Contractor*’s failure to reasonably perform the *Work* in accordance with the terms and conditions of the Contract, including the *Contractor*’s issuance of unnecessary Requests for Information. The *Consultant* will notify the *Owner* and *Contractor* where it has been determined that additional services will be required or have been provided in order not to cause a delay. The *Owner* shall make claims based on the *Consultant*’s invoices.”

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

- .1 Paragraph 7.1.2, second line:  
Delete "to a substantial degree".

**1.33 GC 8.2 - NEGOTIATION, MEDIATION AND ARBITRATION**

- .1 Revise the heading, "GC 8.2 NEGOTIATION, MEDIATION AND ARBITRATION" to read, "GC 8.2 NEGOTIATION AND MEDIATION".
- .2 Delete paragraphs 8.2.6, 8.2.7, and 8.2.8 in their entirety.
- .3 Add the following new paragraphs 8.2.9, 8.2.10, 8.2.11, 8.2.12., 8.2.13., and 8.2.14.
- 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 8.2.14 of this *Contract*; and
  - c) any claims or issues which the *Contractor* or the *Owner*, as the case may be, wishes 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 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 respondent receives a copy of the notice of arbitration.
- 8.2.12 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.
- 8.2.13 The provisions of paragraph 8.2.9 shall apply mutatis mutandis to written notice to be given by the *Consultant* to any sub-consultant.
- 8.2.14 In the event of notice of arbitration given by the *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.

- .4 Add the following new paragraphs 8.2.15.

8.2.15 "Nothing in this section shall be interpreted to limit the parties' rights to Adjudication as defined in the Construction Act".

#### 1.34 GC 9.1 - PROTECTION OF WORK AND PROPERTY

- .1 Delete subparagraph 9.1.1.1 in its entirety and substitute new subparagraph 9.1.1.1:

"9.1.1.1 Errors in the *Contract Documents* which the *Contractor* could not have discovered applying the standard of care described in paragraph 3.14.1;"

- .2 Delete paragraph 9.1.2 in its entirety and substitute the following new paragraph 9.1.2:

"9.1.2 Before commencing any *Work*, the *Contractor* shall determine the locations of all underground utilities and structures indicated in or reasonably determinable from the *Contract Documents*, or that are reasonably determinable from an inspection of the *Place of the Work* exercising the degree of care and skill described in paragraph 3.14.1."

#### 1.35 GC 9.2 - TOXIC AND HAZARDOUS SUBSTANCES

- .1 Add to paragraph 9.2.6 after the word "responsible", the following new words:

"or whether any toxic or hazardous substances or materials already at the *Place of the Work* (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the *Contractor* or anyone for whom the *Contractor* is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the Owner or others,"

- .2 Add "and the *Consultant*" after the word "*Contractor*" in subparagraph 9.2.7.4.

- .3 Add to paragraph 9.2.8 after the word "responsible", the following new words:

"or that any toxic or hazardous substances or materials already at the *Place of the Work* (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the *Contractor* or anyone for whom the *Contractor* is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the Owner or others,"

- .4 Add "and the *Consultant*" after the word "Owner" in subparagraph 9.2.8.4.

- .5 Add new paragraph 9.2.10:

"9.2.10 For the purposes of this General Condition the term toxic and hazardous substances and materials shall be taken to mean and shall be limited to only substances as currently defined by applicable statutory and regulatory requirements."

#### 1.36 GC9.4 - CONSTRUCTION SAFETY

- .1 Add new paragraph 9.4.2:

"The Contractor shall assume the role of the "Constructor" as defined by applicable legislation."

**1.37 GC 9.5 - MOULD**

- .1 Add “and the *Consultant*” after “*Owner*” in subparagraph 9.5.2.4.
- .2 Add “and the *Consultant*” after “*Contractor*” in subparagraph 9.5.3.4.

**1.38 GC 10.2 - LAWS, NOTICES, PERMITS AND FEES**

- .1 Add the following paragraph after 10.2.1:
  - .1 The Construction Act shall be in force, govern payment and interim dispute resolution.
- .2 Delete from the first line of paragraph 10.2.2 the words, “building permit”.
- .3 Paragraph 10.2.3:
  - .1 Insert the word “fees,” after the word “permits,” in the first sentence.
  - .2 Insert the word “fees,” after the words “these permits,” in the second sentence.
- .4 Delete from the first line of paragraph 10.2.5 the word, “The” and substitute the words: “Subject to paragraph 3.14.1, the”.

**1.39 GC 10.4 - WORKERS’ COMPENSATION**

- .1 Paragraph 10.4.1, change first line to read:  
“Prior to commencing the Work, and with each application for payment, and again with the Contractor’s application...”

**1.40 GC 11.1 - INSURANCE**

- .1 Delete paragraph 11.1.1.3, “Aircraft and watercraft liability insurance”.
- .2 Add new paragraph 11.1.8:  
“11.1.8 Insurance shall not be terminated until the Owner has been notified in writing of this intention by the insured and agrees to such termination.”

**1.41 GC 12.1 - INDEMNIFICATION**

- .1 Add new clause 12.1.1.3:  
“12.1.1.3 The Contractor shall indemnify and hold harmless the Consultant, its agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceedings by third parties that arise out of, or are attributable to, the Contractor’s performance of the Contract, provided such claims are attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property, and caused by negligent acts or omissions of the Contractor or anyone for whose acts the Contractor may be liable, and made in writing within a period of 6 years from the date of Substantial Performance of the Work as set out in the certificate of Substantial Performance of the Work, or within such shorter such period as may be prescribed by any limitation statute or the province or territory of the Place of Work.”
- .2 Add new paragraph 12.1.7:  
“12.1.7 If a construction lien is registered or a construction action is commenced against the Owner for any reason whatsoever, the Contractor shall satisfy all judgments and pay all costs

resulting from such liens and actions and shall fully indemnify the Owner against any and all expenses resulting from such liens and actions, including legal costs on a solicitor and his own client basis.”

#### 1.42 GC 12.3 - WARRANTY

- .1 Add “Where *Substantial Performance of the Work* is not certified, warranty periods shall be from date that completion is certified.” to subparagraph 12.3.1.
- .2 Delete from the first line of paragraph 12.3.2 the word, “The” and substitute the words:  
“Subject to paragraph 3.14.1, the”.
- .3 Add the following paragraph between Paragraphs 12.3.2 and 12.3.3:  
“The Contractor shall be responsible for obtaining Product Warranties from respective manufacturers where such warranties are required and/or offered by the manufacturer.
- .4 Add a new paragraph 12.3.7:  
“12.3.7 Carrying out of replacement work and making good of defects as described in the Contract Documents shall be executed at times convenient to the Owner. Such Work may be required to be performed outside normal working hours at no additional cost to the Contract.”

#### 1.43 CCDC 41 - CCDC INSURANCE REQUIREMENTS

- .1 Paragraph 1, change first sentence to read:  
“. . . not less than \$8,000,000 per occurrence, an aggregate limit of not less than \$8,000,000 within any policy . . .”
- .2 Paragraph 2, change first sentence to read:  
“. . . not less than \$8,000,000 inclusive per occurrence for bodily injury, ...”
- .3 Paragraph 3, change first sentence to read:  
“. . . not less than \$8,000,000 inclusive per occurrence for bodily injury, death and damage to property including loss of use thereof and limits of not less than \$8,000,000 for aircraft passenger hazard.”

### PART 2 - PRODUCTS

#### 2.1 NOT USED

- .1 Not Used

### PART 3 - EXECUTION

#### 3.1 NOT USED

- .1 Not Used

END OF SECTION



## **PART 1 - GENERAL**

### **1.1 CONTRACT METHOD**

- .1 Construct Work under a single lump sum, Stipulated Price Contract, based on the CCDC 2-2008 document, as amended by Supplementary General Conditions contained herein.
- .2 Obtain Substantial Completion on or before time indicated
- .3 Contractor Use of Premises: assume responsibility for complete use of the Construction Site.
- .4 Workplace Policies: Comply with all Workplace policies (policies are available from the Workplace) including, but not limited to the following:
  - .1 Workplace Sexual Harassment Policy.
  - .2 Alcohol, Tobacco and Other Drugs - Consumption of tobacco, alcohol and other drugs on Board property are strictly prohibited.
- .5 Criminal Background Checks: comply with all Workplace policies on Criminal Background Checks of Offence Declarations on Service Providers.
- .6 Approvals and Permits:
  - .1 Refer to CCDC 2, GC 10.2.
  - .2 Work is subject to the approval, inspection, by-laws and regulations of all municipal, provincial, federal and other authorities having jurisdiction.

### **1.2 WORK SEQUENCE**

- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction.
- .2 Coordinate Progress Schedule with Owner during construction. Contractor to provide construction schedule at onset of project with expected key dates in order to coordinate any routine operations with the Town. Bypassing of sewage to the environment is not permitted.
- .3 Required stages (Preliminary sequence):
  - .1 Install new generator and ATS
  - .2 Provide and operate temporary pumping necessary for the duration of the project (as required).
  - .3 Remove existing electrical equipment
  - .4 Install new electrical equipment
  - .5 Commission new equipment
  - .6 Removal temporary pumping
  - .7 Install new load back
- .4 Maintain fire/emergency access/control at all times. Maintain access for operations staff at all times.

### **1.3 FEES, PERMITS AND CERTIFICATES**

- .1 Refer to GC 10.2, Laws, Notices, Permits and Fees.
- .2 Pay all fees and obtain all required approvals and permits unless otherwise indicated. Provide

authorities with plans and information for acceptance certificates. Furnish inspection certificates as evidence that work conforms to requirements of authority having jurisdiction.

- .3 Pay all advertisement for substantial completion.
- .4 Maintain and pay for insurance requirements in accordance with GC 41, CCDC 41 CCDC Insurance Requirements.

#### **1.4 CONTRACTOR USE OF PREMISES**

- .1 Coordinate use of premises under direction of Consultant.
- .2 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .3 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .4 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Consultant.
- .5 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

#### **1.5 OWNER OCCUPANCY**

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

#### **1.6 SETTING OUT**

- .1 Retain a Registered Ontario Land Surveyor to lay out new building and other site features as described in the documents.
- .2 Verify new layout against other site features (e.g., hydrants, manholes, roads, etc.) and advise Consultant of any potential inconsistencies.
- .3 After layout is complete and verified, notify Consultant in writing that layout has been completed in accordance with document requirements.
- .4 On completion of the building foundations, have a Legal Survey undertaken by the Ontario Land Surveyor responsible for the layout and submit a signed and sealed confirmation that the construction has been vertically and horizontally located on the site as specified by the Contract Documents.

#### **1.7 EXISTING SERVICES**

- .1 Notify Consultant, Owner and utility companies of intended interruption of services and obtain required permission.
- .2 Provide alternative routes for personnel and vehicular traffic.

- .3 Establish location and extent of service lines in area of work before starting Work. Notify Consultant of findings.
- .4 Submit schedule to and obtain approval from Consultant for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .5 Provide temporary services when directed by Consultant to maintain critical building and tenant systems.
- .6 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .7 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.
- .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .9 Record locations of maintained, re-routed and abandoned service lines.

#### **1.8 DOCUMENTS REQUIRED**

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

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC):
  - .1 CCDC 2-2008, Stipulated Price Contract.
- .2 Project Supplementary Conditions.

### **1.2 CASH ALLOWANCES**

- .1 Refer to CCDC 2, GC 4.1.
- .2 At the conclusion of all cash allowance Work, the Contract Price will be adjusted by written order to provide for excess or deficit to the overall cash allowance.
- .3 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents.
- .4 Include progress payments on accounts of work authorized under cash allowances in Consultant's monthly certificate for payment.
- .5 Prepare schedule jointly with Consultant to show when items called for under cash allowances must be authorized by Consultant for ordering purposes so that progress of Work will not be delayed.
- .6 Include in the Contract, the total stipulated sum **as stated below** for the following allowances for Work specified in the respective Specifications sections:
  - .1 Section 01 45 00 – Quality Control, **\$2,000**, for Independent Testing/ Inspection including but not limited to:
    - .1 Concrete testing.
    - .2 Compaction testing.
  - .2 Towns System Integrate for Communications - **\$10,000**

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Scheduled pre-construction, and progress meetings.

### **1.2 ADMINISTRATIVE**

- .1 The Consultant shall schedule and administer project meetings throughout the progress of Work.
- .2 Meetings to be held at Town Hall.
- .3 Preside at meetings.
- .4 The Consultant shall record the minutes.
- .5 The purpose of the meeting minutes is to document significant proceedings and decisions and identify actions by parties.
- .6 The Consultant shall reproduce and issue a copy of minutes within five (5) business days after each meeting to the Owner, Contractor and all parties in attendance except Subcontractors for their review. Within two (2) business days of receipt of the meeting minutes, the Consultant shall be notified of any noted errors and/or omissions. Consultant will revise the meeting minutes if deemed appropriate and return the revised meeting minutes to the Owner, Contractor and all parties in attendance except Subcontractors.
- .7 The Contactor shall be responsible for distribution of meeting minutes to their Subcontractors.
- .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

### **1.3 PRE-CONSTRUCTION MEETING**

- .1 Within seven (7) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Senior representatives of Owner, Consultant, Contractor, major Subcontractors, and field inspectors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Contractor Use of Premises, Workplace policies and Criminal background checks in accordance with Section 01017 – Summary of Work.
  - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in

- accordance with Section 01330 - Submittal Procedures.
- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01520 - Construction Facilities.
- .5 Delivery schedule of specified equipment in Bar (GANTT) Chart format.
- .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .7 Owner provided products.
- .8 Record drawings in accordance with Section 01330 - Submittal Procedures.
- .9 Take-over procedures, acceptance, warranties in accordance with Section 01780 - Closeout Submittals.
- .10 Monthly progress claims, administrative procedures, photographs, hold backs.
- .11 Appointment of inspection and testing agencies or firms in accordance with Section 01400 – Quality Control.
- .12 Insurances, transcript of policies.
- .13 Site concerns/inquiries to date.
- .14 Environmental protection, measures specific to the project and Place of Work in accordance with Section 01561 – Environmental Procedures.
- .15 Next Meeting.
- .16 Other Business.

#### 1.4 PROGRESS MEETINGS

- .1 During course of Work and two (2) weeks prior to project completion, schedule progress meetings as required.
- .2 Contractor, major Subcontractors involved in Work Consultant and Owner are to be in attendance.
- .3 Notify parties minimum five (5) days prior to meetings.
- .4 Consultant will record minutes of meetings and circulate to attending parties and affected parties, except Subcontractors. The Contractor shall be responsible for distribution of meeting minutes to their Subcontractors.
- .5 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for effect on construction schedule and on completion date.
  - .12 Other business.

**PART 2 - PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**PART 3 - EXECUTION**

**3.1 NOT USED**

.1 Not Used.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES**

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

### **1.2 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC):
  - .1 CCDC 2-2008, Stipulated Price Contract.

### **1.3 ADMINISTRATIVE**

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

### **1.4 DOCUMENTATION REQUIRED**

- .1 Refer to CCDC 2, GC 3.5. - Construction Schedule.



- .2 Prior to construction start, submit the following:
  - .1 An executed construction contract.
  - .2 Performance Bond(s) and Labour and Material Bond(s).
  - .3 Proof of liability insurance, with provisions preventing unilateral cancellation, and with the names of the Owner(s) and Consultant(s) listed as additional insured.
  - .4 Proof that a building permit or applicable clearances from authorities having jurisdiction, has been issued.
  - .5 Proof of environmental clearances, permits as required by authorities having jurisdiction.
  - .6 Proof of compliance with site specific requirements as prescribed in the site plan control agreement with the township, municipality, or city.
  - .7 Copy of 'Notice of Project' to Ontario Ministry of Labour.
  - .8 Certificate of good standing from the Worker's Compensation Board.
  - .9 Copy of company health and safety policies complete with names of employees and subcontractor employees.
  - .10 Construction schedule.
  - .11 Copy of criminal background check of all employees working on site.

## 1.5 SHOP DRAWINGS AND PRODUCT DATA

- .1 Refer to CCDC 2 GC 3.10.
- .2 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, Consultant in writing of revisions other than those requested.
- .3 Accompany submissions with transmittal letter containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .4 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents. Shop drawings submitted without the Contractor's executed stamp of review, will not be considered and will be returned to the Contractor for review and re-submission.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.

- .8 Relationship to adjacent work.
- .5 Should the Consultant deem the Contractor has not complied with the requirements of this section, the Contractor shall be held fully responsible for all delays in the Work to the same extent as if no shop drawings or details had been submitted for that section of the Work.
- .6 After Consultant's review, distribute copies.
- .7 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
- .8 Submit one (1) electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .9 Submit one (1) electronic copy of certificates for requirements requested in specification Sections and as requested by Consultant.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .10 Submit one (1) electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Consultant.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .11 Submit one (1) electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.
  - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 If upon review by the Consultant, no errors or omissions are discovered or if only minor corrections are made, one (1) electronic copy stamped by the Consultant complete with appropriate comments where applicable will be returned electronically in .PDF format and fabrication and installation of Work may proceed. If shop drawings are rejected, one (1) electronic copy stamped by the Consultant complete with appropriate comments where applicable will be returned electronically in .PDF format and resubmission procedure indicated above, shall be repeated prior to fabrication and installation of Work.

## 1.6 CERTIFICATES AND TRANSCRIPTS

- .1 Prior to commencing work on site, and with each application for progress payment, submit Workplace Safety Insurance Board Certificate (WSIB) of good standing.
- .2 Prior to commencing work on site submit:
  - .1 Certificate of General Liability Insurance.
  - .2 Certificate of "All Risk" Property and Boiler Insurance.

**PART 2 - PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**PART 3 - EXECUTION**

**3.1 NOT USED**

.1 Not Used.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 REFERENCES AND CODE**

- .1 Perform Work in accordance with Ontario Building Code (OBC) including amendments up to RFP closing date and other codes of local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes and referenced documents.

### **1.2 HAZARDOUS MATERIAL DISCOVERY**

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Consultant.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Consultant.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Consultant.
- .4 Refer to the append Designated Substance Survey Report for designated substance present at the station
- .5 The disturbance and/or removal of designated substances and hazardous materials must be conducted as per the Occupational Health and Safety Act and Regulations and the Environmental Protection Act and Regulations.
- .6 The non-friable gaskets within the explosion proof lighting contain asbestos. The entire fixture may be disconnected and disposed of without disturbing the gasket following Type 1 abatement procedures described in O.Reg. 278/05.
- .7 Non-friable transite piping may be concealed with the wet-well. This piping may be disconnected and disposed of following Type 1 abatement procedures listed in O. Reg. 278/05.
- .8 Disturbance of the lead-containing paints must be managed per the Ministry of Labour – Guideline – Lead on construction Projects.

### **1.3 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions and municipal by-laws.

**PART 2 - PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**PART 3 - EXECUTION**

**3.1 NOT USED**

.1 Not Used.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.

### **1.2 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC)
  - .1 CCDC 2-2008, Stipulated Price Contract.

### **1.3 INSPECTION**

- .1 Refer to CCDC 2, GC 2.3 Review and Inspection of the Work.
- .2 Allow Owner and Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.
- .4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .5 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

### **1.4 INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged Contractor for purpose of inspecting and/or testing portions of Work.
- .2 Allocated costs: to Section 01210 – Allowances.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 Independent Inspection/Testing Agency to submit copies of all inspection/testing reports directly to Consultant.
- .6 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as

advised by Consultant at no cost Owner. Contractor to pay costs for retesting and re-inspection, and will not be covered under the designated Cash Allowance.

## **1.5 SUPERINTENDENT**

- .1 Refer to CCDC 2, GC 3.6 – Supervision.
- .2 Employ only the Superintendent named, unless otherwise approved by the Consultant, and any other necessary assistance required to perform the Work.
- .3 The Superintendent shall be satisfactory to the Owner and Consultant and shall not be changed except for good reason and only then after consultation with and agreement by the Owner and Consultant.
- .4 The Superintendent shall represent the Contractor at Work site and directions given to him by the Consultant shall be held to have been given to the Contractor.
- .5 The Contractor shall remove the Superintendent of the Work if in the opinion the Superintendent is unable to carry out their proper functions and duties, due to whatever reason, to the complete satisfaction of the Consultant and the Owner.
- .6 Should the Contractor wish to replace the Superintendent, the Contractor shall submit to the Consultant, a request for the change in writing. Include in the written request the reason for the change and the experience and qualifications of the replacement superintendent. The acceptance of the replacement superintendent will be at the sole discretion of Owner and Consultant and issued to the Contractor in writing. Should the replacement superintendent be deemed unacceptable to the Owner or Consultant, submit experience and qualifications of other superintendents for review and approval by the Owner and Consultant until a suitable replacement is accepted.
- .7 The Superintendent of the work shall remain at the place of Work until all deficiencies of all trades have been rectified and the project is deemed Totally Performed by the Consultant.
- .8 The duties of the Superintendent shall include, but not be limited to the following:
  - .1 Co-ordination of the Work of all trades including own forces.
  - .2 Expediting labour and Products of all trades including own forces.
  - .3 Total project control and co-ordination.
  - .4 Project scheduling.
  - .5 Quality control and supervision as required to ensure the project is constructed in accordance with the Contract Documents.

## **1.6 ACCESS TO WORK**

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

## 1.7 PROCEDURES

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

## 1.8 REJECTED WORK

- .1 Refer to CCDC, GC 2.4.
- .2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .3 Make good other Contractor's work damaged by such removals or replacements promptly at no cost to the Owner.
- .4 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.

## 1.9 REPORTS

- .1 Submit one (1) electronic copy of inspection and test reports Consultant.
- .2 Provide copies to subcontractor of work being inspected or tested.

## 1.10 TESTS AND MIX DESIGNS

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

## 1.11 TOLERANCES

- .1 Unless more stringent tolerances are required by a Section of the Specifications or a referenced standard, meet the following tolerances for installed Work:
  - .1 "plumb" shall mean plumb within 3 mm ( $1/8$ " ) in 3 m (10 ft.).
  - .2 "level" shall mean level within 3 mm ( $1/8$ " ) in 3 m (10 ft.).



- .3 "square" shall mean not in excess of 10 seconds less or more than 90°.
- .4 "straight" shall mean within 3 mm ( $\frac{1}{8}$ ") in 3 m (10 ft.) under a 3 m (10 ft.) straight edge.

#### **1.12 DRAINAGE**

- .1 Lay out and construct Work to ensure that positive drainage is provided, preventing undrained areas and ponding.
- .2 Ensure that allowable construction tolerances and structural deflection do not cause ponding of water.
- .3 Report to Consultant in writing prior to executing Work affected, in case adequate drainage cannot be provided.

#### **PART 2 - PRODUCTS**

##### **2.1 NOT USED**

- .1 Not Used.

#### **PART 3 - EXECUTION**

##### **3.1 NOT USED**

- .1 Not Used.

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 U.S. Environmental Protection Agency (EPA) / Office of Water:
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01330 - Submittal Procedures.

### **1.3 INSTALLATION AND REMOVAL**

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

### **1.4 DEWATERING**

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

### **1.5 WATER SUPPLY**

- .1 Provide and pay for temporary supply of potable water for construction use.
- .2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.

### **1.6 TEMPORARY POWER AND LIGHT**

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .3 Provide temporary power for electric cranes and other equipment as required.

### **1.7 FIRE PROTECTION**

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

## **1.8 CONSTRUCTION AID**

- .1 Provide temporary stairs, ladders and ramps required for movement and placing of materials, equipment and personnel.
- .2 Provide and maintain regular shoring and bracing in accordance with Construction Safety Act and other applicable regulations. Design and construct falsework in accordance with CSA S269.1-1975.
- .3 Use of explosive power tools must be approved in writing by Consultant. The use of explosive power tools will not be permitted under any circumstances unless equipped with a device which positively prevents free flight of the stud.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **PART 3 - EXECUTION**

### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

## **PART 1- GENERAL**

### **1.1 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC):
  - .1 CCDC 2-2008, Stipulated Price Contract.
- .2 Canadian Standards Association (CSA International):
  - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-0121-M1978(R2003), Douglas Fir Plywood.
  - .3 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.
- .3 U.S. Environmental Protection Agency (EPA) / Office of Water:
  - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01330 - Submittal Procedures.

