



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 156-2005

**WINNIPEG WATER TREATMENT PROGRAM – DEACON BOOSTER PUMPING
STATION ELECTRICAL TEMPORARY SERVICE**

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PART B - BIDDING PROCEDURES

B1. PROJECT TITLE

B1.1 WINNIPEG WATER TREATMENT PROGRAM – DEACON BOOSTER PUMPING STATION ELECTRICAL TEMPORARY SERVICE

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, May 12, 2005.

B2.2 Bid Submissions determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.

B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

B3.1 Further to GC:3.1, the Contract Administrator or an authorized representative will be available at the Site from 10:00 a.m. to 11:30 a.m. on May 4, 2005 to provide Bidders access to the Site.

B3.2 The Bidder shall not be entitled to rely on any information or interpretation received at the Site investigation unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

B3.1 Further to GC:3.1, the Bidder may make an appointment to view the Site by contacting the Contract Administrator.

B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.

B4.2 If the Bidder finds errors, discrepancies or omissions in the Bid Opportunity, or is unsure of the meaning or intent of any provision therein, the Bidder shall notify the Contract Administrator of the error, discrepancy or omission, or request a clarification as to the meaning or intent of the provision at least five (5) Business Days prior to the Submission Deadline.

B4.3 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator to all Bidders by issuing an addendum.

B4.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.

B4.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B4 unless that response or interpretation is provided by the Contract Administrator in writing.

B5. ADDENDA

B5.1 The Contract Administrator may, at any time prior to the Submission Deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.

- B5.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.
- B5.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.
- B5.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Branch internet site for addenda shortly before submitting his Bid.
- B5.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 8 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B6. SUBSTITUTES

- B6.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.
- B6.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B6.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.
- B6.4 The Bidder shall ensure that any and all requests for approval of a substitute:
- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;
 - (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
 - (c) identify any anticipated cost or time savings that may be associated with the substitute;
 - (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;
 - (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.
- B6.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his sole discretion grant approval for the use of a substitute as an "approved equal" or as an "approved alternative", or may refuse to grant approval of the substitute.
- B6.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, only to the Bidder who requested approval of the substitute.
- B6.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely responsible for disseminating information regarding the approval to any person or persons he wishes to inform.

- B6.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B6.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative shall base his Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B14.
- B6.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B7. BID SUBMISSION

- B7.1 The Bid Submission consists of the following components:
- (a) Form A: Bid; and
 - (b) Form B: Prices.
- B7.2 The Bid Submission shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.
- B7.2.1 Samples or other components of the Bid Submission which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid Submission.
- B7.3 Bid Submissions submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B7.4 Bid Submissions shall be submitted to:
- The City of Winnipeg
Corporate Finance Department
Materials Management Branch
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B8. BID

- B8.1 The Bidder shall complete Form A: Bid, making all required entries.
- B8.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his own name, his name shall be inserted;
 - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
 - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
 - (d) if the Bidder is carrying on business under a name other than his own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.
- B8.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B8.2.
- B8.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

- B8.4 Paragraph 10 of Form A: Bid shall be signed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his own name, it shall be signed by the Bidder;
 - (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
 - (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers;
 - (d) if the Bidder is carrying on business under a name other than his own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

B8.4.1 The name and official capacity of all individuals signing Form A: Bid shall be printed below such signatures.

B8.4.2 All signatures shall be original.

B8.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid Submission and the Contract, when awarded, shall be both joint and several.

B9. PRICES

B9.1 The Bidder shall state the lump sum price in Canadian funds for the Work on Form B: Prices.

B9.1.1 Notwithstanding GC.12.2.3(c), the price on Form B: Prices shall not include the Manitoba Retail Sales Tax (MRST, also known as PST), which shall be extra where applicable.

B10. QUALIFICATION

B10.1 The Bidder shall:

- (a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba;
- (b) be responsible and not be suspended, debarred or in default of any obligation to the City;
- (c) be financially capable of carrying out the terms of the Contract;
- (d) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract;
- (e) have successfully carried out work, similar in nature, scope and value to the Work;
- (f) employ only Subcontractors who:
 - (i) are responsible and not suspended, debarred or in default of any obligation to the City (a list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>); and
 - (ii) have successfully carried out work similar in nature, scope and value to the portion of the Work proposed to be subcontracted to them, and are fully capable of performing the Work required to be done in accordance with the terms of the Contract; and
- (g) have a written workplace safety and health program in accordance with The Workplace Safety and Health Act (Manitoba).

B10.2 The Bidder shall be prepared to submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B10.3 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B11. OPENING OF BIDS AND RELEASE OF INFORMATION

B11.1 Bid Submissions will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Branch, or in such other office as may be designated by the Manager of Materials.

B11.1.1 Bidders or their representatives may attend.

B11.2 After the public opening, the names of the Bidders and their Total Bid Prices as read out (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.

B11.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract Amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.

B11.4 The Bidder is advised that any information contained in any Bid Submission may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

B12. IRREVOCABLE BID

B12.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 9 of Form A: Bid.

B12.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work for the time period specified in Paragraph 9 of Form A: Bid.

B13. WITHDRAWAL OF BIDS

B13.1 A Bidder may withdraw his Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

B13.1.1 Notwithstanding GC:23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.

B13.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 10 of Form A: Bid, and only such person, has authority to give notice of withdrawal.