### **1.3 INSTALLATION AND REMOVAL**

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

### **1.4 COLD WEATHER CONDITIONS**

- .1 The term "cold weather periods" shall mean the periods between the 15<sup>th</sup> of September to the 31<sup>st</sup> day of May of the following year; from the date of commencement of the Work until the Work is completed.
- .2 Assume full responsibility and pay all costs for snow or ice removal from the project site. Maintain site during cold weather periods including but not limited to cleaning and/or clearing any snow or ice accumulation as required to perform the Work and to provide a safe working environment around the building and project site. Dump snow at properly designated areas to the requirements of local authorities.

## 1.5 SITE STORAGE/LOADING

- .1 Refer to CCDC 2, GC 3.11.
- .2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .3 Do not load or permit to load any part of Work with weight or force that will endanger Work.

## 1.6 CONSTRUCTION PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work or operation of Inn.
- .2 Provide and maintain adequate access to project site and traffic areas. Ensure access to Inn is unencumbered at all times.

## 1.7 SECURITY

- .1 Comply with Owner's security system to Owner approval.
- .2 Provide and pay for security as may be required to guard site and contents of site after working hours and during holidays.

## 1.8 OFFICES

- .1 A copy of all below documents to be maintained by the contractor on-site:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed Shop Drawings.
  - .5 Reviewed Shop Drawings of Owner Furnished Items.
  - .6 List of Outstanding Shop Drawings.
  - .7 Site Instructions.
  - .8 Change Notices.
  - .9 Change Orders.
  - .10 Other Modifications to Contract.
  - .11 Field Test Reports.
  - .12 Copy of Most Recent and Approved Work Schedule.
  - .13 Health and Safety Plan and Other Safety Related Documents.
  - .14 'Notice of Project' from Ontario Ministry of Labour.
  - .15 Building permit.
  - .16 Meeting Minutes.
  - .17 Other documents as specified.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

## **1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE**

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

## **1.10 SANITARY FACILITIES**

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

## **1.11 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

- .1 Not Used.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 Definitions:
  - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
  - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
  - .3 Adequate Ventilation: ventilation, including air circulation and air changes, required to cure material, dissipate humidity, and prevent accumulation of dust fumes, vapours or gases.
  - .4 Construction and Demolition Waste: includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
    - .1 Includes both combustible and non-combustible wastes, such as paper, boxes, glass, crockery, metal and lumber scrap, metal cans and bones.
  - .5 Debris: includes both combustible and non-combustible wastes, such as leaves and tree trimmings that result from construction or maintenance and repair work.
  - .6 Chemical Waste: includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
  - .7 Environmental Pollution and Damage: the presence of chemical, physical, or biological elements or agents that adversely affect human health or welfare; unfavourably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.
  - .8 Hazardous Materials: includes pesticides, biocides, and carcinogens, as listed by recognized authorities.
  - .9 Interior Final Finishes: materials and products that will be exposed at interior, occupied spaces, including flooring, wall coverings, finish carpentry and ceilings.
  - .10 Municipal Solid Waste Landfill: a permitted facility that accepts solid, nonhazardous waste such as household, commercial and industrial waste, including construction and demolition waste.
  - .11 Packaged Dry Products: materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging, including carpets, resilient flooring, ceiling tiles, and insulation.
  - .12 Sediment: soil and other debris that has been eroded and transported by storm or well production runoff water.
  - .13 Sanitary Wastes:
    - .1 Garbage: refuse and scraps resulting from preparation, cooking, distribution, or consumption of food.
    - .2 Sewage: domestic sanitary sewage.
  - .14 Wet Products: materials and products installed in wet form, including paints, sealants, adhesives and special coatings.
- .1 Reference Standards:
  - .1 U.S. Environmental Protection Agency (EPA)/Office of Water:
    - .1 EPA 832/R-92-005-[92], Storm Water Management for Construction Activities, Chapter 3.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01330 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, provide Environmental Protection Plan for review by Consultant.
- .3 Ensure Environmental Protection Plan includes comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan:
  - .1 Name of person responsible for ensuring adherence to Environmental Protection Plan.
  - .2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site.
  - .3 Name and qualifications of person responsible for training site personnel.
  - .4 Descriptions of environmental protection personnel training program.
  - .5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
  - .6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
  - .7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Ensure plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
  - .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Ensure plan includes measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
  - .9 Spill Control Plan including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
  - .10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
  - .11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
  - .12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
  - .13 Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
  - .14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
  - .15 Pesticide treatment plan to be included and updated, as required.



### **1.3 SUBMITTALS**

- .1 Submittals: in accordance with Section 01330 - Submittal Procedures.

### **1.4 FIRES**

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

### **1.5 DISPOSAL OF WASTE**

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

### **1.6 DRAINAGE**

- .1 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .2 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .3 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

### **1.7 SITE CLEARING AND PLANT PROTECTION**

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

### **1.8 WORK ADJACENT TO WATERWAYS**

- .1 Construction equipment to be operated on land only.
- .2 Do not use waterway beds for borrow material.
- .3 Waterways to be free of excavated fill, waste material and debris.

- .4 Do not skid logs or construction materials across waterways.

## 1.9 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.
- .3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .4 Environmental Controls: disposal operations for waste materials that are not identified to be salvaged, recycled or reused:
  - .1 Remove debris, rubbish, and other waste materials resulting from construction operations from site.
  - .2 No burning permitted.
  - .3 Transport materials with appropriate vehicles, and dispose off-site to areas that are approved for disposal by governing authorities having jurisdiction.
  - .4 Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways. Remove spillage, and sweep, wash, or otherwise clean project site, streets, or highways.
  - .5 Comply with applicable regulations.
- .5 Air Resources: prevent creation of dust, air pollution, and odours.
  - .1 Use water sprinkling, temporary enclosures, and other appropriate methods to limit to lowest practical level dust and dirt rising and scattering in air.
    - .1 Do not use water when it may create hazardous or other adverse conditions such as flooding and pollution.
  - .2 Store volatile liquids, including fuels and solvents, in closed containers.
  - .3 Properly maintain equipment to reduce gaseous pollutant emissions.

## 1.10 NOTIFICATION

- .1 Consultant will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Consultant of proposed corrective action and take such action for approval by Consultant.
- .3 Do not take action until after receipt of written approval by Consultant.
- .4 Consultant will issue stop order of work until satisfactory corrective action has been taken.
- .5 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

**PART 2 - PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**PART 3 - EXECUTION**

**3.1 NOT USED**

.1 Not Used.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES**

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

### **1.2 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC):
  - .1 CCDC 2-2008, Stipulated Price Contract.
- .2 Within text of each specifications section, reference may be made to reference standards.
- .3 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .4 If there is question as to whether products or systems are in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.
  - .1 Cost for such testing will be borne by Contractor.

### **1.3 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

#### **1.4 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify 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 event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

#### **1.5 STORAGE, HANDLING AND PROTECTION**

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

#### **1.6 TRANSPORTATION**

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

#### **1.7 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will establish course of action.

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

#### **1.8 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

#### **1.9 COORDINATION**

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

#### **1.10 CONCEALMENT**

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

#### **1.11 REMEDIAL WORK**

- .1 Refer to CCDC 2

#### **1.12 PROTECTION OF WORK IN PROGRESS**

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

#### **1.13 EXISTING UTILITIES**

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

**PART 2 - PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**PART 3 - EXECUTION**

**3.1 NOT USED**

.1 Not Used.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Province of Ontario:
  - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, c.0.1, as amended and O. Reg. 213/91 as amended - Updated 2005.

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01330 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within five (5) working days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit one (1) electronic copy of Contractor's authorized representative's work site health and safety inspection reports to Consultant and authority having jurisdiction, as per their request.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Consultant's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

### **1.3 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

### **1.4 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

### **1.5 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with, Owner, Consultant and authority having jurisdiction prior to commencement of Work.



## 1.6 REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with Section 01 41 00 - Regulatory Requirements.

## 1.7 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Consultant may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

## 1.8 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

## 1.9 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.

## 1.10 UNFORESEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety coordinator and follow procedures in accordance with Acts and Regulations of Ontario having jurisdiction and advise Consultant verbally and in writing.

## 1.11 HEALTH AND SAFETY COORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-coordinator. Health and Safety Co-coordinator must:
  - .1 Have site-related working experience specific to activities associated with the Work.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work and report directly to and be under direction of site

supervisor.

#### **1.12 POSTING OF DOCUMENTS**

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

#### **1.13 CORRECTION OF NON-COMPLIANCE**

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

#### **1.14 BLASTING**

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Consultant and authorities having jurisdiction.

#### **1.15 WORK STOPPAGE**

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

### **PART 2 - PRODUCTS**

#### **2.1 NOT USED**

- .1 Not used.

### **PART 3 - EXECUTION**

#### **3.1 NOT USED**

- .1 Not used.

END OF SECTION

## **PART 1- GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Progressive cleaning.
- .2 Final cleaning.

### **1.2 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC):
  - .1 CCDC 2-2008, Stipulated Price Contract.

### **1.3 PROJECT CLEANLINES**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, to the Owner approval.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site waste containers for collection of waste materials and debris.
- .5 Provide and use marked separate bins for recycling.
- .6 Dispose of waste materials and debris off-site, in accordance with authorities having jurisdiction.

### **1.4 FINAL CLEANING**

- .1 Refer to CCDC 2, GC 3.13.
- .2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris to Owner approval.
- .6 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Broom clean and wash exterior walks, steps and surfaces, paved areas and rake clean other

surfaces of grounds affected by the Work.

.9 Clean drainage systems affected by the work.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

.1 Not Used.

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

.1 Not Used.

END OF SECTION

PART 1 – GENERAL

- 1  
General
- .1 System commissioning is required to verify and document the successful operation of major equipment and mechanical and electrical building systems.
  - .2 Observe detailed procedures and requirements, as specified in Divisions 14, 15, 16, and 17.

PART 2 – PRODUCTS

- 1  
Not Applicable
- .1 Not Applicable.

PART 3 - EXECUTION

- 1  
Commissioning Plan
- .1 At outset of construction, submit for approval names and qualifications of proposed commissioning team, including experienced Commissioning Supervisor.
  - .2 Submit for approval a detailed commissioning plan, including a list of systems to be commissioned, plus personnel, schedule, detailed procedures and reporting requirements for each system.
  - .3 Coordinate commissioning activities with all affected trades.
  - .4 Encourage and accommodate observation of commissioning activities by Owner's Operations Personnel. On completion of commissioning, provide formal Operator Training, as per Section 01760.

- 2  
Commissioning
- .1 Prior to commissioning an individual system, ensure that all prerequisite equipment startups, system balancing and controls verification has been completed and documented.
  - .2 Operate equipment and subsystems through all modes of control and operation, including full and part load, and emergency conditions.
  - .3 Verify operations of all safety limits and alarming/monitoring.
  - .4 Observe actual physical response of systems and components and compare to specified requirements. Reliance on control signals or other indirect indicators is not sufficient.

- .5 Identify any check or test which cannot be completed due to seasonal conditions, lack of occupancy, etc. and propose schedule for completion of testing.
- .6 Document result of each individual check or test on report forms as submitted and approved with commissioning plan.
- .7 Included commissioning reports in Operations and Maintenance Manual for each system.

END OF SECTION

PART 1 – GENERAL

1  
General

- .1 The purpose and intent of Operator Training is to familiarize Owner's Building Operations Personnel with the basic system functioning, proper operation and maintenance requirements for all major building systems.
- .2 Provide Operator Training for all systems, specified in Divisions 2 to 17, and as a basic minimum for the following systems:
  - .1 Heating System
  - .2 Cooling and Ventilation Systems
  - .3 Building Automation and Controls System
  - .4 Plumbing Systems including Domestic Water, Domestic Hot Water, Drainage Sump Pumps and Sanitary Sewerage Lift Pumps, as applicable
  - .5 Normal Power Systems
  - .6 Emergency Power Generator and Transfer
  - .7 Fire Alarm
  - .8 Elevators
  - .9 Specialized Equipment such as Dock Levelers, Trash Compactors, etc., as applicable
  - .10 Kitchen and Laundry Equipment, as applicable.

2  
Preparation

- .1 Prepare and submit a list of all Operator Training sessions.
- .2 Prepare and submit a Training Session outline for each training session.
- .3 Prepare and coordinate with Owner a schedule for various training sessions.
- .4 Ensure that all startup, balancing and commissioning activities have been completed prior to training.
- .5 Include and encourage Owner's Operations Personnel to attend during startup and commissioning activities, however, such participation will not be considered as a substitute for formal training sessions.
- .6 Operate building systems during training, and until such time as formal takeover by the Owner.
- .7 Arrange for video recording of all training sessions, and submit separate video records for each session clearly marked as to system.
- .8 Arrange for the attendance of Manufacturer Representatives, as required, to address all system aspects.

- 3  
Training
- .1 Use Operation and Maintenance Manuals as the basis for training, clearly identifying where operation and maintenance activities can be found in the manuals.
  - .2 Demonstrate operational procedures for all modes of operation.
  - .3 Demonstrate required system maintenance.
  - .4 Demonstrate procedures for dealing with abnormal conditions and emergency situations.
  - .5 Indicate acceptable tolerances in all operational modes and system adjustments to achieve the same.
- 4  
Condition of Substantial Performance
- .1 Operator Training is required for the Owner's use of the facility for the purpose intended and as such is a prerequisite for Substantial Performance of the Work.

PART 2 – PRODUCTS

- 1  
Not Applicable
- .1 Not Applicable.

PART 3 – EXECUTION

- 1  
Not Applicable
- .1 Not Applicable.

END OF SECTION



## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Administrative procedures preceding preliminary and final inspections of Work.

### **1.2 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC):
  - .1 CCDC 2-2008, Stipulated Price Contract.

### **1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Procedures for Acceptance of Work:
  - .1 Contractor's Inspection: Prior to making application for substantial performance of the Work
    - .1 Conduct inspection of Work, identify and submit to the Consultant in writing a comprehensive list of deficiencies and defects, and repair as required to conform to Contract Documents.
    - .2 Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
  - .2 Request in writing for Consultant to inspect Work and identify defects and deficiencies.
  - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
    - .1 Work: completed and inspected for compliance with Contract Documents.
    - .2 Defects: corrected and deficiencies completed.
    - .3 Work: complete and ready for final inspection.
  - .4 Consultants Inspection:
    - .1 When completion tasks are done, make application for Certificate of Substantial Performance. Refer to CCDC 2, General Conditions Article GC Part 5, and Payment. Request in writing for an inspection of Work to be performed by Consultant, and Contractor for the purpose of obtaining Substantial Performance.
    - .2 The Consultant will prepare a written list of deficiencies which will be issued to the Contractor. The Contractor shall then proceed to correct the deficiencies and complete the Work.
    - .3 Should the Work be deemed complete by the Consultant for the purpose of declaring the project Substantially Performed, the Consultant will issue a Certificate of Substantial Performance to the Contractor and Owner in accordance with the requirements of the lien statute of Place of Work.
    - .4 Should Work be deemed incomplete according to Consultant, complete outstanding items and repeat the steps noted above for additional inspections.

### **1.4 NUMBER OF INSPECTIONS**

- .1 The Consultant and the Owner will perform final inspections as described above.
- .2 Should additional inspections be necessary in the opinion of the Consultant, such inspections will be performed by the Consultant and Owner and the Contractor shall pay all costs of time, transportation and miscellaneous expenses incurred by any and all members of the Consultant and Owner team.

- .3 The applicable Consultant rates shall be J.L. Richards & Associates Limited current per diem professional rates. The Owner shall be reimbursed at the Owner's established rates.

## **1.5 FINAL CLEANING**

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

- .1 Not Used.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 SECTION INCLUDES:**

- .1 Record documents, samples, specifications.
- .2 Equipment and systems.
- .3 Product data, materials and finishes, and related information.
- .4 Operation and maintenance data.
- .5 As constructed documents.
- .6 Warranties and bonds.

### **1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with Consultant to:
    - .1 Verify Project requirements.
    - .2 Review manufacturer's installation instructions and warranty requirements.
  - .2 Consultant to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks following Substantial Performance of the Work, provide to the Consultant and / or Owner as directed by Consultant:
  - .1 As Constructed documents.
  - .2 Warranties.

### **1.4 FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 8 ½ x 11 inches with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.

- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .6 Text: manufacturer's printed data, or typewritten data.
- .7 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .8 Provide 1:1 scaled CAD files in dwg format.

### **1.5 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume (provide title of project):
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant and Contractor / Sub-Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01400 - Quality Control.

### **1.6 AS-CONSTRUCTED DOCUMENTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, Consultant one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Supplemental Instructions.
  - .5 Change Orders and other modifications to Contract.
  - .6 Reviewed shop drawings, product data, and samples.
  - .7 Field test records.
  - .8 Inspection certificates.
  - .9 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.

- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant.

## **1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

- .1 Record information on set of drawings, provided by Consultant.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress:
  - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Supplemental Instructions.
  - .6 Changes made by change orders.
  - .7 Details not on original Contract Drawings.
  - .8 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Supplemental Instructions.
  - .3 Changes made by Addenda and change orders or change directives.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications.
- .7 Provide digital photos, if requested, for site records.

## **1.8 FINAL SURVEY**

- .1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

## 1.9 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Remove and replace damaged products at own expense and for review by Consultant.

## 1.10 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, thirty (30) days before planned pre-warranty conference, to Consultant approval.
- .3 Warranty management plan to include required actions and documents to assure that Consultant receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Consultant for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint four (4) month and nine (9) month warranty inspection, measured from time of acceptance, by Consultant.
- .9 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.

- .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
- .7 Cross-reference to warranty certificates as applicable.
- .8 Starting point and duration of warranty period.
- .9 Summary of maintenance procedures required to continue warranty in force.
- .10 Cross-reference to specific pertinent Operation and Maintenance manuals.
- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.
- .3 Contractor's plans for attendance at four (4) and nine (9) month post-construction warranty inspections.
- .4 Procedure and status of tagging of equipment covered by extended warranties.
- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the Consultant to proceed with action against Contractor.

## **PART 2 - PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **PART 3 - EXECUTION**

### **3.1 NOT USED**

- .1 Not Used.

END OF SECTION

1.1  
Description of Section

- .1 This Section provides the basis for construction sequencing and scheduling and identifies scheduling constraints.
- .2 Alternative sequencing proposed by the Contractor will be considered subject to approval of the Owner and the Consultant and provided that ongoing facility operation can be maintained.

1.2  
General Outline of Procedures

- .1 The following general construction sequence is intended to identify potential constraints to the construction schedule, in order that risks to the process are reduced and that unless noted otherwise the existing level of service is maintained during the entire construction and commissioning period. Facility operation itself, is dynamic. Construction scheduling may need to be modified to suit ongoing conditions at the plant.
- .2 With reference to Section 01017 - General Instructions, construct all new works in a manner that minimizes interference with existing process.
- .3 Modifications to the facility can proceed with controlled interference to the operation of the existing facility. While proposed new works are under construction, process flows will continue through the facility, or through bypasses where indicated herein. Bringing new works into operation will affect certain operational procedures and these must be discussed and approved with the designated Owner representative before proceeding.
- .4 The facility generally consists of pumps that move wastewater to the treatment lagoons. The facility has some redundancy built-in, but there is no redundant pumping station, and it must remain in service throughout construction.
- .5 The Contractor is to establish a backup plan related to ongoing work within the facility in order to respond to increases in influent flows.
- .6 Contractor supplied backup equipment is to be available at all times, unless the risk of non-availability has been properly assessed and has been accepted in writing by the Owner and the Consultant. Verify backup equipment operation prior to proceeding with related shutdowns. Documented contingency plans must be in place prior to any operations that may affect the treatment process.
- .7 Standby power to remain available continuously. Interruptions to standby power availability of very short durations will be permitted, but only under specified conditions and prior approval from the Owner.
- .8 Provide temporary standby power where indicated herein and where necessary to maintain the required level of operation and redundancy.

1.3  
Responsibilities

- .1 Facility staff will take over responsibility for operating all new equipment that has been successfully commissioned, operator



- training, and acceptance in writing by the Owner.
- .2 Reliance on and acceptance of responsibility for new automatic controls by the Owner will occur only after the system is successfully commissioned.
- .3 Contractor is to maintain all new equipment in accordance with the manufacturer's written instructions until Substantial Performance. Contractor must keep a maintenance log indicating when required maintenance has been completed. Breakdowns of new equipment followed by failure of backup equipment due to faulty installation or lack of due diligence, resulting in spills or unacceptable effluent quality before Substantial Performance, will be Contractor's responsibility.
- 1.4 Coordinating Construction with Operation of Existing Facilities
- .1 Operation of the facility must be given priority at all times. Refer to Section 01017 General Instructions.
- 1.5 Scheduling
- .1 Contractor to prepare a preliminary schedule of activity that could have an impact on the existing facility process. Note that this scheduling requirement is in addition to requirements outlined in Section 01320, Construction Progress Documentation. The schedule for activities that impact facility operations is to be included for discussion at all construction sequencing review meetings in addition to regular construction meetings.
- .2 The schedule is to be updated monthly and include a detailed schedule of activities for the following three (3) weeks. Owner requires a minimum of 1 weeks' notice to arrange, if possible, temporary shutdowns of various processes.
- .3 During critical activities, meet each day prior to commencing work to review the day's activities.
- .4 Where unit processes are taken out of service, monitor Environment Canada weather forecasts on a daily basis or more frequently where increasing facility influent flows could necessitate flooding in which construction activities are incomplete.
- .5 Identify temporary shutdowns, or requested operational changes a minimum of ten (10) days in advance. Five (5) days before the intended shutdown or operational change, define a specific date. Confirm the date and time 72 hours in advance. Owner will review the proposed temporary shutdown or operational change.
- .6 For each temporary shutdown, or requested operational change, provide a written plan identifying:
- .1 Length of shutdown.
- .2 Manpower assignment and contact list.
- .3 Material and equipment resources required.

- 
- .4 Contingency plans for equipment or component failure.
  - .5 Contingency plans for foreseeable conditions such as power failure, component failure, higher or lower than expected process variables.
  - .7 List of all related items to be completed prior to proceeding with the shutdown or process disruption.
  - .8 Review plan with the Owner and Consultant and incorporate comments and required changes.
  - .9 Prior to commencing work, review plan and confirm with the Consultant and Owner that all required resources are available. Submit plan allowing sufficient time for the Owner to submit to regulatory authorities for review, where there is a risk that facility performance may be impaired.
  - .10 Prepare schedule in order that one unit process is tested and commissioned prior to undertaking construction activities and/or commissioning that may affect the performance of a second unit process.
- 1.6 Cooperation with Other Contractors
- .1 Refer to Section 01017 – General Instructions with respect to cooperation with third-party Contractors.
  - .2 Refer to Section 01017 - General Instructions, and Section 11300 – General Terms and Conditions with respect to preselected equipment
- 1.7 Isolating Existing Facilities
- .1 Existing isolation valves and gates may not be used by the Contractor to isolate sections of the works.
  - .2 The Owner provides no guarantee that existing equipment is adequate for tight shutoff or suitable for health and safety requirements. The Contractor is to provide additional devices such as blind flanges, sandbagging, etc., necessary to complete the work.
  - .3 All valves, gates, etc. are to be operated by Owner staff in cooperation with the Contractor. Both the Contractor and Owner are to provide separate lock out devices on actuators, disconnects, etc. Provide written notice to the Owner prior to opening/closing valves or installing/removing gates.
- 1.8 Off-Hour Supervision
- .1 Essential existing equipment functions are monitored and alarmed. Plant staff respond to alarms.
  - .2 Existing annunciator and alarm system is to be maintained at all times. Temporary similar systems may be used where acceptable to the Owner and Consultant.
  - .3 Prior to putting new or temporary equipment or systems into

service, connect, verify and demonstrate to the Owner and the Consultant remote alarming as required in the documents.

- .4 Maintain automatic monitoring and alarm systems during off-hours, Where work may have affected monitoring and alarming capability verify and demonstrate operation
- .5 Where critical functions are not monitored to the satisfaction of the Owner, provide competent off-hours supervision until such time that work and controls, and monitoring are complete.
- .6 In some cases, the Owner may request that the Contractor provide onsite attendance during normally unoccupied periods. In this event, the Contractor is to provide senior staff. Contractor will be compensated for this additional work where all other conditions of the contract have been satisfied.
- .7 During normal working hours advise the Owner in writing of any interruption of monitoring and alarm systems.
- .8 Contractor to have senior staff on call and be able to respond within 90 minutes during critical shutdowns or initial operation of equipment where there is a risk to plant operations.

1.9  
Temporary Electrical Services

- .1 Refer to Section 01500 – Temporary Utilities for additional information.

1.10  
Partial Occupancy or Use

- .1 Subject to the terms of the Contract, the Owner will consider accepting various upgrades and/or equipment prior to Substantial Performance. Clearly indicate in the Construction Schedule, any parts of the Work that will be completed and ready for early acceptance

1.11  
General Construction Sequence

- .1 The following outlines a preliminary construction sequence. This sequence is intended to provide the Contractor with general guidance and is not intended to be a prescribed sequence or an all-inclusive comprehensive list of all construction sequencing constraints or issues. The Contractor's detailed construction is to incorporate the intent of this construction sequence:
  - 1. Demolish existing lighting and install new chain hung fixtures.
  - 2. Install generator, underground ducts, temp generator lugging/switch, EPO, JB-100.
  - 3. Partial demolition of retaining wall to allow for new ATS.
  - 4. Install new ATS, complete all standby power wiring.
  - 5. Rough-in common standby and normal power wiring conduit.
  - 6. Test generator and simulate for ATS response (Existing station still not affected in any way).
  - 7. Install temporary diesel pumps, manually supervised to maintain station functionality during demolition.
  - 8. Isolate utility power.
  - 9. Demolition of 600V bus and existing ATS.
  - 10. Demolition of generator controller.

11. Maintain PLC controls below demolished panels.
12. Remove 1 $\phi$  transformer and all primary 600V wire/conduit. Maintain secondary 120/240V wiring for back-feeding existing circuit from LP-100.
13. Remove 3 $\phi$  transformer above 3 $\phi$  panel. Remove primary and secondary wiring and equipment. Maintain existing LP-A panel for back-feeding from new LP-100.
14. Demolish existing electric unit heater. Provide temporary unit heater as required.
15. Install new 600V distribution panel DP-100.
16. Install new 45 KVA transformer TX-100 and 120/208V panel LP-100.
17. Complete rough-ins from standby power and normal power from CT/PT.
18. Back feed 120V to both existing panels (LP-A and LP-B) from LP-100.
19. Complete 120/208V power connections to new generator sources from LP-100.
20. Provide control monitoring connections to new generator / ATS.
21. Restore utility power and test.
22. Maintain VFD power connections to pumps.
23. Back feed existing single phase circuit from LP-100.
24. Remove diesel pumping and commissioning systems.
25. Demolish existing generator and mechanical systems.
26. Demolish battery charger and batteries, exhaust fan T-STAT and damper system.
27. Provide feeders and circuit protection for new air conditioners.
28. Install new 600V electric unit heaters.
29. Install load bank controller system to protect the new generator from light load wet stacking conditions.
30. Replace existing junction box as described in Detail 2/E03.

END OF SECTION

## **Schedule D**

### **ELECTRICAL TECHNICAL SPECIFICATIONS (BY J.L.RICHARDS)**

PART 1 - GENERAL

1.1  
Related Work

- .1 Definition: Related Work does not define the responsibility of providing but rather refers to standards of materials and installation required. Refer to Part 2 of the appropriate section for responsibility of providing the material and Part 3 for responsibility of installation.
- .2 General Requirements: Division 1
- .3 Equipment to be Salvaged: Division 1
- .4 Excavation and Backfill: Division 2
- .5 Concrete Work/Formwork/Reinforcing: Division 3
- .6 Plywood Backboards: Division 6
- .7 Painting: Division 9
- .8 Grounding: Section 16045
- .9 Electrical Inspection and Testing: Section 16031

1.2  
Definitions

- .1 Following are definitions of terms and expressions used in specification:
  - .1 "Inspection Authority" means agent of any authority having jurisdiction over construction standards associated with any part of electrical work on site.
  - .2 "Supply Authority" means electrical power company or commission responsible for delivery of electrical power to project.
  - .3 "Electrical Code" means Ontario Electrical Safety Code Latest Edition.
  - .4 "as indicated" means as shown on drawings.
  - .5 "as specified" means as specified elsewhere in specification.
  - .6 "Provide" means coordinate, supply, install, wire, connect, start-up and commission into intended operational service.
  - .7 "Process Equipment" means any motor, operating station, instrument, etc., used in the process of monitoring and moving waste water.

- .8 "House Equipment" means any devices such as lights, switches, receptacles, heaters, etc. that forms part of the building system and is not used directly in the process of moving waste water.
- .9 "Manufacturer's Representative" means factory trained person who can start up a particular device from a particular manufacturer. Manufacturer must provide written confirmation of a representative not in their direct employment.
- .10 "Finger Printing" means map out existing controls, process, and peripheral system monitoring as well as operation intergration of aforementioned systems. Provide report upon completion.

.2 Refer to CSA C22.2 No. 0 for "Definitions and General Requirements".

1.3  
Abbreviations

- .1 OESC means Ontario Electrical Safety Code, Latest Revision and applicable Safety Bulletins.
- .2 CEC means Canadian Electrical Code.
- .3 CEMA - see EEMAC.
- .4 CGSB means Canadian General Standards Board.
- .5 CSA means Canadian Standards Association.
- .6 EEMAC means Electrical and Electronic Manufacturers Association of Canada.
- .7 NBC means National Building Code.
- .8 OBC means Ontario Building Code.
- .9 ISA means Instrumentation Society of America.

1.4  
Electrical Abbreviations

- .1 Following abbreviations are used for electrical terms:
  - .1 AC alternating current
  - .2 AWG American wire gauge
  - .3 A ampere
  - .4 AM/FM amplitude and frequency modulation
  - .5 dB decibel
  - .6 DC direct current
  - .7 Hz hertz
  - .8 kV kilovolt
  - .9 kVA kilovolt-ampere

- .10 kW kilowatt
- .11 kWh kilowatt-hour
- .12 m meter
- .13 mA milliampere
- .14 mm millimeter
  
- .15 rms root-mean-square
- .16 V volt
- .17 W watt

.2 The following abbreviations are used for equipment:

- .1 ACP - Area Control Panel
- .3 DTT - Dry Type Transformer
- .4 ATS - Automatic Transfer Switch
- .5 DP - Distribution Panel
- .6 VFD - Variable Speed Drive
- .7 UPS - Universal Power Supply.
- .8 ALB – Automatic Load Bank.
- .9 MTS – Manual Transfer Switch.
- .10 DP – Electrical Distribution Panel (600V).
- .11 LP – Electrical Lighting Panel.
- .12 BP – Electrical Branch Panel.
- .13 DMS – Digital Power Metering System.

1.5  
Codes and  
Standards

- .1 Carry out all work in accordance with these drawings and specifications, meet latest regulations of Electrical Code and applicable Municipal and Provincial Codes and Regulations. In each and every instance of application, the Code, Regulation, Statute, By-Law or Specification having most stringent requirements applies.

1.6  
Permits and Fees

- .1 Submit to Inspection Authority and Supply Authority necessary number of working drawings and specifications for examination and approval prior to commencement of work and pay all associated fees. These documents to be provided by Engineer at no cost.
- .2 Obtain and pay for all inspection fees.

1.7  
Electrical System  
Support Anchorage  
and Seismic Restraint

- .1 Provide support, anchorage and restraint of Electrical distribution systems and equipment, designed and constructed in accordance with the latest edition of the following:
  - .1 National Building Code, Section 4.1.9.
  - .2 Ontario Building Code, Section 4.1.9.
  - .3 ASHRAE Applications, Seismic Restraint Design.



- 
- .2 Reserved.
  - .3 Coordinate electrical system support, anchorage and restraint system with the requirements and constraints of the structure, vibration isolation systems and the support, anchorage and restraint systems for mechanical and architectural components of the building.
  - .4 Reserved
  - .5 The following items are to be specifically addressed:
    - .1 Installation of Standby Power Generator
    - .2 Installation of Electrical Panels and Cabinets.
    - .3 Reserved
    - .4 Installation of Transformers.
    - .5 Installation of Distribution, Lighting and Branch Panels
    - .6 Installation of Electric Unit Heaters.
- 
- 1.8 Product Data and Shop Drawings
    - .1 As per Section 01340 – Shop Drawings, Product Data and Samples.
    - .2 Show on product data and shop drawings, details of construction dimensions, capacities, weights and electrical performance characteristics of equipment or material.
    - .3 Wiring drawings showing interconnection with work of other divisions are required.
    - .4 Submit product data and/or shop drawings for all electrical equipment (Divisions 16 and 17) and equipment devices supplied under this contract.
- 
- 1.9 Operation and Maintenance Data
    - .1 As per Section 01730 – Operation and Maintenance Manual.
    - .2 Include in manuals, information based on following requirements:
      - .1 Operation and maintenance instructions to be sufficiently detailed with respect to design elements, construction features and component function and maintenance requirements to permit effective operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
      - .2 Technical data to be in the form of reviewed product data supplemented by bulletins, technical descriptions of items, and parts lists. Advertising or sales literature will not be acceptable.
    - .3 Include copies of all product data and shop drawings.

- 
- |   |    |  |
|---|----|--|
|   | .4 | Provide wiring and schematic diagrams and performance curves.  |
| 1.10<br><u>Maintenance Materials</u>        | .1 | As per Section 01731 – Maintenance Materials, Special Tools and Spare Parts.   |
|   | .2 | Maintenance materials are required as specified in appropriate sections.   |
| 1.11<br><u>Receipts</u>                     | .1 | Turn over to Owner and obtain receipts for:<br>.1 Maintenance materials.<br>.2 Portable equipment specified.<br>.3 Tagged keys for all equipment supplied with locks.<br>.4 Spare lamps.<br>.5 Fuses.              |
|   | .2 | Submit photocopies of these receipts with final Certificates of Approval.  |
| 1.12<br><u>Delivery and Storage</u>         | .1 | Store all equipment indoors.   |
|   | .2 | Ship and store floor-mounted equipment in upright position.  |
|   | .3 | Ship channel bases and templates in advance of equipment.  |
|   | .4 | Keep doors locked, meters and the like protected from damage and dust.   |
| 1.13<br><u>Care, Operation and Start-up</u> | .1 | Instruct Owner or designated personnel in operation, care and operation of installation at times arranged with Owner.  |
|   | .2 | Arrange and pay for services of manufacturer's factory representative to supervise start-up of installation, check, adjust, balance and calibrate components.  |
|   | .3 | Where a factory representative is required, this is specified in appropriate section.  |
|   | .4 | Provide these services for such period and for as many visits as necessary to put installation in working order, and to ensure that operating personnel are conversant with all aspects of its care and operation. |
| 1.14<br><u>Project Record Documents</u>     | .1 | As per Section 01780 – Closeout Submittals.  |
|   | .2 | Indicate on record drawings location of all buried services either   |

discovered or installed under this contract. This information is to be certified correct by Engineer before backfilling commences.

.3 Show interconnection of mechanical and electrical components, on record drawings.

.4 Indicate in red on Record Documents all changes from work as indicated. Include all changes made by Addendum or Change Order.

.5 These documents will be reviewed by Engineer and considered as part of the contract when reviewing monthly progress payments.

.6 Should the Contractor fail to provide satisfactory record drawings, these will be prepared by the Engineer at the expense of the Contractor.

.7 The Engineer will provide Contractor with two (2) sets of white prints on award of contract.

.8 Contractor to use one set for recording changes during construction. The changes to be transferred to the second set as record drawings. Both sets of prints to be returned to Engineer.

1.15  
Review of Materials

.1 Refer to Section 01340 – Shop Drawings, Product Data and Samples.

1.16  
Cooperation

.1 Schedule execution of work with associated work specified in other divisions.

1.17  
Ratings

.1 Operating voltages to be within those defined in CAN3-C235.

.2 All motors, electric heating, control and distribution devices and equipment provided under this contract to operate satisfactorily at 60 Hz within normal operating limits established by above standards. Equipment must be able to operate in extreme operating conditions as defined in standard without damage to equipment.

1.18  
Qualifications

.1 Contractor to have qualified personnel to continuously direct and monitor all electrical work.

.2 Contractor may be required to list names and qualifications of supervisory personnel on tender form.

.3 Supervisory personnel to attend all site meetings.

1.19  
Products, Materials  
and Equipment

- .1 Refer to Section 01340 – Shop Drawings, Product Data and Samples for the following definitions:
  - .1 Specified manufacturer/supplier.
  - .2 Standard of Acceptance.
  - .3 Acceptable Manufacturers/Suppliers.
- .2 Some of the equipment in Division 16 and 17 have been collected through an extensive review with multiple manufacturing companies and the equipment listed meets pricing and performance criteria established for this project. In such cases, only Acceptable Manufacturers/Suppliers have been listed.

PART 2 - PRODUCTS

2.1  
General

- .1 All equipment and material to be new, CSA certified, manufactured to minimum CSA standard quoted including additional specified requirements.
- .2 Where there is no alternative to supplying equipment which is not CSA certified, submit such equipment to Inspection Authorities and provide for special inspection and obtain approval before delivery of equipment to site.
- .3 All control panels and component assemblies to be shop manufactured and CSA certified.
- .4 Use material and equipment available from regular production by manufacturer concerned except where custom designed equipment is specified.

2.2  
Identification

- .1 Identify all electrical equipment supplied under this Division. Hand-painted identification will not be accepted.
- .2 Use phenolic plastic laminate, machine engraved nameplates attached with self-tapping screws.
- .3 Use white plates with black characters for normal power and red plates with white characters for emergency power.

DIMENSIONS

# LINES

LETTER HEIGHT

Size 1	10 x 50 mm	1	3 mm
Size 2	13 x 75 mm	1	5 mm
Size 3	13 x 75 mm	2	3 mm
Size 4	20 x 100 mm	1	8 mm
Size 5	20 x 100 mm	2	5 mm
Size 6	25 x 125 mm	1	12 mm
Size 7	25 x 125 mm	2	7 mm
Size 8	50 x 150 mm	1	25 mm
Size 9	75 x 150 mm	2	19 mm
.4	Wording on nameplates to be approved by Engineer prior to manufacture.		
.5	Allow for average of twenty-five (25) characters per nameplate.		
.6	All identification to be in English.		
.7	Panel nameplates, size 7, to identify panels, as indicated, and voltage characteristics.		
.8	For distribution panels provide a nameplate, size 5, for each circuit appropriately engraved identifying equipment or panel controlled.		
.9	For branch circuit panels provide a typed directory inside door of each panel stating type of load and room location for each circuit. Supply a protective plastic envelope for directory.		
.10	Identify circuit numbers on back of receptacle and switches with wire markers.		
.11	Correct existing panel legends and nameplates to reflect changes made.		
.12	Transformer nameplates, size 7, to show capacity, primary and secondary voltages.		
.13	Nameplates, size 5, for disconnect switches, splitters and contactors to indicate equipment being controlled, voltage characteristics, ampere or horsepower kilowatt rating of equipment.		
.14	Nameplate for each stand-alone starter to be size 1 engraved "name of equipment controlled".		
.15	Nameplate on each remote control device to be size 1 engraved "name of equipment controlled".		
.16	Nameplates, size 5, for terminal cabinets, pull boxes and junction boxes to indicate system and/or voltage characteristics.		
.17	At underground penetrations, size 9 on outside wall stating description of feed(s), and their supply source.		

2.3  
Wiring  
Identification

- .1 Provide phase identification markings on both ends of phase conductors of feeders. Arrange uniform phase-to-main lug connection on all equipment, i.e. panelboard, starter, disconnect switches, etc.
- .2 Provide numbered tape markings on all branch conductors including neutrals. Where common neutrals are used, identify branch circuit numbers.
- .3 The following colour coding of conductor insulation is to be strictly adhered to:
 

Phase A	-	red
Phase B	-	black
Phase C	-	blue
Neutral	-	white
Ground	-	green
- .4 At all junction boxes, splitters, cabinets and outlet boxes, maintain identification system.

2.4  
Conduit  
Identification

- .1 Colour code all conduits, instrumentation cables, and TECK90 cables.
- .2 Coding to be located on all conduits and cables exposed after completion of building and in suspended removable ceilings.
- .3 Coding to be plastic tape or paint at all points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .4 Colours to be 25 mm wide prime colour and 13 mm wide auxiliary colour.

	<u>Prime</u>	<u>Auxiliary</u>
Up to 250 V	yellow	
Up to 600 V	yellow	green
Telephone	green	
RF Antenna Signal	green	red
Ethernet CAT6	blue	
Ethernet Fibre	blue	red
Device Net	blue	green
Modbus/RS485/RS232	blue	yellow
Intruder Alarm	red	yellow
Process Discrete	green	blue
Process Analog	green	yellow

- .5 For conduits containing multiple systems, request direction from the Engineer in writing.
- .6 For all cables and conduits indicated with a process tag number, provide tag label using Electrovert Uni-Labels, mounting strips, lettering 12 mm, black letters, secure with Ty-Wraps.

2.5  
Labels and Signs

- .1 Manufacturers' nameplates and CSA labels to be visible and legible after equipment is installed.
- .2 Provide warning signs, suitable background colour and lettering as required to meet requirements of Inspection Authority and Engineer. Use porcelain enamel signs, minimum size 180 mm x 250 mm.
- .3 Provide warning signs, Size 5, red with white letters, for all panels supplied by multiple power sources to read "Warning: Multiple Sources of Power".

2.6  
Finish

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original finish.
- .2 Clean and prime exposed hangers, racks, fastenings, etc. to prevent rusting.
- .3 Paint all outdoor equipment to EEMAC Y1-1.
- .4 Paint all indoor equipment to EEMAC 2Y-1.

2.7  
Terminations

- .1 All lugs, terminals, screws used for termination of wiring must be suitable for either copper or aluminum conductors.

PART 3 - EXECUTION

3.1  
Reference Standards

- .1 Provide a complete installation in compliance with the OESC, the local Inspection Authority as well as to the Local Supply Authority, in every respect.
- .2 Do overhead systems to CSA 22.3 No. 1 except where specified otherwise.
- .3 Do underground systems to CSA 22.3 No. 7 except where specified otherwise.

3.2  
Installation

- .1 Determine manufacturer's recommendations regarding storage and installation of equipment and adhere to these recommendations.
- .2 Check all factory joints and tighten where necessary to ensure continuity.

3.3  
Inspection Authority

- .1 Obtain a Certificate of Acceptance from Inspection Authority upon completion of work and hand it over to Engineer.
- .2 Notify inspection authority in sufficient time for them to inspect work.
- .3 Engineer will carry out inspections and prepare deficiency lists for correction by Contractor during and on completion of construction.
- .4 Contractor to correct deficiencies and advise the Engineer in writing that they have been corrected.

3.4  
Tests

- .1 Conduct tests and pay for all work associated with the following for those items installed under this contract. Provide Engineer with 48 hours written notice prior to tests required to be witnessed.
  - .1 Complete power distribution system including phasing, voltage, grounding and load balancing.
  - .2 All new circuits originating from branch distribution panelboards.
  - .3 Generator and load bank site run tests with the generator, load bank, ATS and ACP to be fully commissioned and ready for testing.
  - .4 All motors, heaters and associated control equipment including sequenced operation of systems where applicable and verification of correction over-current and overload pretesting devices.
  - .5 Complete operation of all systems, i.e. communications, etc.
  - .6 Obtain from manufacturers, certificates or letters confirming that entire installation as it pertains to each system has been installed to their satisfaction.
  - .7 ATS and Generator start-up and ACP commissioning.
  - .8 Provide all instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
  - .9 Refer to Section 16031 and equipment specifications for a complete scope of inspection and testing.

3.5  
Insulation Resistance

- .1 Megger all circuits, feeders and equipment up to 350 V with a 500 V instrument and from 350-600 V with a 1000 V instrument. Ensure that insulation resistance to ground is not less than required by code before energizing.
- .2 Approval of insulation between conductors and ground, and efficiency of grounding system is left to discretion of Inspection Authority.



3.6  
Load Balance

- .1 Measure and record phase current to all panelboards with normal loads operating at time of acceptance.
- .2 Measure and record phase voltages at normal load and adjust transformer taps to obtain, within 2%, rated voltage of equipment.
- .3 Measure and record primary and secondary currents of transformers.
- .4 Submit a written report at completion of work to Engineer containing all phase and neutral currents and voltages, for panelboards, dry-type transformers and motor control centres, operating under normal load. State hour and date on which each load was measured.

3.7  
Location of Outlets

- .1 Do not install outlets back-to-back in wall; allow 150 mm minimum horizontal clearance between boxes.
- .2 Location of outlets indicated may be changed by Engineer at no extra cost or credit, providing distance does not exceed 3000 mm, information is given before installation, and construction similar.
- .3 Check direction of door swings from architectural drawings and on site. Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms, on latch side of door.
- .4 Make all necessary adjustments when interior finish is completed.

3.8  
Mounting Heights

- .1 Mounting height of equipment is given from finished floor to centreline of equipment.
- .2 Exact mounting height of unnoted equipment must be verified with Engineer before proceeding with installation.
- .3 Where outlets occur at same location, or on same wall, or part of wall, locate outlets symmetrically and at comparable heights disregarding specified mounting heights.
- .4 Install electrical equipment at heights outlined below unless otherwise indicated.
  - .1 Local Switches 1200 mm
  - .2 Wall Receptacles/Telephone and Data Outlets
    - .1 In service rooms and process areas 1200 mm
  - .3 Lighting Panels 1500 mm

	.4	Cabinets	1500 mm
<u>3.9 Protection</u>	.1	Protect exposed live equipment such as panel mains and outlet wiring during construction for personnel safety.	
	.2	Shield and mark all live parts "LIVE 120 VOLTS", or with appropriate voltage.	
	.3	Arrange for installation of temporary doors for all rooms containing electrical distribution equipment. Keep these doors locked at all times except when under direct supervision of electrician.	
<u>3.10 Motor Rotation</u>	.1	Rotate motors in direction indicated by equipment being served.	
<u>3.11 Conduit Sleeves and Holes</u>	.1	Install conduit, and sleeves, prior to pouring of concrete. Sleeves through concrete floors to be plastic pipe, sized for free passage of conduit, and protruding 50 mm (or as indicated) above finished floor.	
	.2	Holes through exterior walls and roof to be flashed and made waterproof. Seal inside the conduit with suitable compound to prevent entry of water through conduit.	
	.3	Install all cables, conduits and fittings, which are to be embedded or furred in, neatly and closely to building structure so that necessary furring can be kept to minimum.	
<u>3.12</u>	.1	Reserved.	
<u>3.13 Excavation and Backfill</u>	.1	Refer to appropriate section for responsibility.	
	.2	Ensure that excavation for underground electrical services is in location and depth indicated. Provide protective materials around and over services and be present at all times during excavation and backfilling to supervise work. Engineer to approve before backfilling commences.	
	.3	All work to be provided in accordance with the OESC and the Local Inspection Authority.	
<u>3.14 Cutting and Repairing</u>	.1	As per Section 01017.	
	.2	Assume full responsibility for laying out electrical work and for any damage caused by incorrectly located equipment or improper	

performance of this work.

3.15  
Cleaning

- .1 As per Section 01740.
- .2 Clean all outlets, cabinets, enclosures, tubs, etc. of construction materials.
- .3 Clean and remove paint from all cover plates and wiring devices.
- .4 Clean up daily all waste materials and remove from site.

3.16  
Use of  
Permanent System

- .1 The connection points and use of the permanent electrical system for construction power or lighting is to be approved by the Engineer.
- .2 When permanent lighting is used prior to turning building over for occupancy, all fixtures to be cleaned.

3.17  
Scope of Work

- .1 The scope of work for this contract shall include all work indicated on the drawings and includes but is not limited to the following:
  - .1 Coordinate with the General, Mechanical and System Integrator for the preparation of shop drawings and installation of items outlined:
    - 1. Automatic Transfer Switch
    - 2. Standby Power Generator
    - 3. Mobile Generator Lugging Panel and MTS.
    - 4. Automatic Load Bank System
    - 5. HVAC motors and controls.
    - 6. Load Bank.
  - .2 Provide new buried conduit and cabling on site as indicated.
  - .3 Provide grounding system, including rods, grounding and bonding conductors and all connectors as indicated.
  - .4 Provide distribution equipment and electrical distribution feeders as indicated.
  - .5 Provide lighting and devices as indicated.
  - .6 Provide wiring for "House Equipment".
  - .7 Disconnect, make safe and remove abandoned electrical equipment back to their sources.
  - .8 Provide panels, instrumentation and control devices as indicated in Division 17.