B13.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials shall:

- (a) retain the Bid Submission until after the Submission Deadline has elapsed;
- (b) open the Bid Submission to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 10 of Form A: Bid; and
- (c) if the notice has been given by any one of the persons specified in B13.1.3(b), declare the Bid withdrawn.

B13.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B12.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law.

B14. EVALUATION OF BIDS

B14.1 Award of the Contract shall be based on the following bid evaluation criteria:

- (a) compliance by the Bidder with the requirements of the Bid Opportunity (pass/fail);
- (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B10 (pass/fail);
- (c) Total Bid Price;
- (d) economic analysis of any approved alternative pursuant to B6.

B14.2 Further to B14.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid Submission is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements if the interests of the City so require.

B14.3 Further to B14.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his Bid Submission or in other information required to be submitted, that he is responsible and qualified.

B14.4 Further to B14.1(c), the Total Bid Price shall be the lump sum price shown on Form B: Prices.

B14.4.1 If there is any discrepancy between the lump sum price written in figures and the lump sum price written in words, the price written in words shall take precedence.

B15. AWARD OF CONTRACT

B15.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B15.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.

B15.2.1 Without limiting the generality of B15.2, the City will have no obligation to award a Contract where:

- (a) the prices exceed the available City funds for the Work;
- (b) the prices are materially in excess of the prices received for similar work in the past;
- (c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;
- (d) only one Bid is received; or
- (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.

B15.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid.

B15.4 Notwithstanding GC:4, the City will issue a Purchase Order to the successful Bidder in lieu of the execution of a Contract.

B15.5 The Contract, as defined in GC:1.1, in its entirety shall be deemed to be incorporated in and to form a part of the Purchase Order notwithstanding that it is not necessarily attached to or accompany said Purchase Order.

PART C - GENERAL CONDITIONS

C1. GENERAL CONDITIONS

C1.1 The *General Conditions for Construction Contracts* (Revision 2000 11 09) are applicable to the Work of the Contract.

C1.1.1 The *General Conditions for Construction Contracts* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

- D1.1 In addition to the *General Conditions for Construction Contracts*, these Supplemental Conditions are applicable to the Work of the Contract.
- D1.2 The General Conditions are amended by striking out “The City of Winnipeg Act” wherever it appears in the General Conditions and substituting “The City of Winnipeg Charter”.
- D1.3 The General Conditions are amended by striking out “Tender Package” wherever it appears in the General Conditions and substituting “Bid Opportunity”.
- D1.4 The General Conditions are amended by striking out “Tender Submission” wherever it appears in the General Conditions and substituting “Bid Submission”.
- D1.5 The General Conditions are amended by deleting GC:6.16 and GC:6.17. The City of Winnipeg is now within the jurisdiction of the Manitoba Ombudsman pursuant to The Ombudsman Act.

D2. SCOPE OF WORK

- D2.1 The Work to be done under the Contract shall consist of supply and installation of a temporary electrical service for the Deacon Booster Pumping Station.
- D2.2 The major components of the Work are as outlined in Division 1 of the Specifications.

D3. DEFINITIONS

- D3.1 When used in this Bid Opportunity:
- (a) **ASTM** means American Society for Testing and Materials,
 - (b) **CSA** means Canadian Standards Association;
 - (c) **DBPS** means Deacon Booster Pumping Station;
 - (d) **Provide** means supply and install;
 - (e) **Supply Contractor** means a contractor engaged by the City under a separate Contract to supply pre-purchased equipment which shall be installed by the Contractor;
 - (f) **Manufacturer** means the person, partnership, or corporation responsible for the manufacture and fabrication of equipment provided to the Contractor for the completion of the Work; and
 - (g) **Manufacturer’s Representative** means a trained serviceman empowered by the Manufacturer to provide installation, testing, and commissioning assistance to the Contractor in his performance of these functions.
- D3.2 The definitions of technical terms, abbreviations, and symbols will be those of ASTM, CSA and the applicable Codes and Standards. In the event of dispute, the Contract Administrator’s decision will be final.

D4. CONTRACT ADMINISTRATOR

- D4.1 The Contract Administrator is UMA Projects (CM) Ltd., represented by:
Mr. Bill Richert, P. Eng.

Program Administration Manager
1479 Buffalo Place
Winnipeg, MB R3T 1L7

Telephone No. (204) 284-0580
Facsimile No. (204) 453-5172

- D4.2 At the pre-construction meeting, Bill Richert will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D5. CONTRACTOR'S SUPERVISOR

- D5.1 At the pre-construction meeting, the Contractor shall identify his designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D6. NOTICES

- D6.1 Except as provided for in GC:23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

- D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3, D6.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D4.1.

- D6.3 All notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following address or facsimile number:

The City of Winnipeg
Chief Administrative Officer Secretariat
Administration Building, 3rd Floor
510 Main Street
Winnipeg MB R3B 1B9
Facsimile No.: (204) 949-1174

- D6.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following address or facsimile number:

The City of Winnipeg
Corporate Services Department
Legal Services Division
185 King Street, 3rd Floor
Winnipeg MB R3B 1J1
Facsimile No.: (204) 947-9155

SUBMISSIONS

D7. INSURANCE

- D7.1 The City shall provide and maintain the following Project Insurance Coverages:
- (a) Builder's Risk Insurance in the amount of one hundred percent (100%) of the total project cost.