- .9 Provide power, control and network wiring for "Process Equipment".
- .10 Provide temporary installation of wiring, devices and panels as required to maintain operation of facilities where required.
- .11 Provide all work indicated in schematics and other schedules listed on the drawings.
- .12 Remove all abandoned wiring, conduit and electrical devices, including power, communications and telephone wiring, as indicated.
- .2 Electrical Contractor is to provide the installation of the new power equipment in full coordination with the Local Supply Authority.
- 3.18 System Integrator
  - .1 Provide a System Integrator to coordinate the demolition of existing electrical equipment as well as the integration and commissioning of new electrical equipment. System Integrator shall provide, as required:
    - .1 PLC and/or SCADA programming.
    - .2 Assist with the commissioning and performance trials.
    - .3 PLC I/O expansion and/or modifications as required.
  - .2 Acceptable Systems Integrator:
    - .1 ISI Controls Inc.

END OF SECTION

PART 1 – GENERAL

- 1.1  
Related Documents .1 The work covered by this section of the specification is to be coordinated with the related work as specified elsewhere under the project coordination.
- 1.2  
Standards .1 The tests and inspections shall comply with NETA, International Electrical Testing Association.
- .2 Burn-in periods are 100 hours for continuous use equipment or 7 days for cyclic duty equipment.
- 1.3  
Scope .1 The work covered by this section of the specification, includes the furnishing of all labour, test equipment, and performance tests for installations shown on drawings and as herein specified during and at conclusion of project.
- .2 Provide Electrical Inspections and Testing complete with reports for all new or modified equipment and wiring. Electrical Inspection and Testing requirements shall be limited to the following general reporting categories for proper operation, record documentation and final adjustments:
- .1 Low Voltage Distribution Wiring
  - .2 Dry Type Transformers (DTT).
  - .3 Power Monitors.
  - .4 Automatic Load Bank.
  - .5 Distribution Panels (DP).
  - .6 Lighting Panels (LP).
  - .7 Generator Alternator.
  - .8 Low voltage molded case breakers and protective relays.

PART 2 – PRODUCTS

- 2.1  
Test Equipment and Scope .1 General:
- 1. Ensure suitable power supply is available for test equipment, be it 120 VAC or battery-powered devices. Record make, model, and calibration date of test instrument(s).
  - 2. All test equipment to have valid calibration stickers displayed on the equipment and must be calibrated within the last 12 months by a company who regularly engages in this service.

- .2 Relay Test Equipment:
  - .1 Relay test equipment to be designed for relay testing, secondary current injection.
  - .2 Current output to be capable of 60 A for testing of instantaneous features.
  - .3 Indicators to detect open signals, pick-up signals and other required signals.
  - .4 Timers accurate to 1 millisecond.
  - .5 MultiAmp or equivalent relay test units. Specifically designed relay testers for specific relays should be used if available.
  - .6 For equipment required on three phase systems, have a three-phase voltage and current output test unit.
  - .7 For equipment required on three-phase differential test, have a six-channel current output test unit(s) or equivalent.
- .3 Insulation Resistance Meter (Megger):
  - .1 DC megger to have insulation scale to 100,000 megohms (1000 V scale).
  - .2 Output voltages on DC megger units to be 500 V, 1000 V, 2500 V and 5000 V.
  - .3 DC megger units to be suitable for 10-minute megger tests and polarization index tests.
  - .4 Conduct Insulation Resistance Tests on new or modified electrical distribution equipment indicated as defined below:
    - .1 Process power wiring at 600 V.
    - .2 All DP mains.
    - .3 All LP mains.
    - .4 All DTT windings.
    - .5 Generator Alternator.
- .4 Low Resistance Test Units (Ductor):
  - .1 Low resistance test units to have 10 A output.
  - .2 Digital display and accuracy to 1 microhm.
  - .3 Conduct Low Resistance Tests on new or modified electrical distribution equipment indicated as defined below:
    - .1 All 600V lugs to ATS, MTS, Generator, main disconnects and DPs (including grounding).
    - .2 All DP branch circuit breakers above 50A.
    - .3 All Lighting Panels (LP) mains lugs and grounding.

- .4 All transformer lugs (including grounding).
  - .5 Load Survey:
    - .1 Test equipment shall be Fluke, 3-phase Power/Power Quality monitor or equivalent. With capability to harmonic measurements, amplitude and phase angle for each harmonic, watts, VA, VAR, true power factor, and displacement power factor, Power Quality standard measurements with high-speed sampling of impulses at 2 MHz to measure impulses to 6400 V peak, 500 nanoseconds duration and displays peak voltage.
    - .2 Conduct Load Survey on new or modified electrical distribution equipment as defined below:
      - .1 Service Entrance Equipment.
      - .2 Standby Power Generator and ATS.
      - .3 All Lighting Panels (LP).
      - .4 All Distribution Panels (DP).
      - .5 Automatic Load Bank (all stages).
  - .6 Thermographic Scan Equipment:
    - .1 Test equipment to be minimum equal to Agema Thermo Vision 570 Portable Infrared camera system. Must be capable of taking a colour infrared image of all observation and noted irregularities.
    - .2 Conduct Thermographic Survey on new or modified electrical distribution equipment as defined below:
      - .1 Dry-Type Transformers (DTT).
      - .2 Distribution Panels (DP).
      - .3 Lighting Panels (LP).
  - .7 Phase and Rotation Testing:
    - .1 Test equipment shall be adequate to safely confirm project phasing and sequence of power phase rotation. Fluke 9040 or approved equivalent.
- 2.2 Reports
- .1 Reports of all tests to be in typewritten form.
  - .2 Include copy of test results in maintenance manuals.
  - .3 General:
    - .1 All test results to be input to an electronic test sheet program.
    - .2 All test sheets to include equipment nameplate data, customer identification, time and date of tests, environmental conditions during tests and test results.

- .4 Test Results and Reporting - Data For Inclusion:
  - .1 The following data to be included in the test report:
    - .1 Equipment data with selected position, if applicable, e.g., transformer tap.
    - .2 Protective device(s) make, model number, rating, "as found" settings. These to include CT, PT relays, overloads, fuses, breakers.
    - .3 Adjustments, modifications and repairs made on the equipment on site with explanation on such work (necessity and method of execution).
    - .4 Observations recorded and summary of conclusions upon technician's review of the inspection and testing observations.
      - .1 The acceptable criteria and limiting values of measured figures by the equipment manufacturer. These are to include the insulation resistance (megohm), contact resistance (microhm), leakage current (microampere).
      - .2 Include observation photographs of each key components tested, including thermographic scans thermal gradients observations.
    - .5 Recommendations for long-term and short-term remedial work.
- .5 Report Format:
  - .1 Final report to be submitted in electronic and print format in three (3) bound copies neatly in 3-ring binders with separate sections for each item as listed therein.
  - .2 Photographs to be mounted on background sheet complete with labels. Curves and graphs to be neatly plotted on appropriate graph paper. Result tables to be made electronically and logically arranged.
  - .3 The enclosed test report forms are samples of the data required on the reporting forms. It is not intended to imply that these are the only forms required. The contractor to submit all forms necessary to fully describe the inspection, testing and maintenance of all items.

### PART 3 – TEST PROCEDURES

#### 3.1 General

- .1 Coordination of all tests and shutdowns with Owner.
- .2 Pre-service and post-service Inspection and Testing of equipment shall provide and summarized into a final report as:



- .1 Ungrounded Conductors and Wiring Insulation:
  - .1 Insulation Resistance Tests (Megger) of low voltage feeders, DPs and LPs, as well as process motors prior to start-up testing and energization.
  - .2 Record 60 second megger reading on each ungrounded phase for DPs, LPs, MCCs.
  - .3 Record ½, 1, 2, 3, 5, 10 minute megger readings on each ungrounded phase for motors, alternators, cables and conductors.
  - .4 Report and correct any defective motor, cable, wire or panel with initial insulation resistance below IEEE and NETA guidelines. Retest confirming operational readiness of all corrections provided.
- .2 Power Cable Checks:
  - .1 Check all power cables, e.g., TECK cables properly spaced (by one cable diameter unless specifically indicated otherwise) and secured by proper clips.
  - .2 For cables likely to have sheath current, check to ensure metal supports are not used, e.g., fiber plates used.
  - .3 Check for the proper physical protection of cables through concrete opening or metal plating.
  - .4 Insulation jacket damage and repair to the satisfaction of the manufacturer's representative.
- .3 Low Voltage Power Circuit Breaker and Protective Relay:
  - .1 Breaker and relay performance testing after initial adjustment.
  - .2 Record 'As-Found' and 'As-Set' breaker and relay settings when applying settings.
  - .3 Report and correct any defective device complete with final test confirming operational readiness.
- .3 Ductor Micro-Ohm Testing:
  - .1 Grounding lugs to ground cables on all DTTs, LPs, DPs, ATS, MTS, Generators, Motors and Grounding Bus bars.
  - .2 Mechanical bus-bar connections between MCC shipping splits. Confirm all hardware to torque requirements of the manufacturer, and mark off all hardware after verification.
  - .3 Torque connections and correct observations outside NETA guidelines. Provide final test confirming operational readiness upon completed corrections.
- .4 Load Survey:
  - .1 Survey initial DP & LP loading and adjust to balance phases in panels. Adjust DTT taps to provide desired service voltage within 2.5% under load.
  - .2 Survey final DP & LP loading after all systems are fully commissioned into service and provide final adjustments to DTTs to provide desired service voltage to within 2.5% under normal 'as-constructed' plant load conditions.

- .5 Power Monitors and CT/PT based instruments:
  - .1 Confirm correct polarity and accuracy of Power Factor, kVA, kVAR by manufacturer's approved representative. Provide corrections as necessary. Submit representatives 'As-Found' and 'As-Left' report complete with comment indicating the operational reliability status of the instrument.
  
- .6 Phasing and Phase Rotation:
  - .1 Confirm correct phase markings as well as phase rotations at all DPs, ATS, MTS, Load Bank, Generator, LPs and Motor Starters/Drives.
  
- .7 Thermographic Scan:
  - .1 Survey initial Generators, ATS, MTS, DPs, LPs, VFDs, soft start drives and DTTs for abnormalities prior to entering commissioning activities of related process or administrative areas. Correct any observed abnormality and rescan to confirm the applied correction.
  
  - .2 Survey final Generators, MCCs, DPs, LPs and DTTs after all systems are fully commissioned into service after all trial periods are complete and down stream equipment has been in service for at least 2 hours.
  
- 3.2 Insulation Resistance Tests (Megger)
  - .1 Insulation Resistance Tests:
    - .1 Use a megger with 100,000 megohm @ 1000 V resolution for megger tests.
  
    - .2 Record ambient temperature and humidity and adjust the measured megohm reading to 20°C ambient.
  
    - .3 Use 1000 V megger range for power equipment of 600 V and below.
  
    - .4 For 10-minute megger test, record megohm values in megohms at 30 seconds, 60 seconds, 3 minutes, 5 minutes, and 10 minutes. Plot megohms against time for each electrical connection and phase. Calculate and record the ratio of measured megohms data from each test as follows:
      - .1 60-second megohm/30-second megohm = dielectric absorption.
      - .2 10-minute megohm/60 second megohm = polarization index.
      - .3 Report the 60 second megohm as the insulation resistance value.
      - .4 Submit tabulated measured megohm figures for all values observed over the 10-minute insulation tests. Submit both in table and graphical format.

- 3.3 .1 Low Voltage Breaker and Protective Relay Testing Low Voltage Breaker and Protective Relay:
- .1 Perform contact resistance testing on all breakers at or above 100 A.
  - .2 If available, perform secondary injection testing of zero sequence current transformers and ensure pick-up value is in accordance with its respective ground fault relay. Function test each breaker via its zero sequence CT to ensure reliable operation.
  - .3 Inspection and testing to include visual inspection of breaker and auxiliary device(s). Note any deficiencies.
  - .4 All relays to be adjusted and tested to show conformance with recommended settings in coordination study. Verify protective relay settings with coordination study.
  - .5 Perform secondary current injection tests to confirm proper operation of trip devices.
  - .6 Record:
    - .1 Long-time pick-up current.
    - .2 Long-time trip times at 200% and 300% of pick-up.
    - .3 Short-time pick-up current.
    - .4 Short time trip time at 150% of pick-up.
    - .5 Instantaneous pick-up.
    - .6 Ground pick-up.
  - .7 Overcurrent and Ground Fault Tripping Relays:
    - .1 Test by secondary current injection, tripping of device or alarms to be confirmed.
- 3.4 .1 Phase and Phase Rotation Testing Phasing and Phase Rotation:
- .1 Test and coordinate the phase continuity throughout the distribution (ABC).
  - .2 Test and coordinate phase rotations between the utility-supplied power and generator.
  - .3 Test and rearrange phases as required to ensure generator and motor rotations are coordinated prior to identifying/labeling conductors.
- 3.5 .1 Dry-Type Transformer Testing Dry-Type Transformer Tests:
- .1 General
    - .1 Conduct inspections and tests and compile test reports.
    - .2 Compile separate test report for each transformer.

- .2 Inspections:
  - .1 Conduct external inspections in accordance with layout shop drawings. Check nameplates and vector diagrams against test results.
  - .2 Where present, inspect temperature gauge and fans. For devices with settings, record the settings in use. Record actual reading of all gauges and ambient temperature.
  - .3 Check to ensure transformer is properly anchored to floor or pad.
- .3 Performance Tests:
  - .1 Perform insulation tests on high voltage windings to low voltage windings.
  - .2 Confirm proper grounding of transformer frame and core assembly.
  - .3 Measure winding resistances.
  - .4 Provide Thermographic Scans.
- 3.6 Power Monitor and CT/PT Instrument Testing .1 General:
  - .1 Use special test equipment and methods as available from monitor manufacturer. Take all recommended precautions from the manufacturer.
  - .2 Include a copy of power monitor manufacturer's test and commissioning schedule as part of the test report.
  - .3 Submit calculations to substantiate current/voltage figures used in tests where these are not obvious.
  - .4 Verify current transformer and potential transformer windings.
  - .5 Use 3-phase current and voltage relay test units for verification of power monitoring devices, including verification of power flow quadrant.
- 3.7 Thermographic Scan Survey .1 Thermographic Scan Survey:
  - .1 Visual and Mechanical Inspection:
    - .1 Remove all necessary covers prior to scanning.
    - .2 Inspect for physical, electrical, and mechanical condition.
  - .2 Test Parameters:
    - .1 Scanning distribution system with ability to detect 1°C between subject area and reference at 30°C.
    - .2 Equipment shall detect emitted radiation and convert detected radiation to visual signal.
    - .3 Infrared surveys should be performed during periods of maximum possible loading but not less than twenty percent (20%) of rated load of the electrical equipment

being inspected.

- .3 Test Results:
  - .1 Interpretation of temperature gradients requires an experienced technician. Some general guidelines are:
    - .1 Temperature gradients of 3°C to 7°C indicate possible deficiency and warrant investigation.
    - .2 Temperature gradients of 7°C to 15°C indicate deficiency; repair as time permits.
    - .3 Temperature gradients of 16°C and above indicate major deficiency; repair immediately.
    - .4 Provide infrared and digital photo recording (thermograms) of each irregularity. Submit an electronic photograph of the general area around the hot spot. Label and identify data/photo clearly.
  - .4 Report Sheets:
    - .1 Report shall be provided as per clause 2.2 of this section and consist of the following:
      - .1 List of equipment by name that was scanned.
      - .2 Deficient items to be identified on a separate page of the report.
      - .3 Separate page to consist of the following:
        - .1 Equipment identification and location.
        - .2 Photograph of item.
        - .3 Thermograph of item.
        - .4 Temperature measurement in °C of the following:
          - .1 Defective component.
          - .2 Reference component.
          - .3 Over temperature of component.
          - .4 Difference to ambient.
      - .5 Electrical load on device during inspection:
        - .1 Phase unbalance, if present.
        - .2 Probable cause of deficient item.
        - .3 Recommendation for corrective action.

3.8  
Load Survey Testing

- .1 Load Survey:
  - .1 Measure and record Phase-to-Phase Voltage, Phase to Neutral Voltage, Phase Current, Neutral Current and Ground Current.
  - .2 Measure and record Magnitudes of Harmonic Phase and Neutral Currents at all the equipment mentioned in paragraph 3.1. Identify the current magnitudes for the 3rd, 5th, 7th, 9th, 11th, 13th, 15th, 17th, 19th and 21st harmonic (based on

60 Hz).

- .3 Utilize test instruments with a maximum error of  $\pm 2\%$  and submit two copies of typed result sheets, signed, dated and bound to the Consultant.
- .4 Measure power quality standard measurements: sags, swells, and wave shape fault events, rms volts, rms amps, and frequency summaries. Transients to 1000 volts peak, 130 microseconds duration.
- .5 Measure at the main switchboard, Power Consumption.: Watts, VA, VAR, PF (true and displacement), Demand, KWh.

END OF SECTION

PART 1 - GENERAL

- 1.1  
Grounding Systems
- .1 Grounding to be provided for the new generator pad, loadbank, bollards and enclosures.
  - .2 Bond piping, grating, railings and structural steel.

PART 2 - PRODUCTS

- 2.1  
Materials
- .1 Grounding equipment to CSA C22.2 No. 41-Latest Edition.
  - .2 Copper grounding conductors to ASA G7.1-Latest Edition.

- 2.2  
Equipment
- .1 Rod electrodes, copper clad steel 19 mm dia. by 3 m long.
  - .2 Grounding conductors to be green insulated, stranded copper, soft annealed, sized as indicated.
  - .3 Direct-buried conductors to be bare copper.
  - .4 Provide all non-corroding accessories necessary for grounding system.

- 2.3  
Manufacturers
- .1 Only specified manufacturers/suppliers as defined in Section 01340.
    - .1 Burndy Corp. Hy-ground Compression Connections.

PART 3 - EXECUTION

- 3.1  
Installation General
- .1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including electrodes, conductors, connectors, accessories, as indicated, to conform to requirements of Engineer and local authority having jurisdiction over installation.
  - .2 Protect exposed grounding conductors from mechanical injury.
  - .3 Make buried connections, and connections to conductive water main, electrodes as indicated.

- .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
  - .5 Install bonding wire in flexible conduit.
  - .6 Install grounding conductor in all power conduits.
  - .7 Install separate ground conductor, to outdoor lighting standards.
  - .8 Connect building structural steel and metal siding to ground by welding copper to steel as indicated.
  - .9 Make grounding connections in radial configuration only, with connections terminating at a single grounding point. Avoid loop connections.
  - .10 Use tinned copper conductors for aluminum structures.
- 3.2  
Electrodes
- .1 Install rod electrodes and make grounding connections as indicated.
  - .2 Bond separate, multiple electrodes together.
  - .3 Make special provision for installing electrodes that will give acceptable resistance to ground value, where rock or sand terrain prevails. Ground as indicated.
- 3.3  
Equipment Grounding
- .1 Provide perimeter grounds and service grounding triads.
  - .2 Ground all electrical panels and standby generator.
  - .3 Ground control panels and junction boxes.
  - .4 Bond structural steel.
  - .5 Bond metallic piping.
  - .6 Bond grating and railings.
- 3.4  
Tests
- .1 Perform ductor ground continuity and low resistance tests to the approval of Engineer and local authority having jurisdiction over installation.
  - .2 Perform tests before energizing electrical system.
  - .3 Disconnect ground fault indicator during tests.

END OF SECTION



PART 1 – GENERAL

- |  |    |  |            |
|--|----|--|------------|
| 1.1<br><u>Related Work</u>                     | .1 | General Instructions:  | Division 1 |
|  | .2 | Demolition:  | Division 2 |
|  | .3 | Materials and equipment not specifically outlined in this section to be demolished under another Division.   |            |
|  |    |  |            |
| 1.2<br><u>General</u>                          | .1 | Dispose of demolished materials except where specifically noted otherwise.   |            |
|  | .2 | Where existing materials are to be reused, the Contractor for this division is responsible for their removal, storage, cleaning and re-installation.   |            |
|  | .3 | Where existing materials are to be turned over to the Owner, the Contractor for this division is responsible for their removal and delivery to the Owner on site.  |            |
|  | .4 | Where electrical equipment is to be demolished, the Contractor for this division is responsible to ensure that they have been isolated from the power supply prior to demolition under another division.       |            |
|  | .5 | Where some existing materials are to be retained in place, it is the responsibility of the Contractor for this division to identify the materials and equipment to remain prior to commencement of demolition. |            |
|  | .6 | Maintain adequate structural support and electrical protection for equipment and material during demolition process.   |            |
|  |    |  |            |
| 1.3<br><u>Maintain Services</u>                | .1 | It is the responsibility of the Contractor for this Division to maintain electrical services and systems at all times to areas beyond the construction area.   |            |
|  | .2 | Reinstate immediately any existing circuits disrupted during construction not intended to be removed as part of this contract.   |            |
|  |    |  |            |
| 1.4<br><u>Relocation of Existing Equipment</u> | .1 | Refer to General Arrangement drawings for equipment to be relocated from other areas.  |            |
|  | .2 | Include for disconnection of electrical services to equipment and where circuit conductors are left exposed terminate in box with blank cover and identify with circuit number.                                |            |

- .3 Non-electrical equipment will be physically relocated by another Division.
  - .4 Include for reconnection of electrical services to equipment as indicated.
- 1.5  
Wiring
- .1 Remove all existing surface wiring and outlets as noted.
  - .2 Remove all wiring exposed where walls are removed or openings made for doors. Reinstate affected circuits.
  - .3 Where flush outlets are abandoned:
    - .1 remove wire from conduit; and
    - .2 boxes behind finished surface to be patched over by another division. If flush with finished surface remove the box.
  - .4 Remove all abandoned armoured cable, conduit and wiring becoming obsolete in the execution of this contract that is exposed or in removable ceiling spaces.
- 1.6  
Lighting Fixtures
- .1 Where indicated, remove existing lighting fixtures and dispose.
- 1.7  
Equipment Containing PCBs
- .1 Refer to Designated Substances Report per Division 1.
  - .2 Equipment to be removed may contain PCBs, i.e. transformers, capacitors or fluorescent ballasts.
  - .3 When equipment containing PCBs is discovered, contact Engineer immediately for instructions.
  - .4 Store such equipment on site in a secure location as directed until such time as disposal is determined.

END OF SECTION

PART 1 - GENERAL

- 1.1  
Related Work
- .1 Concrete Encased Duct Banks and Manholes: civil
  - .2 Direct Buried Underground Cable Duct: civil
  - .3 Excavating, Trenching and Backfilling: civil
  - .4 Power cable and overhead conductors (1001 V+): Section 16121
  - .5 Wires and Cables (0-1000 V): Section 16122
  - .6 Underground Electrical Service: civil.
- 1.2  
Product Data
- .1 Submit product data in accordance with Section 01340.
- 1.3  
Regulatory Requirements
- .1 Underground electrical installations shall be fully compliant with Ontario Electrical Safety Code (OESC) requirements and related bulletins. Installation dimensions shall comply with OESC diagrams D8 through D11, as is applicable. In the event of conflict, the more stringent shall apply to the satisfaction of the local electrical safety inspector.

PART 2 - PRODUCTS

- 2.1  
Materials for Direct Buried Services
- .1 Sand bedding, free from aggregate particles retained on a minimum 6 mm sieve to Division 2.
  - .2 50 mm thick concrete patio stones, where indicated. Size to suit, as indicated.
  - .3 Provide Brady "Identoline" red warning tape 150 mm embossed - Electrical. Coordinate with ESA.
  - .4 Refer to trenching cross section details for additional material and installation requirements. Configuration of trenching details on drawings is illustrative only. In the event of conflict, Contractor shall provide installation configurations which are fully compliant to the applicable Ontario Electrical Safety Code Diagram D8 to D11.

- 2.2  
Cable Pulling  
Equipment
- .1 6 mm stranded nylon pull rope tensile strength 5 kN.

PART 3 - EXECUTION

- 3.1  
Installation  
General
- .1 Install ducts as indicated and to manufacturer's instructions.
- .2 Ensure that excavation for direct burial of underground services is to satisfaction of Engineer, prior to proceeding with installation.
- 3.2  
Trench  
Installations
- .1 Provide 100 mm of bedding material on bottom of trench before laying ducts and conduits.
- .2 Side fill with bedding material up to top of ducts and conduits. Tamp around ducts with hand tampers.
- .3 Provide 150 mm of bedding material above ducts and conduits.
- 3.3  
Direct Burial  
of Wires and Cables
- .1 Grade bottom of trench to smooth surface, free of stones or soft spots, and secure sides from caving-in.
- .2 Cover bottom of trench with 150 mm of sand.
- .3 Lay wires or cables maintaining 75 mm clearance from each side of trench. Pulling wire or cable into trench or dragging along trench not permitted.
- .4 Underground splices not acceptable.
- .5 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .6 Maintain 75 mm minimum separation between different circuits. Maintain 300 mm horizontal separation between low and high voltage wires or cables. When low voltage wires cross high voltage cables maintain 300 mm vertical separation with low voltage in upper position. At crossover, maintain 75 mm minimum vertical separation between low voltage wiring and 150 mm between high voltage cables. Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables and wiring, with fire alarm and control cables in upper position. Install 50 mm thick concrete patio stones on lower cables 600 mm in each direction at crossings.

- .7 Cover wiring or cables with 150 mm bedding sand, compacted to a degree of compaction not less than 95% standard proctor density as determined by AASHO method T99-70.
- .8 Install continuous row of overlapping 50 mm concrete patio stones as indicated to cover length of run.
- .9 Balance of trench backfilling by Division 2.
- 3.4  
Cable Installation  
in Duct
- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multi-conductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.
- 3.5  
Cable Removal  
from Duct
- .1 Remove existing wires from existing duct, as indicated.
- .2 Provide fish cords in ducts.
- 3.6  
Markers for  
Underground  
Services
- .1 Install Identoline tape below grade mid span between buried service and finished grade.

END OF SECTION

PART 1 - GENERAL

- 1.1  
Related Sections .1 Section 16151 - Wire and Box Connectors - 0 - 1000 V.
- 1.2  
References .1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.  
.2 CAN/CSA-C22.2 No. 131, Type Teck 90 Cable.
- 1.3  
Product Data .1 Submit product data in accordance with Section 01340 – Shop Drawings, Product Data and Samples.

PART 2 - PRODUCTS

- 2.1  
Building Wires .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.  
.2 Copper conductors: size as indicated, with 1000 V RW90 insulation (600 V RW90 insulation for 120/208 V circuits).
- 2.2 .1 Reserved
- 2.3  
Armoured Cables .1 Conductors: insulated, copper, size as indicated.  
.2 Type: AC90.  
.3 Armour: interlocking type fabricated from aluminum strip.
- 2.4  
Control Cables .1 This section applies to "house equipment" only. For process, Generator, ATS and Load Bank controls, see Division 17.  
.2 600 V type: stranded annealed copper conductors, #14 AWG with PVC insulation type TWH, with shielding of wire braid over each pair of conductors with sheath of aluminum interlocked armour and jacket over sheath of PVC.

PART 3 - EXECUTION

- 3.1  
Installation of  
Building Wires
- .1 Install wiring as follows:
- .1 In conduit systems in accordance with Section 16133 –  
Conduits, Conduit Fastening and Conduit Fittings.
- .2 In underground ducts in accordance with Section 02585 –  
Underground Services.
- .3 In trenches in accordance with Section 16106 –  
Underground Ducts, Conduits and Wiring.
- 3.2 .1 Reserved.
- 3.3  
Installation of  
Armoured Cables
- .1 Group cables wherever possible.
- .2 Terminate cables in accordance with Section 16151 - Wire and  
Box Connectors.
- 3.4  
Installation of  
Control Cables
- .1 Install control cables in conduit or in mechanically protected areas.
- .2 Ground control cable shield at one end only.
- 3.5  
Use of Cables
- .1 All process and power cables are identified on process layout  
drawings and schematics.
- .2 Coordinate the use of TECK90 cables with the use of conduits.
- .2 For "house equipment" use:
- .1 Armoured cable or RW90 in EMT wall partitions.
- .2 Armoured cable or RW90 in EMT in concealed ceiling  
spaces.
- .3 RW90 in EMT in exposed interior areas.
- .4 RWU90 in RIGID PVC in exterior installations passing  
below grade (complete with expansion fittings at 450mm  
above grade).

- .5 RW90 in RIGID Aluminum in exterior installations that does not penetrate below grade.

END OF SECTION



PART 1 – GENERAL

- 1.1  
Scope .1 This section refers to electrical power equipment only. Controls and Instrumentation boxes and accessories are defined in Division 17.

PART 2 - PRODUCTS

- 2.1  
Material Standards .1 Splitters to CSA C22.2 No. 76-M.  
.2 Junction, pull boxes, and cabinets to CSA C22.2 No. 40.  
.3 Enclosures CSA Type 1 to CSA C22.2 No. 14.  
.4 Enclosures CSA Types 2, 3, 4 and 5 to CSA C22.2 No. 94.  
.5 For "process controls equipment", refer to Division 17.
- 2.2  
Junction and Pull Boxes .1 Junction and pull boxes of welded steel construction with screw-on flat covers for surface mounting.  
.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.  
.3 Only main junction and pull boxes are indicated. Provide pull boxes so as not to exceed 30 m of conduit run between pull boxes.  
.4 Indoor boxes are to be rated to NEMA 1. Outdoor Boxes are to be rated to NEMA 3R.
- 2.3  
Identification .1 Refer to Section 16010.

PART 3 - EXECUTION

- 3.1  
Installation of Junction, Pull Boxes and Cabinets .1 Install junction and pull boxes in inconspicuous but accessible locations.  
.2 Install terminal blocks in junction boxes and cabinets.  
.3 Mark location of all junction and pull boxes on record drawings.

END OF SECTION

PART 1 - GENERAL

1.1

Definitions

- .1 Outlet box: means sheet steel enclosure for either electric wiring or fittings, having knockout openings in either sides or back, or both, for entrance of wire in conduit, electrical metallic tubing, cable, or flexible tubing. Cover is fastened by screws, not hung on hinges.
- .2 Conduit box: means cast box having threaded openings for conduit, bushings and clamps or connectors for cable or threadless openings for electrical metallic tubing and conduit.
- .3 Fitting: means fitting intended to secure rigid conduit or electrical metallic tubing to enclosure or to adjacent length of rigid conduit or electrical metallic tubing. Such fitting may be integral part of conduit or other box.
- .4 Conduit outlet body: means cast fitting installed in conduit systems to act as pull outlets for conductors being installed or to make 90° bends.
- .5 Conduit: a raceway as defined in Section 16133.

PART 2 - PRODUCTS

2.1

Materials

- .1 Outlet boxes, conduit boxes and fittings to CSA C22.2 No. 18.
- .2 All fittings used to be manufactured as accessories to the associated raceway and of consistent material i.e., PVC where PVC conduit is used.

2.2

Outlet and Conduit  
Boxes General

- .1 Gang boxes where wiring devices are grouped.
- .2 347 V outlet boxes for 347 V toggle switches.

2.3

Sheet Steel  
Outlet Boxes

- .1 Electrogalvanized steel single and multi-gang device boxes for flush installation, minimum size 76 mm x 51 mm x 38 mm unless otherwise indicated.
- .2 100 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Electrogalvanized steel utility boxes for outlets connected to surface-mounted EMT, rigid heavy wall galvanized steel conduit, minimum size 102 mm x 54 mm x 48 mm.

	.4	100 mm square or octagonal outlet boxes for lighting fixture outlets.
	.5	100 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished walls.
2.4 <u>Masonry Boxes</u>	.1	Electrogalvanized steel masonry single and multi-gang boxes for devices flush mounted in exposed block walls.
2.5 <u>Concrete Boxes</u>	.1	Electrogalvanized sheet steel concrete type boxes for flush mount in poured in-place concrete with matching extension and plaster rings as required.
2.6 <u>Conduit Boxes</u>	.1	Cast FS aluminum boxes with factory-threaded hubs and mounting feet for surface installation.
2.7 <u>Conduit Fittings General</u>	.1	Bushings and connectors with nylon insulated throats.
	.2	Pushpennies to prevent entry of foreign materials.
	.3	Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
	.4	Factory "ells" where 90°bends are required for 25 mm and larger conduits.
2.8 <u>Fittings for Rigid Conduit</u>	.1	Threaded type steel couplings and fittings.
	.2	Double locknuts and insulated bushings on sheet metal boxes.
	.3	Use explosion-proof fittings in areas indicated.
	.4	Where rigid conduit is used externally, transition to EMT within the building structure; and, transition to Rigid PVC at 600mm above grade, complete with PVC expansion fittings, where exterior raceway passes below grade.
2.9 <u>Fittings for EMT Conduit</u>	.1	Provide watertight steel type connectors and couplings.

PART 3 - EXECUTION

3.1

Installation

- .1 Use FS boxes in process areas and for new house services installations.
- .2 Use boxes rated for use in Class 1, Division 2 in areas designated as hazardous.
- .3 Support boxes independently of connecting conduits.
- .4 Fill boxes with paper or foam to prevent entry of construction material during construction.
- .5 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .6 Provide correct size of openings in boxes for conduit, armoured cable connections, reducing washers not allowed.

END OF SECTION

PART 1 - GENERAL

1.1  
References

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
  - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
  - .5 CAN/CSA C22.2 No. 227.3, Flexible Nonmetallic Tubing.

1.2  
Seismic Restraint

- .1 Installations in this section are subject to support and anchorage requirements, as directed by the seismic restraint consultant retained by Contractor.

PART 2 - PRODUCTS

2.1  
Conduits

- .1 Rigid galvanized steel conduit (RGS): to CSA C22.2 No. 45, galvanized steel threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .3 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .4 Rigid aluminum conduit (RAC) to CSA C22.2 No. 45 – Latest Edition – Aluminum Threaded.

2.2  
Conduit Fastenings

- .1 One hole malleable iron straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 3 m o.c.
- .4 Threaded rods, 6 mm diameter to support suspended channels.

- 2.3  
Conduit Fittings
- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
  - .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.
  - .3 Watertight connectors and couplings for EMT in surface mounted or exposed areas. Set-screws not acceptable.
- 2.4  
Expansion Fittings for Rigid Conduit
- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
  - .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- 2.5  
Fish Cord
- .1 Polypropylene.

PART 3 - EXECUTION

- 3.1  
Use of Conduits
- .1 No electrical services (Power or Controls) in floor or roof slabs unless explicitly indicated on drawings.
  - .2 Provide RAC for all exterior installations that does not pass below grade. Conduit transitions to EMT to be carried out within the interior space.
  - .3 Rigid PVC conduit for all underground services. Provide Rigid PVC expansion fittings at 450mm above grade and transition to RAC for above grade exterior conduit installation at 600mm above grade.
  - .4 DB2 conduit for concrete duct banks.
  - .5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations to bridge two rigid structures (maximum length of 900 mm) .
  - .6 Use explosion proof flexible connection for connection to explosion proof motors.
- 3.2  
Detail Design
- .1 The drawings indicate a proposed routing for bid purposes. Field condition may indicate an alternate routing in concentrated areas.

3.3  
Installation

- .2 Review the proposed routing with the General Contractor, Mechanical Contractor and Engineer.
- .3 For outdoor buried runs, spray paint the ground to show centreline of trench proposed.
- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Do not conceal conduits and in ceiling areas.
- .3 Surface mount conduits in process areas.
- .4 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .5 Use explosion proof flexible connection for connection to explosion proof equipment.
- .6 Minimum conduit size for lighting and power circuits: 19 mm.
- .7 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .8 Mechanically bend steel conduit over 19 mm diameter.
- .9 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .10 Install fish cord in empty conduits.
- .11 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .12 Dry conduits out before installing wire.

3.4  
Surface Conduits

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

- |                                    |    |   |
|------------------------------------|----|---|
| 3.5<br><u>Concealed Conduits</u>   | .1 | Do not conceal above grade conduit installations unless explicitly indicated on drawings.   |
| 3.6<br><u>Conduits Underground</u> | .1 | Slope conduits to provide drainage.   |
|                                    | .2 | Waterproof joints with heavy coat of bituminous paint.  |
| 3.7<br><u>Fire Barriers</u>        | .1 | After cables have been installed, cut and install 3M fire barrier system consisting of CS-195X composite sheets, FS-195X wrap/strip, CA 25WB caulk and GIS. For penetrations through wall follow W-L-4004; for floors follow C-AJ-4003. |

END OF SECTION



PART 1 - GENERAL

1.1  
References

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2 CSA C22.2 No. 65, Wire Connectors.
- .2 National Electrical Manufacturers Association (NEMA).

PART 2 - PRODUCTS

2.1  
Materials

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

PART 3 – EXECUTION

3.1  
Installation

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

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

END OF SECTION

PART 1 - GENERAL

- 1.1  
Standards
- .1 Dry type transformers to CSA C22.2 No. 47 and CSA C9.
  - .2 ASHRAE 90.1, Section 8.
- 1.2  
Shop Drawings
- .1 Submit product data in accordance with Section 16010.
  - .2 Include power rating, temperature rating, winding configuration, voltage ratings, BIL, taps, %Z, X/R, % regulation at full load and 0.9 pf, no load losses, full load losses, sound level.

PART 2 - PRODUCTS

- 2.1  
Transformers
- .1 Provide transformers with the following characteristics:
    - .1 Type: ANN.
    - .2 3 phase, 600 V input, 120/208 V output, 60 Hz, as indicated.
    - .3 Delta primary, wye grounded secondary, as indicated.
    - .4 kVA ratings: as indicated.
    - .5 Voltage taps: 2-2½% FCAN, 2-2½% FCBN.
    - .6 Insulation: 115°C temperature rise.
    - .7 Basic Impulse Level (BIL): 10 kV.
    - .8 Copper/Aluminum windings.
    - .9 Average sound level: 45 dB.
    - .10 Efficiency per ASHRAE 90.1, Section 8 for dye-type low voltage transformers.
    - .11 Enclosure: EEMAC 1, removable metal front panel, sprinkler-proof.
    - .12 Mounting: floor or wall, complete with vibration isolation pads.
    - .13 Finish: Standard ASA 61 grey.
    - .14 Regulation: 3.1% or less at full load and 0.9 pf.
    - .15 CAN/CSA-802 Compliant.
    - .16 Sprinkler-proof to meet the requirements of the OESC.
    - .17 Insulation Class: 220°C.
    - .18 Electrostatic shield.
    - .19 Ovoid shaped windings.
    - .20 Stacked laminations with isolated bolts through the entire core.
    - .21 Epoxy impregnation.
- 2.2  
Equipment Identification
- .1 Provide equipment identification in accordance with Section 16010.

2.3  
Acceptable  
Manufacturers/  
Suppliers

- .1 Specified Product:
  - .1 Bemag.
- .2 Alternate Product(s):
  - .1 Hammond.
  - .2 Delta.

PART 3 - EXECUTION

3.1  
Installation

- .1 Install mounted dry type transformers as indicated.
- .2 Ensure adequate clearance around transformer for ventilation.
- .3 Install transformers in level upright position.
- .4 Remove shipping supports only after transformer is installed and just before putting into service.
- .5 Loosen isolation pad bolts until no compression is visible.
- .6 Make primary and secondary connections in accordance with wiring diagram.
- .7 Ground as shown.
- .8 Energize transformers after installation is complete.
- .9 Testing before and after energization.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 Surge Protective Devices (SPDs) shall be designed, manufactured, tested and installed in compliance with the most recent edition of the following codes and standards:
  - .1 American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41.1 and C62.41.2);
  - .2 Underwriters Laboratories UL 1283 and UL 1449;
  - .3 CSA C22.2 No. 269.1 and 269.2

### **1.2 SUBMITTALS**

- .1 Product Data: Provide catalogue sheets showing voltage, peak surge current capacity per phase, voltage protection ratings, nominal discharge current ratings, short circuit current rating, maximum continuous operating voltage rating, physical size, dimensions showing construction, lifting and support points, enclosure details, per mode and per phase peak surge current, modes of discrete suppression circuitry, warranty period and replacement terms, conductor size, conductor type and lead length.
- .2 Submit product data for all components and accessories.
- .3 Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product. Indicate recommended size of circuit breaker or fuse to be connected for each unit.
- .4 List and detail all protection systems such as fuses, disconnecting means and protective features.
- .5 Provide verification that the SPD devices are listed to UL1449 and 1283 latest version, and CSA labelled.

### **1.3 QUALITY ASSURANCE AND WARRANTY**

- .1 The panel mounted SPD and supporting components shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of ten (10) years from the date of substantial completion of service and activation of the system to which the suppressor is attached. Additionally, during the applicable warranty period, any SPD which fails due to any transient surges, including lightning, shall be repaired or replaced by the manufacturer without charge.
- .2 Since "Acts of Nature" or similar statements typically include the threat of lightning to which the SPDs shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this particular section. That is, the warranty must specifically provide for unlimited free replacements of the SPD in the event of failure caused by the effects of lightning and all other transient surges. The warranty shall cover the entire device, not just various components, such as modules only.
- .3 The SPD manufacturer shall be ISO 14001 and ISO 9001 or 9002 certified.

### **1.4 MANUFACTURER'S QUALIFICATIONS**

- .1 The SPD's shall be manufactured in Canada or the USA by a manufacturer that has been regularly

engaged in the design, manufacturing and testing of SPD's of the types and ratings required for a period of not less than ten years.

- .2 Acceptable Vendors:
  - .1 Advanced Protection Technologies
  - .2 Citel
  - .3 Eaton
  - .4 Innosys Power/Total Protection Solutions
  - .5 Schneider Electric
  - .6 Siemens

**PART 2 - PRODUCTS**

**2.1 GENERAL:**

- .1 The SPD shall be listed by ETL, UL, or other nationally recognized test laboratory to UL's 1283 and UL's 1449 standards, and not merely the components or modules.
- .2 The SPD shall protect all modes L-G, L-N, L-L, and N-G, have discrete suppression circuitry in L-G, L-N and N-G, and have bidirectional, positive and negative impulse protection. Line-to-neutral-to-ground protection is not acceptable where line-to-ground is specified, and accordingly reduced mode units with suppression circuitry built into only 4 modes are not acceptable. In delta systems, line-to-ground-to-line protection is not acceptable where line-to-line is specified.
- .3 The maximum continuous operating voltage (MCOV) of all components shall not be less than 125% for a 120V system and 120% for 220, 240, 277 and 600V systems.
- .4 All SPD's shall be equipped with a comprehensive monitoring system which shall include a visual LCD panel display providing information on unit status and phase loss/protection loss.
- .5 If a disconnect switch is specified, the disconnect switch and the SPD as a system shall be capable of interrupting up to a 200kA symmetrical fault current with 600 VAC applied.
- .6 Short circuit rating of each SPD device shall be equal or greater than the rating of the panel it is connected to.
- .7 Nominal discharge current rating shall be 20kA.
- .8 Voltage Protection Ratings (VPR) shall not be greater than:

<b>System Voltage</b>	<b>L-N</b>	<b>L-G</b>	<b>L-L</b>	<b>N-G</b>
120/208V	800V	800V	1200V	800V
277/480V	1200V	1200V	2000V	1200V
347/600V	1500V	1500V	3000V	1500V

- .9 The operating temperature range shall be -40° to 70° C (-40° to 160°F).
- .10 The unit shall be capable of operation up to 13,000 feet above sea level.
- .11 No appreciable magnetic fields shall be generated.
- .12 Provide NEMA 1 enclosure for integral SPDs. Provide NEMA 4 enclosure for external SPDs. Install SPD recessed in wall if it is connected to a recessed panel.

## **2.2 SPD'S CONNECTED TO DISTRIBUTION PANELS**

- .1 SPD(s) for this location shall be as indicated on project drawings. SPD shall be mounted externally to distribution panel.
- .2 The unit shall have a peak surge current of no less than 160kA/phase.
- .3 Internal Fusing - Overcurrent Protection
  - .1 Each Metal Oxide Varistor, or other primary suppression component, shall be individually fused for safety and performance to allow the SPD to withstand the full rated single pulse peak surge capacity per mode without the operation or failure of the fuses. Overcurrent fusing that limits the listed peak surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode overcurrent fusing is not acceptable where there is more than one MOV per mode.
  - .2 The fusing shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied.
- .4 The suppressor shall include Form C dry contacts (N.O. or N.C.) for remote monitoring capability.
- .5 The SPD shall have an internal audible alarm with mute button on front cover.

## **2.3 SPD'S CONNECTED TO BRANCH CIRCUIT PANELS**

- .1 SPD(s) for this location shall be as indicated on project drawings. SPD shall be mounted externally to branch circuit panel.
- .2 The unit shall have a peak surge current of no less than 100kA/phase.
- .3 Internal Fusing - Overcurrent Protection
  - .1 Each Metal Oxide Varistor, or other primary suppression component, shall be individually fused for safety and performance to allow the SPD to withstand the full rated single pulse peak surge capacity per mode without the operation or failure of the fuses. Overcurrent fusing that limits the listed peak surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode overcurrent fusing is not acceptable where there is more than one MOV per mode.
  - .2 The fusing shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied.
- .4 The suppressor shall include Form C dry contacts (N.O. or N.C.) for remote monitoring capability.
- .5 The SPD shall have an internal audible alarm with mute button on front cover.
- .6 Provide UL 1283 listed filter to provide EMI/RFI filtering of not less than -40dB attenuation at 100kHz as measured by MIL-STD-220C 50 ohm Insertion Loss Method.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- .1 Install the SPD's with the conductors as short and straight as practically possible.
- .2 Follow the SPD manufacturer's recommended installation practice as outlined in the equipment installation manual. The electrical contractor shall ensure that all neutral conductors are bonded to the system ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD.

- .3 Label externally mounted SPDs to identify which panel they are connected to.

END OF SECTION



PART 1 - GENERAL

1.1 <u>Related Work</u>	.1	All Sections:	Division 1
1.2 <u>Standards</u>	.1	Manual transfer disconnect switches to CSA C22.2 No. 4.	
	.2	CSA certified as a complete assembly.	
1.3 <u>Shop Drawings</u>	.1	Provide engineering data sheets for all products indicated, including but not limited to:	
	.1	Make, model and type.	
	.2	Schematic(s), including power connectors.	
	.3	Description of operation as it will be configured for this project.	
1.4 <u>Operation and Maintenance</u>	.1	Provide operation and maintenance data for transfer switch and incorporate into manual specified under Division 1.	
	.2	Provide detailed instructions to permit effective operation and maintenance, including but not limited to:	
	.1	Emergency power source connectors.	
	.2	Spare parts list and fuses.	
	.3	Schematic diagram(s).	
1.5 <u>System Description</u>	.1	Manual load transfer equipment to:	
	.1	To allow manual load transfer from normal supply to emergency source.	
	.2	Allow for connection of mobile generator via a dedicated and safe connection section of the enclosure.	
	.3	Be provided with fuses on the emergency power source (600A).	
	.4	Be provided with two (2) sets of five (5) cam-lock female connectors to be installed on mobile generator cabling (by others). Turn over all loose components to Owner and obtain receipt for inclusion in final Operation and Maintenance Manuals.	

PART 2 - PRODUCTS

- 2.1  
Manual Transfer Switch (MTS) .1 The manual transfer switch shall be provided with:
- .1 Both top and bottom capability for termination of source 1, source 2 and load cabling.
  - .2 Front access for mobile generator cable connections. Mobile generator power termination area to be provide within its own separate compartment.
  - .3 NEMA 4, outdoor design, 600V, 3 pole, 4W, solid neutral plus ground, double through, complete with 600A mobile power source fuses and Cam-Lok quick connectors.
  - .4 Suitable for lock-out tag-out safety procedures.
- 2.8  
Nameplate, Identification and Markings .1 MTS identification: Lamacoid, with white letters on black background, centrally mounted on front.
- .2 Warning sign: Lamacoid with 13 mm white letters on red background, on front of main supply compartment to identify power supply sources.
- 2.10  
Quality Assurance .1 Test MTS assembly in accordance with manufacturer's recommendations and include, but do not limit to, the following:
- .1 Emergency power source mechanical connectors.
  - .2 Continuity of power through connectors.
- 2.11  
Acceptable Manufacturers .1 Eaton Cutler-Hammer Safety Switch CDT Double Throw Quick Connect series.

PART 3 – EXECUTION

- 3.1  
Installation .1 Install manual transfer switch in place, rigid, plumb and square, against wall.
- .2 Check factory-made connections for mechanical security, electrical continuity and phasing.

- .3 Provide grounding connections between equipment ground buses and building grounding system.
- .4 Remove foreign material, including dust before energizing equipment.
- .5 Connect power and grounding wiring.
- .6 Perform tests in accordance with accepted practice.