- (i) The Contractor shall be responsible for deductibles up to \$10,000.00 maximum of any one loss.
- (b) Wrap-Up Liability Insurance in an amount of no less than 10 million dollars (\$10,000,000.00).
 - (i) The Contractor shall be responsible for deductibles up to \$10,000.00 maximum of any one loss.
- (c) The City of Winnipeg will carry such insurance to cover all parties engaged in the Work in this Contract. Provision of this insurance by the City of Winnipeg is not intended in any way to relieve the Contractor from his obligations under the terms of the Contract. Specifically, losses relating to deductibles for insurance, as well as losses in excess of limits of coverage and any risk of loss that is not covered under the terms of the insurance provided by the City of Winnipeg remains with the Contractor.

D7.2 The Contractor shall provide and maintain the following insurance coverage at all times during the performance of the Work:

- (a) Automobile liability insurance for owned and non-owned automobiles used for or in connection with the work in the amount of at least two million dollars (\$2,000,000.00).
 - (i) Deductibles shall be borne by the Contractor;
 - (ii) The Contractor shall not cancel, materially alter, or cause the policy to lapse without providing at least fifteen (15) Calendar Days prior written notice to the Contract Administrator;
 - (iii) The Contractor shall provide the Contract Administrator with evidence of insurance of the policy at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than seven (7) Calendar Days from notification of the award of Contract.
- (b) The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least fifteen (15) Calendar Days prior written notice to the Contract Administrator.

D8. SAFE WORK PLAN

- D8.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.
- D8.2 The Safe Work Plan shall be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at <http://www.winnipeg.ca/matmgt>.

D9. PERFORMANCE SECURITY

- D9.1 If the Contract Price exceeds twenty-five thousand dollars (\$25,000.00), the Contractor shall provide and maintain performance security until the expiration of the warranty period in the form of:
 - (a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; or
 - (b) an irrevocable standby letter of credit issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form attached to these Supplemental Conditions (Form H2: Irrevocable Standby Letter of Credit), in the amount of fifty percent (50%) of the Contract Price; or

- (c) a certified cheque or draft payable to "The City of Winnipeg", drawn on a bank or other financial institution registered to conduct business in Manitoba, in the amount of fifty percent (50%) of the Contract Price.

D9.1.1 Where the performance security is in the form of a certified cheque or draft, it will be deposited by the City. The City will not pay any interest on certified cheques or drafts furnished as performance security.

D9.2 The Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of Purchase Order and prior to the commencement of any Work on the Site.

D10. SUBCONTRACTOR LIST

D10.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than seven (7) Calendar Days from notification of the award of Contract.

D11. SECURITY CLEARANCE

D11.1 Each individual proposed to perform any Work inside the Deacon Booster Pumping Station shall be required to obtain a Criminal Record Search Certificate from the police service having jurisdiction at his place of residence.

D11.2 Prior to the commencement of any Work within the Deacon Booster Pumping Station building, and during the term of the Contract if additional or replacement individuals are proposed to perform Work, the Contractor shall supply the Contract Administrator with a Criminal Record Search Certificate obtained not earlier than one (1) year prior to the Submission Deadline, or a certified true copy thereof, for each individual proposed to perform Work within City facilities or on private property.

D11.3 Any individual for whom a Criminal Record Search Certificate is not provided, or for whom a Criminal Record Search Certificate indicates any convictions or pending charges related to property offences or crimes against another person, will not be permitted to perform any Work within City facilities or on private property.

D11.4 Any Criminal Record Search Certificate obtained thereby will be deemed valid for the duration of the Contract subject to a repeated records search as hereinafter specified.

D11.5 Notwithstanding the foregoing, at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated criminal records search. Any individual who fails to provide a satisfactory Criminal Record Search Certificate as a result of a repeated criminal records search will not be permitted to continue to perform Work under the Contract within City facilities or on private property.

SCHEDULE OF WORK

D12. COMMENCEMENT

D12.1 The Contractor shall not commence any Work until he is in receipt of a Purchase Order from the Award Authority authorizing the commencement of the Work.

D12.2 The Contractor shall not commence any Work on the Site until:

- (a) the Contract Administrator has confirmed receipt and approval of:

- (i) evidence that the Contractor is in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba;
 - (ii) evidence of the workers compensation coverage specified in GC:6.14;
 - (iii) evidence of the insurance specified in D7;
 - (iv) the performance security specified in D9; and
 - (v) the Subcontractor list specified in D10.
- (b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a pre-construction meeting.

D12.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the Purchase Order.

D13. DELIVERY OF CITY SUPPLIED EQUIPMENT

D13.1 The following City supplied equipment will be delivered to the Site by the City:

- (a) 1200A medium voltage load interrupter switch

D13.2 The City will provide unloading via crane truck

D13.3 The Contractor shall take custody of City supplied equipment at the time of delivery; estimated to occur between June 6 and June 17, 2005.

D14. SUBSTANTIAL PERFORMANCE

D14.1 The Contractor shall achieve Substantial Performance by July 8, 2005.

D14.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D14.3 The date on which the Work has been certified by the Contract Administrator as being substantially performed to the requirements of the Contract through the issue of a certificate of Substantial Performance is the date on which Substantial Performance has been achieved.

D15. TOTAL PERFORMANCE

D15.1 The Contractor shall achieve Total Performance by July 15, 2005.