END OF SECTION

PART 1 - GENERAL

1.1 <u>Related Work</u>	.1	All Sections:	Division 1
	.2	Standby Power System	Section 16622
1.2 <u>Standards</u>	.1	CSA C22.2 No. 178 Certified, Automatic Transfer Switches.	
	.2	Underwriters Laboratories UL-1008 listed.	
	.3	ANSI/NEMA ICS 2, Industrial Control Devices, Controllers and Assemblies.	
	.4	EEMAC Standard ICS 2.	
	.5	CAN3-C13, Instrument Transformers.	
1.3 <u>Shop Drawings</u>	.1	Provide engineering data sheets for all products indicated, including but not limited to:	
	.1	Make, model and type.	
	.2	Schematic(s), including power and control/relays systems.	
	.3	Description of operation as it will be configured for this project.	
1.4 <u>Operation and Maintenance</u>	.1	Provide operation and maintenance data for automatic transfer switch and incorporate into manual specified under Division 1.	
	.2	Provide detailed instructions to permit effective operation and maintenance and repair, including but not limited to:	
	.1	Complete illustrated parts list with catalog numbers.	
	.2	Spare parts list.	
	.3	Installation instructions for future maintenance.	
	.4	Schematic diagram(s).	
	.5	Troubleshooting procedures.	
	.6	Certificate(s) of testing and commissioning.	
1.5 <u>System Description</u>	.1	Open transition, automatic load transfer equipment to:	
	.1	Monitor voltage on all phases of normal power supply.	
	.2	Transfer load from normal supply to emergency when	

loss of normal power supply is detected.

- .3 Transfer load from emergency to normal power supply when normal power is brought on line, confirmed by sensing of voltage on all phases above adjustable preset limit for adjustable time period.
- .4 Include line and load side by-pass to provide power to critical facility loads when in maintenance of the main transfer assembly, without interruption of power to the load.
- .5 Buswork to be provided to minimize bending of cables.
- .6 Open transition of the main transfer assembly to break before make using a programmable time delay.

## PART 2 - PRODUCTS

### 2.1 Materials and Layout

- .1 Instrument transformers: to CAN3-C13.
- .2 Contactors: to ANSI/NEMA ICS2.
- .3 The automatic transfer controller shall be provided with:
  - .1 Both top and bottom capability for termination of source 1, source 2 and load cabling.
  - .2 Front access for all source and load cable connections. These power termination areas are to be provide within their own separate compartments.

### 2.2 Molded Case Switch Transfer Equipment

- .1 Molded Case Switch (breaker) Type Transfer Switch:
  - .1 600 V, 60 Hz, 600 A, 3 Wire - 3 Pole, solid neutral.
  - .2 Fault withstand rating: 35 kA, full rating.
  - .3 Full size solid neutral bar.
  - .4 NEMA 1 enclosure, complete with surge suppressor.

### 2.5 Automatic Transfer Controller

- .1 Controller shall be provided with the following Standards and Certifications:
  - .1 An underwriters laboratory (UL) listed component.
  - .2 Meets UL 1008.
  - .3 Complies with FCC Part 15, Class A.
- .2 Provided with an LCD based display for programming, system

diagnostics and display messaging.

- .3 The automatic transfer controller will function via a microprocessor and solid state controls. The set points to be field adjustable without the use of special tools. LED lights to be included on the exterior of the controller to show:
  - .1 Normal Source available.
  - .2 Emergency Source available.
  - .3 Connected to Normal Source.
  - .4 Connected to Emergency Source.
- .4 Control power: 120 V, single phase from a multi-tap transformer on both available power sources.
- .5 Local Controlling Features:
  - .1 Local test operation.
  - .2 Local time delay bypass push button.
  - .3 Local maintenance selector switch.
  - .4 Local Automatic / Local operation selector switch.
- .6 Timer features:
  - .1 Time delay normal to emergency (TDNE): 0-1800 sec.
  - .2 Time delay engine start (TDES): 0-120 sec.
  - .3 Time delay emergency to normal (TDEN): 0-1800 sec.
  - .4 Time delay engine cooldown (TDEC): 0-1800 sec.
  - .5 Time delay neutral position (TDN): 0-120 sec.
  - .6 Time delay emergency fail (TDEF): 0-6 sec.
  - .7 Time delay voltage imbalance: 10-30 sec.
  - .8 Pre-transfer signal: 1-120 sec.
- .7 Remote Monitoring and Controlling Features:
  - .1 Source 1 & Source 2 available: 2NO & 2NC, 120V.
  - .2 Source 1 & Source 3 connected: 1NO & 1NC, 120V
  - .3 Pre-transfer signal: 1NO & 1NC, 120V
  - .4 Two (2) Emergency Generator Start: 2NO, 50 VDC
  - .5 Controller General Fault: 1NO & 1NC, 120V
  - .6 Ten (10) 120V spare terminals block on DIN rail.
- .8 Source 1 and Source 2 Transfer Sensing features, with automatic re-transfer to normal:
  - .1 Under-voltage / Under-frequency
  - .2 Over-voltage / Over-frequency
  - .3 Three-phase voltage unbalance
- .9 Programmable generator exerciser to operate for 0-600 minutes under load transfer or not. Generator exerciser to be selectable on the following duty rotation: OFF, 1 day, 7 days, 14 days, or 28 days.

2.6  
Size and Finish

- .1 Maximum dimensions:
  - .1 Width and height of wall mountable ATS panel shall be compatible with available working space.
  - .2 Painted surfaces: grind smooth, thoroughly clean, etch in phosphate solution and coat with rust-inhibiting primer. Exterior finish colour to be verified during shop drawing review.

2.7  
Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 - Electrical General Provisions.
- .2 Provide transfer mimic of source and load connections.

2.8  
Nameplate, Identification and Markings

- .1 ATS identification: Lamacoid, with white letters on black background, centrally mounted on front.
- .2 Warning sign: Lamacoid with 13 mm white letters on red background, on front of main supply compartment to identify power supply sources.

2.9  
Source Quality Control

- .1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Engineer.
- .2 Notify Engineer two days minimum in advance of date of factory test.
- .3 Tests:
  - .1 Operate equipment both mechanically and electrically to ensure proper performance.
  - .2 Check selector switch, in all modes of operation Test, Auto, Manual, Engine Start and record results.
  - .3 Check voltage sensing and time delay relay settings.
  - .4 Check:
    - .1 Automatic starting and transfer of load on failure of normal power.
    - .2 Retransfer of load when normal power supply resumed.
    - .3 Automatic shutdown.

- 2.10  
Quality Assurance
- .1 Factory test individual components and complete ATS assembly in accordance with applicable standards.
  - .2 Manufacturer to notify Engineer 48 hours minimum, prior to tests.
  - .3 Test Automatic Transfer Switch (ATS) assembly in accordance with applicable Standards and include, but do not limit to, the following:
    - .1 Mechanical and electrical operation of circuit breakers, interlocks, auxiliary switches, protective devices, manual devices.
    - .2 Functional tests on components and circuits. Simulate control signals.
    - .3 Continuity of power and control circuit wiring.
  - .4 Transfer switch to be shipped to generator supplier for system factory acceptance test of ATS, Generator and Load Bank prior to shipping to the site.
- 2.11  
Acceptable Manufacturers
- .1 Acceptable Manufacturer:
    - .1 Eaton Transfer Switches complete with Eaton ATC-900+ Load Transfer Controller
  - .2 Acceptable Alternative Manufacturers (the electrical contractor is responsible to ensure alternative product is fully equivalent functionally and physically):
    - .1 Schneider
    - .2 ASCO

### PART 3 – EXECUTION

- 3.1  
Installation
- .1 Locate, install and connect transfer equipment.
  - .2 Check relays, solid state monitors and adjust as required.
  - .3 Install and connect generator battery and remote alarms.
  - .4 Install Automatic Transfer Switch (ATS) in place, rigid, plumb and square, against wall.
  - .5 Check factory-made connections for mechanical security, electrical continuity and phasing.
  - .6 Provide grounding connections between equipment ground buses and building grounding system.



- .7 Remove foreign material, including dust before energizing equipment.
- .8 Connect power, control and grounding wiring.
- .9 Check contactors. Verify proper operation of protective devices.
- .10 Prior to energization, confirm in writing that solid state devices have been activated, programmed, calibrated, and set by manufacturer's representative.
- .11 Perform tests in accordance with accepted practice.

3.2  
Field Quality Control

- .1 Perform tests in accordance with accepted practice.
- .2 Energize transfer equipment from normal power supply.
- .3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position.
- .4 Ensure proper local mode and automatic mode performances.

END OF SECTION

PART – GENERAL

1.1 .1 The specified system shall be designed, manufactured, tested and  
Standards installed in compliance with CSA standards.

1.2 .1 Submit product data to Section 16010.  
Product Data

PART 2 – PRODUCTS

2.1 .1 Voltage input: up to 600 VAC L-L without the use of PTs.  
Power Monitor

.2 Capable of measuring the following:

- .1 Voltage
- .2 Amperage
- .3 Watts
- .4 VARs
- .5 VA
- .6 Power Factor
- .7 Frequency
- .8 THD voltage and current to the 31st harmonic
- .9 Watt-hours
- .10 VAr-hours
- .11 VA-hours
- .12 Demand (ampere, watt, VAr, VA).

.3 Capable of holding minimum and/or maximum values for the following:

- .1 Volts (L-L, L-N)
- .2 Current (A,B,C)
- .3 Power (watts, VAr, VA)
- .4 Power Factor
- .5 Frequency
- .6 THD (volts, amperes)
- .7 Demand Values
- .8 2 Alarms.

.4 Display: LCD with back lighting, adjustable contrast.

.5 Mounted in a NEMA 1 enclosure with terminal blocks for PT, CT wiring and power source.

.6 Outputs: 4 programmable, optically isolated discrete output ports. Program one output for high load shed of automatic load bank controller when under generator power source.

.7 Inputs: 4 programmable, optically isolated discrete input ports.

- .8 Communications:
  - .1 Ethernet.
- .9 Acceptable Manufacturers:
  - .1 Rockwell Automation, Power Monitor 5000, M6 Series.
  - .2 Acceptable Alternative Manufacturer (the electrical contractor is responsible to ensure alternative product is fully equivalent functionally and physically):
    - .1 Schneider
    - .2 Eaton

### PART 3 - EXECUTION

#### 3.1 Installation

- .1 Power monitor to be installed inside a NEMA 1 enclosure.
- .2 Follow the power monitor's manufacturer's recommendations as indicated in the equipment installation manual. Program generator running status and high load disable output of automatic load bank controller.
- .3 The Contractor shall comply with all applicable codes.
- .4 Provide CTs complete with starting blocks, PTs, terminal blocks and all other appurtenances for a complete system.
- .5 Display to be mounted on enclosure door exterior. Provide extension cable and other appurtenances required.

END OF SECTION

PART 1 - GENERAL

- 1.1  
Related Work .1 Single line diagram.
- 1.2  
Standards .1 Disconnect switches to CSA C22.2 No. 4.
- 1.3  
Shop Drawings .1 Submit product data in accordance with Section 16010.  
.2 Include voltage, current and NEMA ratings as well as physical dimensions.  
.3 Include a detailed breakdown of part number.
- 1.4  
Summary .1 Provide a disconnect switch for each piece of HVAC equipment in accordance with the latest version of the Ontario Electrical Safety Code.  
.2 Provide a disconnect switch for each equipment as indicated.  
.3 Disconnect switch to be non-fusible, unless otherwise indicated.  
.4 Disconnect switch to be installed next to equipment and within sight as per the latest revision of the Ontario Electrical Safety Code. Provide all mounting brackets and hardware as required for a complete installation. Mounting brackets to be aluminum, unless otherwise indicated. Mounting hardware to be stainless steel, unless otherwise indicated.  
.5 Disconnect switch NEMA rating to match intended environment:  
.1 NEMA 12 (painted steel) in non-hazardous dry locations.  
.2 NEMA 4X (stainless steel) in outdoor or damp locations.

PART 2 - PRODUCTS

- 2.1  
Disconnect Switch .1 Each disconnect switch to have the following characteristics:  
.1 Heavy duty construction, rated for industrial environments.  
.2 Voltage and current rating to match intended load.

- .3 Number of poles to meet requirements of intended load.
- .4 Short circuit (kA) rating to suit intended circuit.
- .5 100% load break and load make rated.
- .6 Horsepower rated.
- .7 Visible double break rotary blade mechanism. Two points of contact.
- .8 Triple padlocking capability. Cabinet door to also accommodate a padlock at the top as well as at the bottom of the cabinet door.
- .9 Interlocking mechanism. Door cannot be opened when the handle is in the ON position. Provide a built-in defeater mechanism for user access when necessary.
- .10 De-ionizing arc chutes. Arc chutes to confine and suppress the arcs produced under load.
- .11 Provide optional Factory installed Normally Open early break auxiliary dry contact for control circuit interlock as indicated on drawings.

2.2  
Equipment  
Identification

- .1 Provide equipment identification in accordance with Section 16010.
- .2 Each safety switch to be labeled as indicated.

2.3  
Acceptable  
Product(s)

- .1 Acceptable product(s):
  - .1 Eaton Cutler-Hammer safety switch.
- .2 Acceptable Alternative Manufacturer (the electrical contractor is responsible to ensure alternative product is fully equivalent functionally and physically):
  - .1 Schneider

3.1  
Installation

- .1 Installation as per the latest revision of the Ontario Electrical Safety Code.

END OF SECTION

PART 1 - GENERAL

- 1.1  
Product Data .1 Submit product data to Section 16010.
- 1.2  
Plant Assembly .1 Install all circuit breakers in panelboards before shipment.  
.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- 1.3  
Seismic Restraint .1 Installations in this section are subject to support and anchorage requirements, as directed by the seismic restraint consultant retained by Contractor.

PART 2 - PRODUCTS

- 2.1  
Materials .1 Panelboards and Custom Built Panelboard Assemblies to CSA C22.2 No. 29.
- 2.2  
Panelboards .1 Install circuit breakers in panelboards before shipment.  
.2 600 V panelboards: bus and breakers rated for 35 kA (symmetrical) interrupting capacity or as indicated.  
.3 250 V panelboards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity or as indicated.  
.4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.  
.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.  
.6 Door in door construction.  
.7 Minimum of 2 flush locks for each panel board.  
.8 Two keys for each panelboard and key panelboards alike.  
.9 Copper bus with neutral of same ampere rating of mains.

- .10 Mains: suitable for bolt-on breakers.
  - .11 Trim with concealed front bolts and hinges.
  - .12 Trim and door finish: baked enamel.
- 2.3  
Breakers
- .1 Main breaker on all 208V panelboards: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
  - .2 For breakers 60 amp and greater provide moulded case circuit breakers that operate by means of thermal magnetic trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and instantaneous tripping for phase fault short circuit protection.
  - .3 For breakers smaller than 60 amp provide moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
  - .4 Lock-out/Tag-out devices for any breaker feeding a motorized piece of equipment or HVAC devices.
- 2.4  
Equipment Identification
- .1 Refer to Section 16010.
  - .2 Nameplate for each panelboard size 4 engraved as indicated.
  - .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
  - .4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door.
- 2.5  
Acceptable Manufacturers/Suppliers
- .1 All panelboards to be product of one manufacturer.
  - .2 Acceptable 208V Panel board Manufacturers:
    - .1 Eaton
    - .2 Schneider
  - .3 Acceptable 600V Distribution Panel board Manufacturers:
    - .1 Eaton Power-R-Line PRL4B 50X Panelboard
  - .4 Acceptable Alternative 600V Distribution Panel Board Manufacturer (the electrical contractor is responsible to ensure alternative product is fully equivalent functionally and physically):
    - .1 Schneider



PART 3 - EXECUTION

3.1  
Installation General

- .1 Connect neutral conductors to common neutral bus with respective neutral identified.
- .2 Connect ground conductors to common ground bus in panel.
- .3 Locate panelboards where indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .4 Install surface-mounted panelboards on non-combustible surface.
- .5 Mount panels over 1500 mm high on 150 mm housekeeping pad.
- .6 Connect all loads to circuits as indicated.

END OF SECTION

PART 1 - GENERAL

1.1  
References

- .1 American National Standards Institute (ANSI)
  - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
  - .2 ANSI C82.4-02, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers ( ANSI/IEEE )
  - .1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
  - .1 ASTM F 1137, Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International)
- .5 ICES-005, Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC).
- .7 IESNA LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products.
- .8 IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- .9 NEMA SSL 3, High-Power White LED Binning for General Illumination.

1.2  
Action and Informational Submittals

- .1 Provide submittals in accordance with Section 01340 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified.
  - .3 Photometric data to include: VCP Table where applicable, spacing criterion.

- .3 Quality assurance submittals: provide following in accordance with Section 01400 - Quality Control.
  - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.
- .4 Shop drawings to identify manufacturer and catalogue number of luminaire, lamp and ballast with luminaire identification type.
- .5 Provide lamp and ballast compatibility letters from both the lamp and ballast manufacturer for each pair.

1.3  
Delivery, Storage  
and Handling

- .1 Deliver, store and handle materials in accordance with Section 16010.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Divert unused metal materials from landfill to metal recycling facility.

PART 2 - PRODUCTS

2.1  
LED Lamps

- .1 Optical Assemblies: LEDs shall be provided with discreet optical elements to provide IESNA Type II, III, IV or V distributions. Additional distributions for spill light control shall be utilized when light trespass must be mitigated. All optical assemblies will be mounted parallel to the ground, aimed in the same direction and shall provide the same optical pattern such that catastrophic failures of individual LEDs will not constitute a loss in the distribution pattern. The luminaire shall have minimum efficacy of 85 lm/W as reported by an LM-79 report for each luminaire wattage and photometric distribution considered.
- .2 All photometric data will be measured by the IESNA LM-79-08 standard and formatted per IESNA LM-63-02 as an electronic .ies file.
- .3 Lumen depreciation shall not decrease by more than 30% over the expected operating life of a minimum of 80,000 hrs @ 25 degrees Celsius. The measurements shall be calibrated to standard photopic calibrations. The LED device manufacturer shall have tested the lumen maintenance characteristics of the LED package in accordance with the guidelines of IESNA LM-80-08 "Approved Method for Lumen Maintenance Testing of LED Light Sources". A copy of the manufacturer's LM-80 reports shall be submitted for review, accompanied by lumen depreciation estimates for 10, 15 and 25 degrees Celsius luminaire ambient operating temperatures.

- .4 Light Colour/Quality: The luminaire shall have a correlated colour temperature (CCT) range of 4,000 K to 4,500 K. The colour rendition index (CRI) shall be 70 or greater. Binning of LEDs shall conform to ANSI/G.NEMA SSL 3-2010.
- .5 Backlight-Uplight-Glare: The luminaire shall not allow more than 10 percent of the rated lumens to project above 80 degrees from vertical. The luminaire shall not allow more than 2.5 percent of the rated lumens to project above 90 degrees from vertical. Backlight and Glare ratings as per fixture schedule and calculated per IESNA TM-15.

2.4  
LED Drivers

- .1 Power Consumption: maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.
- .2 Operation Voltage: the luminaire shall operate from a 60 Hz AC line over a voltage ranging from 108 Vac to 305 Vac. The fluctuations of line voltage shall have no visible effect on the luminous output.
- .3 Power Factor: the luminaire shall have a power factor of 0.90 or greater.
- .4 THD: total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent over entire load range 0-100%.
- .5 Surge Suppression: the luminaire on-board circuitry shall include surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes and other harmonic interference. The SPD shall protect the luminaire from damage and failure for common mode transient peak voltages up to 10 kV (minimum) and transient peak current up to 5Ka (minimum). SPD performance shall be tested per the procedures in ANSI/IEEE C62.41-1992 (or current edition) for category C (standard). The SPD shall fail in such a way as the luminaire will no longer operate. The SPD shall be field replaceable.
- .6 The power supply driver enclosure should be sealed to protect against the entry of dust and water. This area should be sealed to minimum Ingress Protection Level 65 (IP65).
- .7 RF Interference: LED drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
- .8 The total current harmonic distortion of power supply driver induced into an AC power line shall not exceed 20%.

2.5  
Finishes

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

PART 3 - EXECUTION

3.1  
Fixture Installation

- .1 Install lighting fixtures in acceptable manner for type of fixture and in accordance with manufacturer's installation instructions, using fixture studs or other recommended methods.
- .2 Align fixtures shown in continuous lines or rows so that they appear as straight lines.
- .3 Do not mount fixtures above pipes, ducts or equipment. Check layouts of work by other trades on project and plan co-operatively with others to avoid conflict. Provide longer hangers to clear obstructions, in event of unavoidably tight locations.

3.2  
Fixture Support

- .1 Chain hang fixtures. Follow manufacturer's documentation for installation details.

END OF SECTION

PART 1 - GENERAL

- 1.1  
Scope of Work
- .1 Provide one (1) Standby Power Generator complete with exhaust, silencer, exhaust extension, electrical systems, fuel and cooling systems. Each generator shall be suitable for outdoor installation and suitable for standby power operations of harmonic generating process loads over multiple staged-starting events.
  - .2 Systems will be diesel.
  - .3 Provide factory integrated acceptance testing of each Emergency Power System comprised of each facilities Generator, Load Bank and Automatic Transfer Switch as functional system.
  - .4 Provide all cables specified; or detailed on Contract Drawings.
  - .5 Testing and startup of all normal and emergency power cabling and protective devices as per Section 16031.
  - .6 Provide all grounding and accessories as shown, and as required.
  - .7 Provide 120/208 V, 3-phase power panelboard c/w circuit for all integral generator support systems.
  - .8 Provide all fuel for testing and final fill up.
- 1.2  
Related Work
- .1 16413 – Automatic Transfer Switch.
  - .2 16622.1 – Standby Power System Factory Report – Safety Devices.
  - .3 16622.2 – Standby Power System Factory Report – Operations.
  - .4 16622.3 – Standby Power System Site Report – Safety Devices.
  - .5 16622.4 – Standby Power System Site Operational Test.
  - .6 16622.5 – Standby Power System Site Full Load Tested.
  - .7 16622.6 – Standby Power System Site Cycle Crank Test.
  - .8 16623 – Horizontal Airflow Outdoor Resistive Load Bank.
- 1.3  
References
- .1 ANSI/API 650, Welded Steel Tanks for Oil Storage.
  - .2 ANSI/NEMA MG1, Motors and Generators.
  - .3 CAN/CGSB 3.6, Automotive Diesel Fuel.

- .4 ISO 3046/1, Specification for Reciprocating Internal Combustion Engines: Performance.
- .5 CAN4-S601, Steel, Aboveground Horizontal Tanks for Flammable and Combustible Liquids.
  
- 1.4 Seismic Restraint
  - .1 Installations in this Section are subject to support and anchorage requirements, as directed by the seismic restraint Engineer retained by the Contractor.
  
- 1.5 Description of System
  - .1 Generating system consists of:
    - .1 Engine (Diesel).
    - .2 Alternator.
    - .3 Alternator control panel.
    - .4 Battery charger and battery.
    - .5 Fuel supply system.
    - .6 Exhaust system.
    - .7 Non walk-in type weatherproof sound attenuated enclosure complete with lighting, battery charging system, block heater, anti-condensation heating of control systems, 120V maintenance receptacle as well as heat detector and magnetic panel door switch sensors for security/asset monitoring.
  - .2 Systems designed to operate as standby power source.
  
- 1.6 Material Standards
  - .1 IEC 34-1, 801.2 Level 4, 801.3 Level 3, 801.4 Level 4, 801.5 Level 5.
  - .2 IEEE.
  