D15.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D15.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D16. LIQUIDATED DAMAGES

- D16.1 If the Contractor fails to achieve Substantial Performance in accordance with the Contract by the day fixed herein for Substantial Performance, the Contractor shall pay the City two thousand dollars (\$2,000.00) per Working Day for each and every Working Day following the day fixed herein for Substantial Performance during which such failure continues.
- D16.2 The amount specified for liquidated damages in D16.1 is based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve Substantial Performance by the day fixed herein for same.
- D16.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

CONTROL OF WORK

D17. JOB MEETINGS

- D17.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.
- D17.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

D18. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

- D18.1 Further to GC6.26, UMA Projects (CM) Ltd. shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).
- D18.2 As Prime Contractor, UMA Projects (CM) Ltd. will administer a Project Safety and Health Management Plan. Compliance with this Plan will be mandatory for all personnel on the construction site and training and certification of all staff by the Prime Contractor's Safety Officer will be required.
- D18.3 The Water Treatment Program Project Safety and Health Management Plan is available on the City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://winnipeg.ca/matmgt/projects>

MEASUREMENT AND PAYMENT

D19. PAYMENT SCHEDULE

- D19.1 Measurement and payment of the Lump Sum Price as listed in Form B: Prices, shall be made as follows:
- (a) One (1) percent of the Lump Sum Price will be paid upon issuance of Form 100 – Certificate of Equipment Delivery and Form 101 – Certificate of Readiness to Install for the City supplied equipment.

- (b) A further five (5) percent of the Lump Sum Price will be paid upon issuance of Form 102 – Certificate of Satisfactory Installation and Form 103 – Certificate of Satisfactory Performance for the City supplied equipment and for Contractor supplied equipment.
- (c) A further two (2) percent of the Lump Sum Price will be paid upon issuance of Form T1 - Certificate of Satisfactory Training for Contractor supplied equipment.
- (d) A further ninety two (92) percent of the Lump Sum Price will be paid in accordance with GC:12.

D19.2 Form 100 – Certificate of Equipment Delivery, Form 101 – Certificate of Readiness to Install, Form 102 – Certificate of Satisfactory Installation, and Form 103 – Certificate of Satisfactory Performance will be initiated by the supplier of City supplied equipment and the Contractor shall sign as the “Installer”. All forms must bear all required signatures prior to issuance.

FORM H1: PERFORMANCE BOND
(See D9)

KNOW ALL MEN BY THESE PRESENTS THAT

_____ ,
(hereinafter called the "Principal"), and

_____ ,
(hereinafter called the "Surety"), are held and firmly bound unto **THE CITY OF WINNIPEG** (hereinafter called the "Obligee"), in the sum of

_____ dollars (\$_____.)

of lawful money of Canada to be paid to the Obligee, or its successors or assigns, for the payment of which sum the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Principal has entered into a written contract with the Obligee dated the

_____ day of _____, 20____, for:

BID OPPORTUNITY NO. 156-2005

WINNIPEG WATER TREATMENT PROGRAM – DEACON BOOSTER PUMPING STATION ELECTRICAL
TEMPORARY SERVICE

which is by reference made part hereof and is hereinafter referred to as the "Contract".

NOW THEREFORE the condition of the above obligation is such that if the Principal shall:

- (a) carry out and perform the Contract and every part thereof in the manner and within the times set forth in the Contract and in accordance with the terms and conditions specified in the Contract;
- (b) perform the Work in a good, proper, workmanlike manner;
- (c) make all the payments whether to the Obligee or to others as therein provided;
- (d) in every other respect comply with the conditions and perform the covenants contained in the Contract; and
- (e) indemnify and save harmless the Obligee against and from all loss, costs, damages, claims, and demands of every description as set forth in the Contract, and from all penalties, assessments, claims, actions for loss, damages or compensation whether arising under "The Workers Compensation Act", or any other Act or otherwise arising out of or in any way connected with the performance or non-performance of the Contract or any part thereof during the term of the Contract and the warranty period provided for therein;

THEN THIS OBLIGATION SHALL BE VOID, but otherwise shall remain in full force and effect. The Surety shall not, however, be liable for a greater sum than the sum specified above.

AND IT IS HEREBY DECLARED AND AGREED that the Surety shall be liable as Principal, and that nothing of any kind or matter whatsoever that will not discharge the Principal shall operate as a discharge or release of liability of the Surety, any law or usage relating to the liability of Sureties to the contrary notwithstanding.

IN WITNESS WHEREOF the Principal and Surety have signed and sealed this bond the

_____ day of _____, 20____ .

SIGNED AND SEALED
in the presence of:

(Witness)

(Name of Principal)

Per: _____ (Seal)

Per: _____

(Name of Surety)

By: _____ (Seal)
(Attorney-in-Fact)

**FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)**
(See D9)

(Date)

The City of Winnipeg
Corporate Services Department
Legal Services Division
185 King Street, 3rd Floor
Winnipeg MB R3B 1J1

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 156-2005

WINNIPEG WATER TREATMENT PROGRAM – DEACON BOOSTER PUMPING STATION
ELECTRICAL TEMPORARY SERVICE

Pursuant to the request of and for the account of our customer,

(Name of Contractor)

(Address of Contractor)

WE HEREBY ESTABLISH in your favour our irrevocable Standby Letter of Credit for a sum not exceeding in the aggregate

_____ Canadian dollars.

This Standby Letter of Credit may be drawn on by you at any time and from time to time upon written demand for payment made upon us by you. It is understood that we are obligated under this Standby Letter of Credit for the payment of monies only and we hereby agree that we shall honour your demand for payment without inquiring whether you have a right as between yourself and our customer to make such demand and without recognizing any claim of our customer or objection by the customer to payment by us.

The amount of this Standby Letter of Credit may be reduced from time to time only by amounts drawn upon it by you or by formal notice in writing given to us by you if you desire such reduction or are willing that it be made.

Partial drawings are permitted.

We engage with you that all demands for payment made within the terms and currency of this Standby Letter of Credit will be duly honoured if presented to us at:

(Address)

and we confirm and hereby undertake to ensure that all demands for payment will be duly honoured by us.

All demands for payment shall specifically state that they are drawn under this Standby Letter of Credit.

Subject to the condition hereinafter set forth, this Standby Letter of Credit will expire on

(Date)

It is a condition of this Standby Letter of Credit that it shall be deemed to be automatically extended from year to year without amendment from the present or any future expiry date, unless at least 30 days prior to the present or any future expiry date, we notify you in writing that we elect not to consider this Standby Letter of Credit to be renewable for any additional period.

This Standby Letter of Credit may not be revoked or amended without your prior written approval.

This credit is subject to the Uniform Customs and Practice for Documentary Credit (1993 Revision), International Chamber of Commerce Publication Number 500.

(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

CERTIFICATE OF EQUIPMENT DELIVERY
FORM 100

We certify that the equipment listed below has been delivered into the care of the Installer. The equipment has been found to be in satisfactory condition. No defects in the equipment were found.

Project: _____

Item of Equipment: _____

Tag No.: _____

Reference Specification: _____

(Authorized Signing Representative of the Supplier) (Date)

(Authorized Signing Representative of the Installer) (Date)

(Authorized Signing Representative of the Contract Administrator) (Date)

CERTIFICATE OF READINESS TO INSTALL

FORM 101

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

Project:

Item of Equipment:

Tag. No.:

Reference Specification:

(Authorized Signing Representative of the Manufacturer)

(Date)

I certify that I have received satisfactory installation instructions from the Equipment Manufacturer/Contractor.

(Authorized Signing Representative of the Installer)

(Date)

CERTIFICATE OF SATISFACTORY INSTALLATION

FORM 102

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

Project: _____

Item of Equipment: _____

Tag No.: _____

Reference Specification: _____

Outstanding Defects: _____

(Authorized Signing Representative of the Manufacturer)

(Date)

(Authorized Signing Representative of the Installer)

(Date)

**CERTIFICATE OF EQUIPMENT SATISFACTORY PERFORMANCE
FORM 103**

We certify that the equipment listed below has been validated and has been operated for at least five (5) consecutive days and that the equipment operates satisfactorily and meets its specified operating criteria. No defects in the equipment were found. The equipment is therefore classed as "conforming".

Project: _____

Item of Equipment: _____

Tag No.: _____

Reference Specification: _____

(Authorized Signing Representative of the Manufacturer)

(Date)

(Authorized Signing Representative of the Installation Contractor)

(Date)

(Authorized Signing Representative of the Contract Administrator)

(Date)

1. Acknowledgement of Receipt of O & M Manuals.

(Authorized Signing Representative of the City)

(Date)

CERTIFICATE OF SATISFACTORY TRAINING

FORM T1

We certify that the initial training for the equipment listed below has been provided as per the Specifications.

Project:

Item of Equipment:

Tag. No.:

Reference Specification:

(Trainer)

(Date)

(Authorized Signing Representative of the City)

(Date)

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS, STANDARD DETAILS AND DRAWINGS

E1.1 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.1.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.

E1.1.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.

E1.1.3 Further to GC:2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.2 The following Drawings are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
1-0601M-A-E0003-001-00D	Cover Sheet
1-0601M-A-E0004-001-00D	Electrical Temporary Feed Excavation Site Plan
	Electrical Temporary Feed Connection Plan and Single Line Diagram

E1.3 The following specifications are applicable to the Work:

Division 1 – General Requirements

01010	Scope of Work
01210	City Supplied Equipment
01600	Material and Equipment
01650	Equipment Installation
01664	Training

Division 16 – Electrical

16010	Electrical General Requirements
16015	Scope of Work
16106	Installation of Cables in Trenches and Ducts
16120	HV Power Cables and 15kV Shielded Cable Terminations
16121	Power Cables and Overhead Conductors 1001-15000V
16153	Connectors and Terminations
16160	Grounding
16191	Fastenings and Supports
16350	Medium-Voltage Vacuum Circuit Breakers
16361	Medium-Voltage Load Interrupter Switch
16960	Starting of Electrical System

E2. EXCAVATION

E2.1 Further to Section 16106, the Contractor shall use vacuum excavation methods inside the fenced compound area around the DBPS in order to protect and not to damage existing underground services.

- E2.2 The Contractor shall not park any heavy machinery on grassy areas around the buildings mentioned in E2.1; use only existing gravel roads and parking areas for parking of any machinery to do the excavation in the fenced area.

SCOPE OF WORK

1. DESCRIPTION OF WORK

- .1 The Work to be performed under this Contract shall include the labour, equipment, and materials required to complete the Deacon Booster Pumping Station Electrical Temporary Service as specified in the Contract.
- .2 The Work includes, but is not limited to the following elements:
 - .1 Scope of Work as specified in Section 16015.