- 1.7 Drawings
  - .1 Submit design and shop drawings as per Section 01340.
  - .2 Drawings to include:
    - .1 Overall dimensions.
    - .2 Dimensional locations of all field tie points, base access openings, including sizes and fittings.
    - .3 Block diagram clearly indicate field work to be completed by others. Block diagram to include cable requirements

- between all components connected to the Generator or  
ATS.
- .4 Wiring diagrams and cable schedules clearly indicating  
prewired, field wiring, terminal numbers, etc., for a  
complete installation.
  - .3 Include make, type, model and quantity of each:
    - .1 Engine: BHP including fan, BMEP, with performance  
curves; include heat dissipation of each fuel injector and  
indicate that this heat is accommodated by fuel  
tank/pumps system.
    - .2 Exhaust emissions compliance and Data Sheet.
    - .3 Alternator; exciter; temperature rise; transient, sub-  
transient and open circuit constants; continuous standby  
rating as per MG1-1998 Part 32.7, 32.8 and 32.9; short  
circuit capability as per MG1-1998 Part 32.13; Non-Linear  
load capability as per MG1-1998 Part 32.15.
    - .4 Voltage regulator.
    - .5 Battery.
    - .6 Battery charger.
    - .7 Alternator control panel: type and accuracy of meters and  
controls; main output circuit breaker with trip curves and  
electronic adjustments.
    - .8 Governor.
    - .9 Engine control panel.
    - .10 "Hospital" grade silencer complete with 8 octave band  
sound spectrum data.
    - .11 Alternator cooling air requirements in m<sup>3</sup>/s.
    - .12 Engine cooling air requirements in m<sup>3</sup>/s.
    - .13 British standard or DIN rating of engine.
    - .14 Enclosure:
      - .1 Weather-protective, sound-attenuated.
    - .15 Flow diagrams for:
      - .1 Fuel.
      - .2 Cooling air.
    - .16 Electrical:
      - .1 Block diagram clearly indicating all components  
shipped to site and requiring field wiring.
      - .2 Wiring schematics.



- .17 Control Panel mounted Local Annunciator Panel.
- .18 Block Heater.
- .19 Fuel Filter(s).
- .20 Air Filter(s).
- .21 Radiator cooled heat exchanger.
- .22 Dimensioned drawing showing complete generating set mounted on structural steel base, including dimensions, vibration isolators, exhaust system, drip trays, and total weight.
- .23 Continuous full load output of set at 0.8 PF lagging; expected engine life (number of hours of operation under prime rating conditions).
- .24 Description of set operation including:
  - .1 Automatic starting and transfer to load and back to normal power, including time in seconds from start of cranking until unit reaches rated voltage and frequency.
  - .2 Manual starting.
  - .3 Automatic weekly load cyclers.
  - .4 Automatic shut down and alarm on:
    - .1 Overcranking.
    - .2 Overspeed.
    - .3 High engine temp.
    - .4 Low lube oil pressure.
    - .5 Short circuit.
    - .6 Alternator overvoltage.
    - .7 Lube oil high temperature.
    - .8 Over temperature on alternator.
    - .9 Low coolant level.
    - .10 Low engine temperature.
  - .5 Manual remote emergency stop.
- .25 Steady state and transient performance response to voltage and frequency.
- .26 THD and TIF performance.
- .27 Load starting capability vs. voltage dip (actual time curve as per MG1-1998-Part 32, 32.18).
- .28 Motor starting capability in KVA vs. voltage dip (actual curve as per MG1-1998-32.18 Figure 32-3).
- .29 Details on warranty.
- .4 To facilitate the coordination study provide the following:
  - .1 Generator breaker frame size, trip unit type and

interrupting rating.

- .2 Generator parameters including the following:
  - .1 kVA
  - .2 Voltage
  - .3 Current
  - .4 Power Factor
  - .5 Number of Poles
  - .6 RPM
  - .7 Type of excitation (fixed voltage, current boost, PMG)
  
- .3 Decrement Curve with all the following in % based on generator rated kVA.
  - .1 Sub-transient Reactance (%Xd<sup>''</sup>)
  - .2 Transient Reactance (%Xd')
  - .3 Synchronous Reactance (%X'd)
  - .4 Negative Sequence Reactance (%X<sub>2v</sub>)
  - .5 Zero Sequence Reactance (%Z<sub>0</sub>)
  - .6 Generator X/R OR 3P armature short circuit current
  - .7 (TA3) and armature DC resistance (%Ra) based on Generator kVA.

1.8  
Operation and  
Maintenance Data

- .1 Provide operation and maintenance data for diesel alternator and accessories as per Division 1.
  
- .2 Include in Operation and Maintenance Manual instructions for particular unit supplied and not general description of units manufactured by supplier and:
  - .1 Operation and maintenance instructions for engine, alternator, control panel, automatic transfer switch, battery charger, battery, fuel system, enclosure ventilation system, exhaust system and accessories, to permit effective operation, maintenance and repair.
  
  - .2 Technical data:
    - .1 Illustrated parts lists with parts catalogue numbers.
    - .2 Schematic diagram of electrical controls.
    - .3 Flow diagrams for:
      - .1 Fuel system.
      - .2 Lubricating oil.
      - .3 Cooling system.
      - .4 Certified copy of factory test results.
      - .5 Certification of Factory Torsional Vibration Analysis on Engine-Alternator set.
      - .6 Maintenance and overhaul instructions and schedules.

- 
- 1.9  
Source Quality Control
- .1 Factory test each generator set, including engine, alternator, control panels and accessories.
  - .2 Notify the Engineer 21 days in advance of any test date.
  - .3 Provide suitable loadbank to test the generator.
  - .4 Running Test Load to have 0.8 lagging power factor.
  - .5 Starting Test Load to be the equivalent of the load described in 2.2 (unit sizing).
  - .6 Install continuous strip chart recorders or equivalent to record frequency and voltage variations during load switching procedures.
  - .7 Provide certification of torsional vibration analysis and performance compliance of engine alternator unit.
  - .8 Measure emissions in accordance with Ontario Ministry of the Environment Source Testing Code when firing 100% load.
  - .9 Factory tests: complete Forms 16622.1 and 16622.2.
- 1.10  
Warranty
- .1 Refer to the General Conditions for warranty details.
- 1.11  
Care, Operation and Start-up
- .1 Manufacturer to provide a certificate indicating that Emergency Power System has been installed to his satisfaction and verify test results.
  - .2 Manufacturer and Engineer to be present during site test and to verify field test report Section 16622.3, 16622.4, 16622.5, 16622.6.
  - .3 Manufacturer to instruct the Owner regarding routine maintenance and operation of the Emergency Power System. Submit a certificate to show that Owner has been instructed in operation of system and maintenance procedures required. A signature certifying this to be obtained.
- PART 2 - PRODUCTS
- 2.1  
General
- .1 Provide emergency power system, including fittings and accessories necessary for proper and satisfactory operation as indicated and as specified.
  - .2 Alternator direct coupled to engine by a flexible drive disc, flywheel housing and coupling to prevent misalignment between

engine and generator.

.3 Mount assembly on a common structural steel base supported on adjustable spring vibration isolators.

.4 Unit rating will be defined as follows, in accordance with ISO3046 or MG1

.1 Standby power at 100% kW output.

2.2  
Performance  
Parameters

.1 The following generator performance requirement parameters are:

- .1 Standby Duty (kW @ 0.8 PF): 500 kW<sub>e</sub>
- .2 Max Load Step Frequency Dip: 22% or less.
- .3 Max Alternator Rise: 125 Deg C.
- .4 Alternator Insulation Class: F
- .5 Max Load Step: 150 Hp VFD Start
- .6 Voltage: 600V, 3 Phase, 4 Wire
- .7 Enclosure Sound Emission: 72 dBa at 7m (or less).
- .8 Diesel Storage: 24 hr runtime at full load.
- .9 NO<sub>x</sub> emission factor: <4.58kg/hp.h

2.3  
Engine

.1 Radiator cooled engine.

.2 Use heavy-duty, industrial type radiator mounted on engine base. Provide flanges for connection with ductwork.

.3 Forced-type cooling fan, engine, driven, to direct airflow through radiator from engine side.

.4 Engine to have sufficient Bhp to produce full-rated electrical output when operating all engine-driven accessories at an ambient temperature of 40°C and 281 meters elevation.

.5 Engine emissions at full and partial load to meet all applicable Provincial and Federal regulations under continuous operation through all ambient operating conditions. As a minimum (if lower than above), emissions to meet USEPA Tier 3 Standards for off-road engines when firing commercially available No. 2 fuel oil. All testing to be to MOE Source Testing Code for NO<sub>x</sub>, hydrocarbons, co-particulate and capacity.

.6 Engine to have following additional fittings and features:

- .1 Engine driven fuel oil lift pump for Number 2 diesel fuel.
- .2 Heavy-duty air cleaners.
- .3 Fuel and lubrication oil filters.
- .4 Electronic, isochronous governor to control speed.

- .5 Electric fuel rack shutoff solenoid, energized to run.
- .6 Complete electric starting system with starting motor, starting solenoid and batteries. Batteries with sufficient ampere-hour capacity to provide two (2) consecutive starts without necessity of recharging when engine and batteries are exposed to winter conditions. Battery cables of ample capacity to be included.
- .7 Engine wiring to have heat and oil resisting insulation, carefully routed and supported away from all hot metal parts and brought to suitable junction box.
- .8 Lubricating oil drain pipe complete with gate valve and end plug beyond concrete base; flexible fuel lines.
- .9 Thermostatically controlled engine coolant heater.
- .10 Thermostatically controlled engine lube oil heater.
- .11 Supply first filling of lubricating oil and antifreeze suitable for -40°C.
- .12 Carbon steel oil drip pan. Pan is to be accessible for cleaning.
- .13 Lube oil cooler.
- .14 Safety guards to OSHA Standards.
- .15 4-cycle engine.
- .16 Enclosed steel battery box mounted on genset frame(s).
- .17 Fuel filters.
- .18 NC solenoid shutoff valve (for fuel) powered from battery circuit and interlocked with operation.
- .19 Fusible link valve.

2.4  
Diesel Fuel System

- .1 Sub-base, double-wall tanks with a minimum 24-hour capacity at full load complete with integral leak detection and local visual level indication to TSSA and applicable standards.
- .2 Provide the following signals:
  - .1 Tank Leak Indicator and General Fault Output (form C).
  - .2 Low Fuel Level (form C contact).

2.5

- .1 Alternators to be rated for kWe load indicated in 2.2, 3 phase,

Alternators

- .2 4 wire, floating neutral, 60 Hz, 1800 rpm manufactured for standby operation at 600V AC.  
125°C temperature rise alternator per NEMA MG1.22.40, IEEE 115 and IEC 34-1, single-bearing, revolving field, brushless 4-pole drip-proof exciter with dynamically balanced flexible drive coupling to engine.
- .3 Rotor supported by pre-lubricated, maintenance-free ball bearing.
- .4 PMG excitation for starting capacity and isolation from non-linear load distortion effects.
- .5 Amortisseur windings, 2/3 pitch.
- .6 AC waveform THD voltage less than 3%, no load to full load, with 20% loads having a crest factor of up to 2.1.
- .7 Telephone Influence Factor (TIF) less than 50.
- .8 Radio Frequency Interference (RFI) to IEC-801 and to MIL-STD-461C, Part 9 (EMI).

2.6  
Exhaust System

- .1 Provide the following factory installed equipment:
  - .1 Heavy-duty, hospital grade exhaust silencer for horizontal mounting, complete with condensate drain and plug.
  - .2 Minimum 310 mm in length of heavy-duty flexible exhaust pipe with flanged connections both ends. Provide stack extension mounted/supported on enclosure as indicated. Pipe is to be extended to be at a minimum of 4.2m above grade.
  - .3 Guards to CSA or OSHA standards over all moving parts to protect maintenance workers.

2.7  
Exhaust Emissions Compliance

- .1 Exhaust emissions tested to an accepted standard by an Independent Agency in accordance with Ontario Ministry of the Environment Source Testing Code to meet Ontario Ministry of the Environment requirements without the installation of ancillary equipment. Provide data for nitrogen oxides, hydrocarbons, carbon monoxide and particulate matter.

2.8  
Control Panel

- .1 Control panel unit can be mounted on Genset if proper isolation is provided.
- .2 Electronic voltage regulator, 3 phase rms sensing:
  - .1  $\Delta V = \pm 1.0\%$  for loads 0 to 100%, steady-state.
  - .2  $\Delta f = \pm 0.25\%$  for loads 0 to 100%, steady-state.

- .3 transient voltage dip on application of 100% load at 1.0 pf: 20%.
- .4 transient voltage rise on removal of 100% load at 1.0 pf: 10%.
- .5 transient voltage dip on motor start of 25 hp across the line: 20% maximum.
- .3 AC digital voltmeter 2% accuracy, 0 to 650 V, true rms sensing, phase to phase.
  - .1 AC digital ammeter 2% accuracy, 0 to 500 A, true rms sensing, phase.
  - .2 Voltmeter switch – 3-position.
  - .3 Ammeter switch – 3-position.
- .4 AC frequency digital meter 1% accuracy, 59 Hz to 61 Hz.
- .5 Running time meter.
- .6 kW digital meter 2% accuracy, full scale kW, true rms sensing.
- .7 Voltage adjusting rheostat or transformer - screwdriver adjustable only.
- .8 Current transformers as necessary.
- .9 Potential transformers as necessary.
- .10 Analog DC voltmeter and ammeter, 0 to 14 V and 0 to 20 A respectively or as required.
- .11 Digital meters for:
  - .1 Engine Oil Pressure (psi)
  - .2 Engine Coolant Temperature (°C)
  - .3 Engine Oil Temperature (°C)
  - .4 Engine rpm.
- .12 Safety Indications and Shutdowns:
 

<u>Indicator/Function</u>	<u>CV</u>	<u>S</u>
.1 Overcrank	X	X
.2 Low engine temperature	X	
.3 High engine temperature	X	X
.4 Low lube oil pressure	X	X
.5 Overspeed	X	X
.6 Low fuel	X	

.7	Emergency power supply system supplying load	X	
.8	Control switch not in automatic position	X	X
.9	Low battery voltage	X	
.10	Lamp test	X	
.11	Contacts for local and remote common alarm	X	
.12	Audible alarm silencing switch	X	
.13	Remote emergency stop		X
.14	Low coolant level	X	X
.15	Low AC voltage	X	
.16	High AC voltage	X	
.17	Underfrequency	X	
.18	Overcurrent	X	
.19	Short circuit	X	X
.20	Fuel reservoir leak indicator/function	X	
.21	Lube oil high temperature	X	X
.22	Over temperature on alternator	X	X

CV = Control panel mounted, individual visual and audible indication.

S = Shutdown of emergency power system.

Note: All fault indicating lights are to remain sealed in until manually reset.

- .13 MANUAL-OFF-AUTO key-operated selector switch. Removal of key possible in "AUTO" position, only.
- .14 600 V, 3-pole, 22 kA output moulded case circuit breaker. Rating to suit generator at 100% continuous current as per UL489 listing.
- .15 Clearly label terminal blocks for all external connections.
- .16 Sign will be installed on the equipment stating that the equipment is automatically controlled and may start at any time.
- .17 Provide E-stop button with adequate protection to prevent accidental activation.
- .18 Hard-wired Transfer Switch/PLC signals for:
  - .1 Generator Running
  - .2 Generator General Fault
  - .3 Generator Low Fuel Warning
- .19 Provide manufacturers software for monitoring and control of Genset via a Microsoft Windows PC.



- 
- .20 Ethernet communication.
- 2.9  
Automatic Battery Charger
- .1 Semi-constant voltage type with an output voltage which varies not more than +3% of preset voltage when input voltage varies plus or minus 15% of line voltage. Charger to incorporate overload protection and charging current ammeter. Charger will be capable of recharging a completely discharged battery to 80% of capacity within 4 hours and to full capacity in not more than 12 hours. Charger to be 120 VAC input.
- .2 Battery charger to provide the generator panel with a fault signal upon failure.
- 2.10  
Engine Liquids Refill
- .1 Provide all initial fills for engine coolant and lubricating oils.
- .2 Provide a complete change of all engine coolant and lubricating oil after the site testing has been successfully completed.
- .3 Replace all filters after site testing has been completed.
- .4 Refill fuel tank(s) after site testing and commissioning has been successfully completed.
- 2.11  
Enclosure
- .1 Provide the following enclosure assembly. Complete enclosure, fuel system, cooling and electrical to be factory assembled.
- .1 A weather-protective enclosure for the diesel engine and alternator set complete with fuel tank, and all other accessories per 2.1 through 2.10 above.
- .2 Lifting eyes at all four corners welded directly to the main structure.
- .3 Drain pan under engine.
- .4 Exterior Walls, Roof and Access Panels for non-walk-in enclosures:
- .1 Exterior sheathing made of minimum 16 gauge galvanized steel with baked enamel paint to match existing building. Colour chip to be submitted and approved by Owner prior to fabrication.
- .2 Steel frame spaced as required.
- .3 Fire retardant polyurethane insulation in between exterior wall and interior perforated galvanized sheathing. Insulate and line roof.
- .4 Heavy-duty stainless steel hinges and/or locking hasps and door handles complete with panic hardware.

- .5 All latches and handles to be pad-lockable.
  - .6 Design enclosure to be vandal resistant. All joints to be welded or designed with a positive mechanical seal. Doors to be provided with P-type gasket seals.
  - .5 Sound Attenuation:
    - .1 In conjunction with the exhaust system published levels must be less than 72 dBA at 7 m operating at full load.
    - .2 Sound data to be obtained using approved ANSI procedures and be acceptable to MOE Approvals Branch. Provide full 8-octave band sound spectrum.
  - .6 Heavy-duty vandal resistant aluminum or galvanized steel louvers minimum 1.5 mm thickness, complete with removable bird screens on all louvres and air filters on air intake.
  - .7 Provide insulated low leakage dampers.
  - .8 Colour of enclosure: to Engineer's choice using Series 8000 exterior zinc phosphate with ceramic segmentation.
  - .9 Enclosure anchors for mounting on site concrete base to meet OBC seismic requirements. Engine, fuel tank, piping and accessory mounting to meet OBC seismic requirements.
  - .10 120/208 V, 3-phase panel and breakers for heaters, charger, lights, service power, etc., that are part of the enclosure. A 30A branch circuit breaker will supply this panel.
  - .11 Provide interior service lighting and 120 V receptacle on separated and dedicated branch circuits.
  - .12 Provide conduit and outlet box at the top of enclosure for and provide asset protection high heat detector with 120V form C contacts. Wire to General Alarm signal from generator complete with control panel LED.
  - .13 All components normally requiring service to be serviceable and removable without disassembling the enclosure as major components. Allow for removal or major components from enclosure. Design enclosure to be weatherproof and free-draining to avoid the accumulation of water from rain or snow melt. Design enclosure such that all louvres will not be obstructed as a result of accumulated snowfall and leaves.
- 
- 2.12 .1 Supply, loose, one (1) REPO (Remote Emergency Power Off)

- Remote Equipment switch for surface mounting.
- .2 Supply, loose, one (1) remote monitoring panel providing critical engine status monitoring.
- 2.13 Electrical Accessories .1 All electrical components necessary to automatically operate the emergency generator installation to be powered by the battery circuit as necessary for start-up and operation.
- 2.14 Spare Parts .1 Provide the following spare parts for each genset.
- .1 Two sets of air, fuel and all other filters. The first spare set is to be installed with the oil and coolant change following commissioning.
- 2.15 Miscellaneous Metals .1 Contractor is to provide metal steps as required, attached to generator, to allow for access to generator control panel at a height of 1500mm.
- 2.16 Acceptable Manufacturers .1 Acceptable manufacturers/supplier are:
- .1 Toromont CAT
- .2 Cummins
- .3 Kohler
- .4 Blue Star

### PART 3 - EXECUTION

- 3.1 Installation of Gensets .1 Provide concrete pad and anchor devices for Genset as per Divisions 2 and 3.
- .2 Install power cables and control cables.
- .3 Install all grounding devices.
- .4 Make all connections as indicated and as per manufacturer's recommendations.
- .5 Provide all necessary core drilling as required for power and control cables.
- .6 Install liquid cooled diesel electric generating units to CAN3-Z299.3 and in accordance with manufacturer's written instructions.

3.2  
Emergency Power  
Factory Acceptance Test

- .1 Factory test generator set, including engine, alternator, control panels, transfer switches, load banks and accessories.
- .2 Notify the Engineer 21 days in advance of any test date.
- .3 Provide an additional suitable loadbank to test the generator up to full capacity in the factory.
- .4 Running Test Load to have 0.8 lagging power factor.
- .5 Starting Test Load to be the equivalent of the load described in 2.2 (unit sizing).
- .6 Install continuous strip chart recorders to record frequency and voltage variations during load switching procedures.
- .7 Provide certification of torsional vibration analysis and performance compliance of engine alternator unit.
- .8 Measure emissions in accordance with Ontario Ministry of the Environment Source Testing Code when firing 100% diesel.
- .9 Factory tests: complete Forms 16622.1 and 16622.2.

3.3  
Emergency Power  
System Site Tests

- .1 Supplier shall perform testing and commissioning on-site.
- .2 Any deficiency in the operation of the genset and accessories will be the responsibility of the Manufacturer. Corrective action will be taken promptly by manufacturer.
- .3 Test and commission unit, after installation by others is complete, and submit test reports to Engineer.
- .4 Site Operational Tests:
  - .1 With the engine in a "cold start" condition and the building emergency load at its normal operating level, a power failure will be simulated by opening all switches or breakers that supply the normal power to the building or facility. The test load will be that load which is normally served by the emergency power system.
  - .2 The operational test will be continued for 1 hour, after which normal power will be restored to the building or facility and satisfactory transfer of the load and shutdown of the emergency Genset will be demonstrated.
  - .3 The following data will be observed and recorded:
    - .1 the time delay on start;
    - .2 the cranking time until the engine starts and runs;
    - .3 the time required to come up to operating speed;
    - .4 the time required to achieve a steady-state

- condition with all switches transferred to the emergency position;
    - .5 the voltage, frequency, and amperes at start-up and at any observed change in load;
    - .6 the engine oil pressure, water temperature where applicable, and battery charge rate at 5 minute intervals for the first 15 minutes, and at 15 minute intervals thereafter;
    - .7 the time delay on retransfer for each transfer switch; and
    - .8 the time delay on engine cool down and shutdown.
  - .4 Complete Test Report 16622.4.
- .5 Site Full Load Test:
  - .1 Following the operational test prescribed in Clause 3.3.4, the emergency Genset will be subjected to a 7-hour, 100% load test.
  - .2 The supplier shall supply a load bank including all necessary temporary wiring and controls required for a full load test on-site. Allow for the provision of an adjustable dummy load rated for generator 100% full load output.
  - .3 Complete Test Report 16622.5.
- .6 Site Cycle Crank Test:
  - .1 The engine will be prevented from running by utilizing any method recommended by the manufacturer. The control switch will then be placed in the "run" position to cause the engine to crank.
  - .2 The crank cycle will consist of either a 30 second continuous crank or three 10-second crank attempts separated by 10-second rest periods; start batteries will have sufficient capacity for two complete crank cycles at 10°C ambient room temperature, with a battery end voltage of not less than 80% of the rated voltage. The crank cycle will be observed and recorded.
  - .3 The time required to recharge the batteries after the above two crank cycles will be demonstrated to be within 4 hours.
  - .4 Complete Test Report 16622.6.
- .7 Site Safety Devices Test:
  - .1 Complete the test report of 16622.3.
  - .2 Shorting of safety devices not acceptable.

3.4  
Site Tests

- .1 Testing of the following shall be by the Contractor.
  - .1 All normal and emergency power feeders.
  - .2 Proper operation of each feeder and device, phase rotation, ground resistance and continuity measurements.

END OF SECTION

PROJECT: \_\_\_\_\_

Test Date:

ADDRESS:

Engine Mfg. \_\_\_\_\_

Model \_\_\_\_\_ Serial

Generator Mfg. \_\_\_\_\_

Model \_\_\_\_\_ Serial

Utility-Paralleling Equipment

Diesel Generator Supplier

Rated kVA \_\_\_\_\_ PF \_\_\_\_\_ Volts \_\_\_\_\_ Amps \_\_\_\_\_ Speed

DEMONSTRATION		TEST CONDUCTED
.1 Overcrank		
.2 Overspeed		
.3 High engine temperature (°C)		
.4 Oil pressure kPa		
.5 Low battery alarm		
.6 Generator overvoltage		
.7 Low coolant level		
.8 Automatic start from ATS		
.9 Automatic stop from ATS		
.10 Selector switch modes		
.11 Low engine temperature alarm		
.12 Load bank operation		

Manufacturer's Supervisor: \_\_\_\_\_

END OF SECTION

PROJECT: \_\_\_\_\_ Test Date: \_\_\_\_\_

MANUFACTURER: \_\_\_\_\_

LOAD ON ALTERNATOR (@ 1.0 pf)	50 %	100%	0 to 100% step	100% to 0% step
RUNNING TIME (hrs.)	1	2.0	0.1	0.1
.1 Ambient temperature				
.2 Frequency				
.3 Amps phase A (true rms)				
.4 Amps phase B (true rms)				
.5 Amps phase C (true rms)				
.6 Volts phase A-B (true rms)				
.7 Volts phase B-C (true rms)				
.8 Volts phase C-A (true rms)				
.9 kW 3 phase (true rms)				
.10 Oil pressure kPa				
.11 Oil temperature (°C)				
.12 Coolant temperature (°C) (IN)				
.13 Coolant temperature (°C) (OUT)				
.14 Outdoor air temperature (°C)				
.15 Ambient air temperature (°C)				
.16 Air temp. leaving radiator (°C)				
.17 Exhaust temperature (°C)				
.18 Battery charge amps				
.19* Transient voltage response	N/A	N/A	*, **	*, **
.20* Transient frequency response	N/A	N/A	*, **	*, **

\* Provide an oscillographic recorder

\*\* Record voltage dip magnitude and transient frequency response, including overshoot and recovery time.