2. PREPURCHASED EQUIPMENT

- .1 The City will be prepurchasing an exterior pad mounted fused load break switch rated at 1200A, 5kV complete with 120V electric heater and 5 kV fuses for incorporation in the Work.
- .2 A copy of the supply contract, Shop Drawings, schedule, and related correspondence will be issued to the Contractor after award of the Contract.
- .3 The Contractor shall coordinate with the Contract Administrator for delivery of the prepurchased equipment to the site. The Contractor shall receive delivery of the prepurchased equipment at the site. The prepurchased equipment will arrive via crane truck and the Contractor shall be required to arrange for unloading within ½ hour of crane truck arrival.
- .4 The equipment supply Contractors for these contracts will provide Shop Drawings installation training, installation and testing supervision, and support during commissioning, in accordance with the terms of their contracts. The Contractor shall provide all remaining supervision, labour, equipment, materials, and services necessary for a successful installation.

END OF SECTION

CITY SUPPLIED EQUIPMENT

1. GENERAL

- .1 The City will be entering into an equipment supply contract as described in Section 01010 "Scope of Work". Copies of the supply contract will be available for viewing at the offices of UMA Engineering Ltd., 1479 Buffalo Place, Winnipeg, Manitoba. The details of the equipment will be shown on the Shop Drawings supplied by these Supply Contractors.
- .2 The equipment supplied by the City under the supply contract will be delivered by the City to the Site. It is the Contractor's responsibility to receive the equipment at the Site and store it in the secured area provided by the City.
- .3 All forms referred to in this Section (Form 100, 101, 102 and 103) are part of the equipment supply contract and will be provided by the Supply Contractors of City supplied equipment to the Contractor to be completed by the Contractor as detailed below (Note: the Contractor shall be responsible for initiating these forms for equipment supplied by him, such as the medium voltage vacuum circuit breaker equipment specified in Section 16350.)
- .4 Prior to accepting any of the City supplied equipment, the Contractor shall inspect the equipment. A representative from each of the following groups will be in attendance at the time of delivery: the Supply Contractor, Contractor, and Contract Administrator. A duly executed *Form 100 – Certificate of Equipment Delivery* shall be completed. Any minor damage identified during the inspection shall be repaired as per the Supply Contractor's recommendations by the Contractor at no cost to the City. Any severe damage will be grounds for rejection of the equipment. The severely damaged equipment will be replaced at no cost to the City. The Contractor shall accept the equipment and assume risk and responsibility for the equipment and fill out *Form 100 - Certificate of Equipment Delivery*. If the Contractor's inspection reveals any deficiencies in the equipment, then these shall be noted in writing prior to the Contractor accepting the equipment. Only deficiencies noted and documented in the foregoing manner will be deemed not the responsibility of the Contractor.
- .5 The Contractor shall be responsible for the installation of the equipment to be supplied by the Supply Contractors in addition to equipment supplied as part of this Contract. The installation shall be in accordance with the Supply Contractors' installation requirements.

2. SUPERVISION OF INSTALLATION, START-UP, COMMISSIONING, AND FIELD TESTING

- .1 For the equipment supplied by the Supply Contractors and this Contract, each Supply Contractor shall provide the services of a qualified representative to supervise the installation, start-up, commissioning, and performance testing of all of the equipment. The services to be performed by the Supply Contractor are as follows:
 - .1 Prior to the Contractor beginning the installation, the Supply Contractor shall provide to the Contractor instructions and advice regarding the detailed requirements for the equipment installation. The Supply Contractor will be required to provide a *Certificate*

CITY SUPPLIED EQUIPMENT

of Readiness to Install, Form 101. The Contractor shall be required to sign Form 101 to acknowledge that he has received adequate instruction.

- .2 Following the completion of the installation, the Supply Contractor will inspect the installation of the equipment to verify that it has been installed in accordance with the manufacturer's requirements. The Supply Contractor will be required to provide a *Certificate of Satisfactory Installation, Form 102.* If any deficiencies in the installation exist at the time of inspection, these shall be noted on Form 102 by the Supply Contractor. The Contractor shall be responsible for the prompt correction of these deficiencies prior to the start-up of the equipment.
- .3 The Supply Contractor shall supervise and direct the Contractor in starting-up and commissioning the City supplied equipment. Commissioning is to conform to the requirements in Section 01670 and Division 16. The Supply Contractor will act (at the City's cost) as the Manufacturer and Manufacturer's Representative in performance of the installation of city supplied equipment in accordance with Section 01650.

END OF SECTION

MATERIAL AND EQUIPMENT

1. PRODUCTS

1.1 Quality of Materials

- .1 Provide new materials, equipment and articles incorporated in the Work, not damaged or defective and of the best quality (compatible with Specifications) for the purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective materials, equipment and articles whenever found may be rejected regardless of previous inspection. Inspection by the Contract Administrator does not relieve the Contractor of his responsibility. Remove and replace defective materials at own expense and be responsible for all delays and expenses caused by rejection.
- .3 Should any dispute arise as to the quality or fitness of materials, equipment or articles, the decision rests strictly with the Contract Administrator based upon the requirements of the Contract Documents.
- .4 Unless otherwise indicated in the Specifications, maintain uniformity of manufacturer for any particular or like item throughout the Work.
- .5 Permanent labels, trademarks and nameplates on materials, equipment and articles are not acceptable in prominent locations except where required for operating instructions and when located in mechanical or electrical rooms.

1.2 Availability of Materials

- .1 Immediately upon award of the Contract, review Product requirements and anticipate foreseeable delivery delays in any items. If delays in deliveries of materials, equipment or articles are foreseeable, propose substitutions or other remedial action in ample time to prevent delay in performance of the Work.
- .2 If such proposal is not given to the Contract Administrator, the Contract Administrator reserves the right to substitute more readily available products later in order to prevent delays at no additional cost to the City.
- .3 No substitution of any item will be permitted unless the item cannot be delivered to the job Site in time to comply with the Schedule.
- .4 To receive approval, proposed substitutes must equal or exceed the quality, finish and performance of those specified and/or shown, and must not exceed the space requirements allotted on the Drawings.
- .5 Provide documentary proof of equality, difference in price (if any) and delivery dates in the form of certified quotations from suppliers of both specified items and proposed substitutions.

MATERIAL AND EQUIPMENT

1.3 Storage, Handling and Protection of Materials

- .1 Handle and store materials in a manner to prevent damage, contamination, deterioration and soiling and in accordance with manufacturer's recommendations when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturers' seals and labels intact. Do not remove packaging or bundling until required in the Work.
- .3 Materials subject to damage from weather are to be stored in weatherproof enclosures.
- .4 Store cementitious materials clear of earth or concrete floors and away from walls.
- .5 When used for grout or mortar materials, keep sand clean and dry. Store on polyethylene and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet material, lumber, etc. on flat, solid supports and keep clear of ground.
- .7 Store and mix paints in a room assigned for this purpose. Keep room under lock and key at all times. Remove oily rags and any other combustible debris from Site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense.

1.4 Manufacturers' Directions

- .1 Unless otherwise specified, install or erect all products in accordance with manufacturers' recommendations. Do not rely on labels or enclosures provided with products. Obtain instructions directly from manufacturers.
- .2 Notify the Contract Administrator, in writing, of any conflicts between the Specifications and manufacturers' instructions so that the Contract Administrator may establish the course of action.
- .3 Improper installation or erection of products due to failure in complying with these requirements authorizes the Contract Administrator to require any removal and re-installation that may be considered necessary, at no increase in Contract Price.

1.5 Transportation Costs of Materials

- .1 Pay all costs for transportation of materials required for the Work.

2. WORKMANSHIP

2.1 General Requirements

- .1 Workmanship is to be of the best quality executed by workers fully experienced and skilled in their respective trades.

MATERIAL AND EQUIPMENT

- .2 At all times enforce discipline and good order among workers. Do not employ any unfit person or anyone unskilled in the duties assigned to him. The Contract Administrator reserves the right to require the removal from Site of workers deemed incompetent, careless, insubordinate or otherwise objectionable.
- .3 Decisions as to the quality or fitness of workmanship in cases of any dispute rests solely with the Contract Administrator whose decision is final.

2.2 Coordination

- .1 Coordinate the Work of all Subcontractors.
- .2 Ensure that all Subcontractors examine the Drawings and Specifications for other parts of the Work, which may affect the performance of their Work.
- .3 Ensure that sleeves, openings and miscellaneous equipment bases are provided as required for the Work.
- .4 Ensure that items to be built in are supplied when required with all necessary templates, measurements and Shop Drawings.

2.3 Concealment

- .1 In finished areas conceal all pipes, ducts and wiring except where indicated otherwise on Drawings or in Specifications.
- .2 Before installation inform the Contract Administrator if there is a contradictory situation. Install as directed.

2.4 Location of Fixtures

- .1 Consider the location of fixtures, outlets, and other mechanical and electrical items indicated on Drawings as approximate. The actual location of these items is to be as required or directed to Site conditions at the time of installation and as is reasonable.
- .2 Before installation inform the Contract Administrator if there is a contradictory situation. Install as directed.

2.5 Cutting and Remedial Work

- .1 Perform all cutting and remedial Work that may be required to make the several parts of the Work come together properly. Coordinate and schedule the Work to ensure that cutting and remedial Work are kept to a minimum.
- .2 Employ specialists familiar with the materials affected in performing cutting and remedial Work. Perform in a manner to neither damage nor endanger any portion of the Work.
- .3 Do not cut, drill or sleeve any load-bearing members without written acceptance of the Contract Administrator.

MATERIAL AND EQUIPMENT

- .4 The Contractor is to perform Work so that no dust is generated.

2.6 Fastenings

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent material unless otherwise specified.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive, non-staining fasteners and anchors for securing exterior Work unless otherwise specified.
- .4 Space anchors within their load limit or shear capacity and ensure that they provide positive permanent anchorage. Wood plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and lay out neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

2.7 Protection of Work In Progress

- .1 Adequately protect all Work completed and in progress. Repair or replace all damaged Work.
- .2 Prevent overloading of any part of the Work.

2.8 Cleaning

- .1 Remove waste materials and debris from the Site at regular intervals. Do not burn waste materials and debris on-site.

3. MEASUREMENT

3.1 Metric Project

- .1 Unless otherwise noted, this Project has been designed and is to be constructed in the International System of Units (SI) metric system of measurements.
- .2 During construction, when specified metric elements are unattainable at the time they are required to meet the Construction Schedule, the Contractor shall notify the Contract Administrator in writing and suggest alternative substitutions. Costs due to these substitutions shall be borne by the Contractor.