Manufacturer's Supervisor: \_\_\_\_\_

END OF SECTION



PROJECT: \_\_\_\_\_

Test Date: \_\_\_\_\_

Engine Mfg. \_\_\_\_\_

Model \_\_\_\_\_ Serial \_\_\_\_\_

Generator Mfg. \_\_\_\_\_

Model \_\_\_\_\_ Serial \_\_\_\_\_

Utility-Parallelling Equipment

Diesel Generator Supplier

Rated kVA \_\_\_\_\_ PF \_\_\_\_\_ Volts \_\_\_\_\_ Amps \_\_\_\_\_ Speed \_\_\_\_\_

DEMONSTRATION	WITNESSES		
	Manufacturer	Division 16	Engineer
.1 Overcrank			
.2 Overspeed			
.3 High engine temperature (°C)			
.4 Oil pressure kPa			
.5 Low battery alarm			
.6 Generator overvoltage			
.7 Low coolant level			
.8 Automatic start			
.9 Automatic stop			
.10 Selector switch modes			
.11 Low engine temperature (°C)			
.12 Load bank start/stop-disconnection			
.13 Low fuel alarm			
.14 Fuel pump			

Manufacturer's Supervisor: \_\_\_\_\_

END OF SECTION

PROJECT: \_\_\_\_\_

Test Date:

CONTRACTOR:

- .1 Time delay on start: \_\_\_\_\_ seconds
- .2 Cranking time until engine starts and runs: \_\_\_\_\_ seconds
- .3 Time to operating speed: \_\_\_\_\_ seconds
- .4 Time to synchronize engine: \_\_\_\_\_ seconds
- .5 Time delay on engine cool down and shutdown: \_\_\_\_\_ minutes

BUILDING EMERGENCY LOAD ON GENERATOR (facility available load + load bank)	0%	Stage 1	Stage 1	Stage 1	Stage 1+2	Stage 1+2
RUNNING TIME	0	30 min.	60 min.	2 hr.	3 hr.	4 hr.
.1 Ambient temperature						
.2 Frequency						
.3 Amps phase A (true rms)						
.4 Amps phase B (true rms)						
.5 Amps phase C (true rms)						
.6 Volts phase A-B (true rms)						
.7 Volts phase B-C (true rms)						
.8 Volts phase C-A (true rms)						
.9 KW 3 phase (true rms)						
.10 Oil pressure kPa						
.11 Oil temperature (°C)						

BUILDING EMERGENCY LOAD ON GENERATOR (facility available load + load bank)	0%	Stage 1	Stage 1	Stage 1	Stage 1+2	Stage 1+2
RUNNING TIME	0	30 min.	60 min.	2 hr.	3 hr.	4 hr.
.12 Coolant temperature (°C) (IN)						
.13 Coolant temperature (°C) (OUT)						
.14 Outdoor air temperature (°C)						
.15 Ambient air temperature (°C)						
.16 Air temp. leaving radiator (°C)						
.17 Exhaust temperature (°C)						
.18 Battery charge amps						

Fuel consumption during test: \_\_\_\_\_ litres

Contractor:

Manufacturer's Supervisor: \_\_\_\_\_

Engineer's Representative: \_\_\_\_\_

END OF SECTION

PROJECT: \_\_\_\_\_

Test Date: \_\_\_\_\_

LOAD BANK + DUMMY LOAD ON GENERATOR	0%	100%
RUNNING TIME (hrs.)	.1	1
.1 Ambient temperature		
.2 Frequency		
.3 Amps phase A (true rms)		
.4 Amps phase B (true rms)		
.5 Amps phase C (true rms)		
.6 Volts phase A-B (true rms)		
.7 Volts phase B-C (true rms)		
.8 Volts phase C-A (true rms)		
.9 kW 3 phase (true rms)		
.10 Oil pressure kPa		
.11 Oil temperature (°C)		
.12 Coolant temperature (°C) (IN)		
.13 Coolant temperature (°C) (OUT)		
.14 Outdoor air temperature (°C)		
.15 Ambient air temperature (°C)		
.16 Air temperature leaving radiator (°C)		
.17 Exhaust temperature (°C)		
.18 Battery charge amps		

Fuel consumption during test: \_\_\_\_\_ litres

Contractor: \_\_\_\_\_

Manufacturer's Supervisor: \_\_\_\_\_

Engineer's Representative: \_\_\_\_\_

END OF SECTION

PROJECT: \_\_\_\_\_

Test Date:

CONTRACTOR:

- .1 Enclosure Ambient Temperature: \_\_\_\_\_ (°C)
- .2 Outdoor Air Temperature: \_\_\_\_\_ (°C)
- .3 Either Test A or Test B below is acceptable:

TEST A

- .1 Rated Battery voltage: \_\_\_\_\_ volts
- .2 First cycle Crank - (30 seconds): \_\_\_\_\_ sec.
- .3 Rest period - (30 seconds): \_\_\_\_\_ sec.
- .4 Second cycle crank - (30 seconds): \_\_\_\_\_ sec.
- .5 Battery end voltage: \_\_\_\_\_ volts
- .6 Manufacturer's Battery Capacity Normalized to +10°C ambient temperature: \_\_\_\_\_

TEST B

- .1 Rated battery voltage: \_\_\_\_\_ volts
- .2 First cycle crank - (10 seconds): \_\_\_\_\_ sec.
- .3 Ten second rest: \_\_\_\_\_ sec.
- .4 Second cycle crank - (10 seconds): \_\_\_\_\_ sec.
- .5 Ten second rest: \_\_\_\_\_ sec.
- .6 Third cycle crank - (10 seconds): \_\_\_\_\_ sec.
- .7 Rest period - (30 seconds): \_\_\_\_\_ sec.
- .8 Repeat steps 2, 3, 4, 5, 6 (50 seconds): \_\_\_\_\_ sec.
- .9 Battery end voltage: \_\_\_\_\_ volts
- .10 Manufacturer's battery capacity normalized to +10°C ambient temperature: \_\_\_\_\_

END OF SECTION

PART 1 - GENERAL

1.1  
Scope

- .1 This specification contains the minimum requirements for the design, manufacture and testing of one (1) CSA listed, air cooled, outdoor weatherproof resistive element load banks.
- .2 The load banks are required for periodic exercising and testing of a standby generator. The load banks shall be permanently mounted in a weatherproof enclosure, forced air cooled with integral mounted control panel.

1.2  
Submittals

- .1 The manufacturer shall submit for review technical data including features, performance, electrical characteristics, physical characteristics, ratings, accessories and finishes.
- .2 Shop drawings shall include dimensional plans, front and side elevations and mounting details sufficient to properly install the load bank. Load bus configuration and load connections termination area shall be clearly identified.
- .3 Electrical schematic drawings shall be provided to detail the operation of the load bank and the provided safety circuits. Over-current protection and control devices shall be identified and their ratings marked. A system interconnection drawing shall be included for control wiring related to the load bank.

1.3  
Standards

- .1 The equipment covered by this specification shall be designed to the latest applicable NEMA, OESC and ANSI standards.
- .2 The load bank shall be CSA listed.

PART 2 – PRODUCTS

2.1  
Ratings

- .1 Ratings and step resolutions per drawings.
- .2 The load bank shall be designed for continuous duty cycle operation with no limitations. The load bank shall operate in an ambient temperature of -40°C to +40°C

2.2  
Material and  
Construction

- .1 The load bank shall be of outdoor weatherproof construction, suitable for installation on a concrete pad or structural base. All exterior fasteners shall be stainless steel. The load bank shall include forklift channels in the base for lifting. Exact pad size to be coordinated with enclosure.
- .2 The load bank shall be constructed of heavy gauge aluminized steel per ASTM A463.
- .3 The main input load bus, load step relays, fuses and blower control relays shall be located within the load bank enclosure. A thermostatically controlled heater shall be located within the control section to provide protection to the control devices against the effects of moisture and condensation.
- .4 Air flow throughout the load bank shall be horizontal. Intake openings shall be signed to prevent objects greater than 12 mm in diameter from entering the unit.
- .5 The load bank exhaust hood shall be angled downward. The exhaust hood shall be constructed of non-corrosive aluminized steel or aluminum.
- .6 The load bank enclosure shall have a baked polyester powder coated finish with a film thickness of 2.8 +/- 0.4 Mils per coat.
- .7 Load elements shall be contained in an integral resistor case. Resistors can be individually removed for inspection or service.

2.3  
Resistive Load  
Elements

- .1 Load elements shall be helically wound chromium alloy rated to operate at approximately 1/2 maximum continuous rating of wire. Elements must be fully supported across the entire length within the air stream by segmented ceramic insulators on steel rods. Element supports shall be designed to prevent a short circuit to adjacent elements or to ground.
- .2 The change in resistance due to temperature shall be minimized by maintaining conservative watt densities.
- .3 The overall tolerance of the load bank shall be -0% to +5% kW at rated voltage. A -5%, +5% rating allows the load bank to deliver less than rated kW and shall not be used. The load bank must deliver full rated kW at rated voltage.

2.4  
Cooling System

- .1 The load bank shall be cooled by integral TEFC or TEAO motors which are direct coupled to the cooling fan blade. The fan motor must be electrically protected against overload using a motor overload device and short circuit protected using three current limiting fuses with an interrupting rating of 200 KAIC.
- .2 The fan blade is to be an airfoil design constructed from aluminum or non-corroding material.



2.5  
Protective Devices

- .3 An integral control power transformer shall be provided to supply 120 V, 1 phase, 60 Hz to the load banks control and motor starter circuitry. Transformer primary and secondary control circuits to be fuse protected.
- .1 A differential pressure switch shall be provided to detect air loss. The switch shall be electrically interlocked with the load application controls to prevent load from being applied if cooling air is not present.
- .2 An over-temperature switch shall be provided to sense the load bank exhaust in the heater case assembly. The switch shall be electrically interlocked with the load application controls to remove load from being applied in the event of an over temperature condition.
- .3 To provide for major fault protection, branch fuses shall be provided on all three phases of switched load steps above 50 kW. Branch fuses shall be current limiting type with an interrupting rating of 200 KAIC.
- .4 The exterior of the load bank shall have appropriate warning/caution statements on access panels.

2.6  
Control Panel

- .1 The control panel shall be a NEMA 4X type wall mount enclosure. The control panel shall contain the following manual controls:
    - .1 Power ON/OFF switch.
    - .2 Blower START/STOP pushbuttons.
    - .3 Master load ON/OFF switch.
    - .4 Load step switches for ON/OFF application of individual load steps.
- Control panel visual indicators shall be as follows:
- .1 Power ON indication light.
  - .2 Blower ON light.
  - .3 Blower/Air FAILURE light.
  - .4 OVERTEMPERATURE light.
- .2 A standard remove load dump circuit shall be provided as part of the load bank control circuit. Provisions shall be provided to remove the load bank off-line from the operation of a remote normally closed set of auxiliary contacts from a transfer switch or other device. In the event of the remote contact opening, all load is removed.
  - .3 An Automatic Load Step Controller shall be provided for maintaining a minimum load on the generator set. The controller shall monitor the connected downstream loads and will automatically add or subtract load steps in response to building load changes as to maintain a minimum load level on the generator set. The controller includes an initial time-delay circuit and automatic time delayed load step application circuit. A remote

contact closure is required for activation and transfer of control. A separate current transformer shall be supplied loose for mounting and sensing of downstream loads.

2.7  
Documentation

- .1 Installation and operation manuals shall be provided with the equipment and shall include complete details for the installation, commissioning, operation and maintenance of the load bank.
- .2 The manuals shall include the electrical schematic and interconnect drawings for the power and control wiring for the load bank and all control devices.
- .3 A complete parts list with part numbers, device identification and rating shall be included in the manuals. The original manufacturer's name and part number shall be included in the parts listing.

PART 3 – QUALITY  
ASSURANCE

3.1  
Quality Control

- .1 The load bank shall be fully tested using a test specification written by the supplier. Tests shall include electrical functional testing, verifying conformance to assembly drawings and specifications. Each load step shall be cold resistance checked to verify proper calibration of resistive load steps and proper ohmic value.
- .2 The manufacturer shall maintain this data on file for inspection purposes by the purchaser. Tests using high potential equipment shall be performed to ensure isolation of the load circuits from the control circuits and to determine isolation of the load circuits from the load bank frame. Tests of all safety circuits shall be performed to verify conformance to the specification.
- .3 All electrical circuits shall have a high potential insulation resistance test performed at twice rated voltage plus 1000 VAC to assure insulation integrity.
- .4 All quality control test equipment shall be regularly maintained and calibrated to traceable national standards.
- .5 The Company's quality system shall be ISO9001 certified.
- .6 Tests in accordance with Section 16031.

3.2  
Qualifications of  
Manufacturer

- .1 The load bank shall be manufactured by a firm regularly engaged in the manufacture of load banks who can demonstrate at least 25 years of experience with at least 25 installation of load banks similar or equal to the ones specified herein.

- .2 The manufacturer shall have a written quality control procedure available for review by the purchaser which will document all phases of operations, engineering and manufacturing.
- .3 Manufacturer must have a field service organization with service personnel located with eight (8) hours of the job site.
- .4 Specified Product:
  - .1 Avtron 4500 Outdoor 200 kW Resistive Load Bank in 25 kW Steps, complete with Automatic Load Step Controller while under Generator Power.
- .5 Alternative Product: shall be pre-approved to meet these specifications without compromise to the intended design, or provide added cost or delays elsewhere within the project.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 REFERENCES**

- .1 Electric heaters to CSA 22.2 No. 46.
- .2 Controls to CSA C22.2 No. 24.

### **1.2 SUBMITTALS**

- .1 Submit following shop drawings:
  - .1 Heaters, identify voltage, phase and power requirements.
  - .2 Capacities.
  - .3 Controls and accessories.
  - .4 Mounting methods.
  - .5 Cabinet material thickness.
  - .6 Limitations.
  - .7 Colour and finish.

## **PART 2 - PRODUCTS**

### **2.1 ELECTRIC UNIT HEATER**

- .1 Provide unit heaters of horizontal or vertical projection with controls and accessories as indicated.
- .2 Finish:
  - .1 Epoxy/polyester powder paint.
- .3 Voltage:
  - .1 Voltage and phase as indicated.
- .4 Construction:
  - .1 18-gauge steel.
  - .2 Adjustable louvres to direct air flow.
  - .3 High limit temperature control with automatic reset.
- .5 Fan:
  - .1 Motor mounted in cold compartment.
  - .2 Thermally protected motor.
  - .3 Totally enclosed and factory lubricated ball bearing motor.
  - .4 58 dBA fan.
  - .5 Fan delay purges heater of residual heat.
- .6 Heating Element:
  - .1 Durable tubular heating elements; stainless steel.
  - .2 Concentric disposition of heating elements.

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- .7 Control:
  - .1 Factory installed control transformer. Unit heater to be controlled by a wall mount line low voltage thermostat as indicated.
  - .2 Provide the option to interlock each unit heater with an A/C unit.
- .8 Wattage:
  - .1 As indicated.
- .9 Acceptable Product(s):
  - .1 Ouellet OAS Series or approved equivalent.
- .10 For each Electric Unit Heater, as indicated, provide a thermostat per the following:
  - .1 Low voltage
  - .2 Minimum range of 10°C to 32°C.
  - .3 Number of contacts and contact rating to suit application. Minimum of two (2) poles.
  - .4 Acceptable product(s):
    - .1 Ouellet T822K1034 Series or approved equivalent.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- .1 Installation as per manufacturer's recommendations.
- .2 Coordinate location of heaters with other divisions.
- .3 Wire heaters and controls as indicated and as per manufacturer's instructions.

END OF SECTION

PART 1 – GENERAL

- 1.1 Reference Sections .1 Reference Sections:
- .1 Gananoque PLC Programming Standards.
  - .2 Gananoque SCADA Specifications and Programming Standards.
  - .3 Section 17500 - Control Narrative, General Overview.
  - .4 Process Control Narratives (series 175XX sections).
- 1.2 Scope of Supply .1 The scope of supply will generally be as listed in Part 2 of this specification section.
- 1.3 Reference Standards .1 Electrical: CSA and local Electrical Inspection Authority Approval for complete installation.
- .2 Electrical: any requirements of local Electrical Authority.
  - .3 Designed to be in compliance with all applicable municipal, provincial, and national codes and standards.
  - .4 Industry standard for water/wastewater plant control systems.
  - .5 Gananoque SCADA/PLC Standards.
  - .6 Gananoque HMI Development Standards.
- 1.4 Testing and Commissioning .1 Controls to be thoroughly tested and verified in accordance with the specifications provided herein.
- 1.5 Operating Treatment Plant .1 The Supplier is to work around the operation of the existing pumping station. The continued proper operation of these facilities takes priority over the work.

PART 2 - PRODUCTS

- 2.1 Scope of Work .1 The following is a summary of major services and equipment to be supplied. The list is not necessarily all inclusive and the proponents should include for all necessary options and accessories to meet the intent of the specifications.

- .1 Provide all programming and PLC adjustments as required to remove and replace the existing generator and ATS control and monitoring circuitry with new equivalent (but not necessarily identical) control and monitoring circuitry from newly installed replacements. This may include temporary programming of new and/or existing PLCs as required by the commissioning process.
- .2 Provide all programming required.
- .3 Provide Operations and Maintenance Manuals as per Section 01730. This includes PLC I/O verification reports.
- .4 Provide Operator training as per Sections 01730, 17210 and 17310.
- .5 Allow for an increase of up to 20% in the number of hardwired and networked I/O points.
- .6 Configure all Ethernet switches as required.
- .7 Commission all Ethernet communications.
- .8 PLC I/O verification of all hardwired and network I/O points. This will involve the actuation of and observation of field devices. Provide detailed PLC I/O verification documentation. A sample PLC I/O verification report is to be provided during the shop drawing review stage.
- .9 Provide a detailed automation checkout report. The report to document normal and abnormal scenarios. Such scenarios shall test the system response to the failure of certain equipment and instruments as well as system response to abnormal process conditions.
- .10 Provide a detailed alarm verification report. All alarms to be set up with the assistance of the Operator, verified in the presence of the Operator and signed off by the Operator.
- .11 Re-commissioning of all existing drives and systems affected.
- .12 Re-commission any I/O point and associated PLC automation if any of the following occurs:
  - .1 Associated wiring has been disconnected for any reason.
  - .2 Associated device/equipment installation has been altered since last commissioned.
- .13 Allow for a minimum of ten (10) days on site for system verification with the Owner and the Consultant. System verification may require more time on site, depending on the issues that may be identified. System verification per site to occur over a minimum of a two-week period. Provide at least two (2) weeks' notice to the Consultant for the system verification.

- .14 Provide PLC programming for alarm dialing. Set up data exchange tables for sending alarms to the Owner. Coordinate data exchange table with the Owner.
- .15 Coordinate with the supplier of each Ethernet enabled equipment to provide Ethernet interface between such equipment and the PLC at the pumping station. Such Ethernet enabled equipment includes: generators, ATS, and power monitor. Configure data exchange tables and Ethernet communications to facilitate PLC interface with all such equipment.
- .16 Coordinate with the Owner to integrate changes to the pumping station into the existing SCADA infrastructure.

2.2  
PLC I/O Commissioning

- .1 The I/O commissioning report to include but not limited to the following:
  - .1 I/O tags.
  - .2 Tag description.
  - .3 Pass/fail for each discrete I/O point. Provide separate pass/fail results for the I/O card LED status check, the PLC software check, and the SCADA software check.
  - .4 Date and time each discrete I/O point was witnessed as well as initials of the witness.
  - .5 Measured (Engineering) value (plus units) calculated by the PLC at 4, 12 and 20 mA for each analog I/O point. Provide actual mA measurements using a NIST traceable digital multimeter. mA to be to two (2) decimal places. Measured values to be to one (1) decimal place for flows, levels, pressures, temperatures, currents, and voltages. Measured values to be to two (2) decimal places for all analytical values, frequencies, power factor, valve position, and valve feedback. Detail the upper and lower range limit for each measured value, for each analog I/O point.
  - .6 Provide separate measurements for all new and modified analog I/Os as indicated by the multimeter, the PLC and the HMI verification.
  - .7 Date and time each new or modified analog I/O point was witnessed as well as initials of the witness
- .2 Submit the template I/O commissioning report for review by the Consultant prior to commissioning.

2.3  
Automation Verification

- .1 Provide a detailed automation verification report for each system/process including, but not limited to the following:
  - .1 Normal operating sequence.



- .2 System reaction to various equipment/device failures as well as abnormal process conditions. List all such scenarios and detail system reaction to these scenarios. It is understood that such a list may not capture all possible conditions; however, a "reasonable" attempt shall be made to identify the more likely and important failure scenarios. Provide the Consultant with a proposed automation checkout report template for review. The template to list the scenarios proposed for testing. The template should be forwarded before commissioning commences.
- .3 Once automation verification has been completed, submit the reports to the Consultant for review. After which system verification can be scheduled.

2.4  
Alarm Commissioning

- .1 Provide a detailed alarm verification report. The report to include, but not limited to the following fields:
  - .1 Tag.
  - .2 Description.
  - .3 I/O point/DeviceNet node (if applicable).
  - .4 Alarm registered (Yes/No).
  - .5 Alarm dialed to the Operator (Yes/No).
  - .6 Alarm received by the Operator (Yes/No).
  - .7 Assigned autodialer channel.
  - .8 Comments.
  - .9 Name and signature of the person performing the test as well as that of the person accepting the test results (typically the Operator), plus the date the test was performed.
- .2 Submit the template alarm commissioning report for review by the Consultant prior to commissioning.

PART 3 – EXECUTION

3.1  
Start and  
Performance Testing

- .1 Allow for as many site visits as required for the thorough and complete testing and commissioning of the control systems.

END OF SECTION

PART 1 - GENERAL

- 1.1  
Related Work .1 Refer to Divisions 15, 16 and 17 of the General Contract to establish requirements under other divisions for control and interface with the overall system.
- 1.2  
Product Data .1 Provide test procedures for each device and for control strategies prior to commissioning.  
.2 Process narratives to be updated per the Gananoque standards.
- 1.3  
Operation and Maintenance Data .1 As per Instructions to Proponents.

PART 2 - PRODUCTS

- 2.1  
Intent .1 To remove and replace the existing ATS and standby Generator with new equivalent ATS and standby Generator. System Integrator shall coordinate with the electrical contractor to allow for coordinated upgrades as well as provide programming and/or modifications to the existing control system to ensure a seemly "like for like" upgrade from a control systems point of view (regardless if the new control signals are not identical to the existing systems removed).  
.2 To provide new PLC/SCADA system monitoring of a new automatic load bank controller (in operation) as well as generator low fuel alarms.  
.3 To provide a seamless SCADA system transition which allows operators to continue to monitor the existing generator and ATS.

PART 3 - PRODUCTS

- 3.1  
Programming .1 Program the PLC(s) to perform the requirements described in Part 2.  
.2 Provide appropriate documentation for the thorough understanding of the programming. Provide Table of Variables for the PLC(s) and SCADA software.

3.2  
Commissioning

- .1 Test each modified system individually. Provide the Engineer with a report prior to commissioning the system.
- .2 Once loops have been tested and accepted, start up system. Engineer and Owner to be present for final acceptance tests.
- .3 For final acceptance prove the general proper operation of:
  - .1 PLC/SCADA Monitoring of the new Generator.
  - .2 PLC/SCADA Monitoring of the new ATS.
  - .3 PLC/SCADA Monitoring of the new Load Bank System

END OF SECTION