END OF SECTION

EQUIPMENT INSTALLATION

1. INTENT

- .1 This Section describes general requirements and for all equipment supplied under the Contract relating to the supervision of installation, testing, operation, and performance verification. The Contractor shall be responsible for the installation work, testing, operation, and performance verification of the supplied equipment.

2. EQUIPMENT DELIVERY

- .1 The equipment shall be delivered to the site to the Contractor who shall be responsible for taking delivery of the equipment. Written acceptance of receipt, at delivery, by the Contractor shall constitute "Delivery to Site" under this Contract. A representative from each of the following groups will be in attendance at the time of delivery: the Manufacturer's Representative, Contractor, and Contract Administrator. A duly executed "Certificate of Equipment Delivery" (Form 100) shall be completed. Any minor damage identified during the inspection shall be repaired as per the Manufacturer's recommendations by the Contractor at no cost to the City. Any severe damage will be grounds for rejection of the equipment. The severely damaged equipment will be replaced by the Contractor at no cost to the City.
- .2 Ten (10) days before delivery, notice shall be given to the Contract Administrator so that arrangements for receipt and for inspection can be made. The shipping lists of materials will be carefully checked by the supply Contractor in the presence of the Contract Administrator and the Contractor.
- .3 Unless otherwise specified, the Contractor shall be responsible for receiving, off-loading, and placing into storage all equipment at the site.
- .4 The Contractor shall ensure that he is fully informed of precautions to be taken in the unloading of equipment and its subsequent storage.

3. INSTALLATION ASSISTANCE

- .1 Before commencing installation of equipment, the Contractor shall arrange for the attendance of the Manufacturer's Representative to provide instructions in the methods, techniques, precautions, and any other information relevant to the successful installation of the equipment.
- .2 The Contractor shall inform the Contract Administrator, in writing, of the attendance at the site of any Manufacturer's Representative for installation training at least fourteen (14) days prior to arrival.
- .3 When the Manufacturer's Representative is satisfied that the Contractor is aware of all installation requirements, he shall so certify by completing Form 101.

EQUIPMENT INSTALLATION

- .4 The completed Form 101 shall be delivered to the Contract Administrator prior to departure of the Manufacturer's Representative from the site.
- .5 Installation of the equipment shall not commence until Contract Administrator has advised that he has received the completed Form 101.
- .6 Separate copies of Form 101 shall be used for different equipment.

4. INSTALLATION

- .1 If necessary, or if so directed by the Contract Administrator during the course of installation, the Contractor shall contact the Manufacturer to receive clarification of installation procedures, direction, or any other additional information necessary to continue or complete the installation in an appropriate manner.
- .2 If it is found necessary, or if so directed by the Contract Administrator, the Contractor shall arrange for the Manufacturer's Representative to visit the site to provide assistance during installation, all at no cost to the City.
- .3 Prior to completing installation, the Contractor shall inform the Manufacturer and arrange for the attendance at the site of the Manufacturer's Representative to verify successful installation.
- .4 The Manufacturer's Representative shall conduct a detailed inspection of the installation including alignment, electrical connections, belt tensions, rotation direction, running clearances, lubrication, workmanship and all other items as required to ensure successful operation of the equipment.
- .5 The Manufacturer's Representative shall identify any outstanding deficiencies in the installation.
- .6 The deficiencies shall be rectified by the Contractor and the Manufacturer's Representative will be required to re-inspect the installation, at no cost to the City.
- .7 When the Manufacturer's Representative accepts the installation, he shall certify the installation by completing Form 102.
- .8 Deliver the completed Form 102 to the Contract Administrator prior to departure of the Manufacturer's Representative from the Site.
- .9 Tag the equipment with a 100 mm by 200 mm card stating "Equipment Checked. Do Not Run." stenciled in large black letters. Sign and date each card.
- .10 Provide separate copies of Form 102 for different equipment.

EQUIPMENT INSTALLATION

5. OPERATION AND PERFORMANCE VERIFICATION

- .1 Equipment will be subjected to a demonstration, running test, and performance tests after the installation has been verified and any identified deficiencies have been remedied.
- .2 Inform the Contract Administrator at least fourteen (14) days in advance of conducting the tests and arrange for the attendance of the Manufacturer's Representative. The tests may be concurrent with the inspection of satisfactory installation if mutually agreed by the Contractor and the Contract Administrator.
- .3 The Manufacturer's Representative will conduct all necessary checks to equipment and if necessary, advise the Contractor of any further checking, cleaning, or other Work needed prior to confirming the equipment is ready to run.
- .4 The Contractor shall then operate the equipment for at least one (1) hour to demonstrate to himself the operation of the equipment and any required ancillary services. Any remedial measures required to ensure satisfactory operation shall be promptly undertaken.
- .5 The Contractor shall then notify the Contract Administrator of his readiness to demonstrate the operation of the equipment. The Contract Administrator shall attend, as expeditiously as possible.
- .6 With the assistance of the Manufacturer's Representative, the Contractor will demonstrate that the equipment is properly installed.
- .7 The equipment shall then be run for one (1) hour. Local controls shall be satisfactorily verified by cycling the equipment through several start-stop operations, modulating its output, or some combination. Operating parameters such as temperature, pressure, voltage, vibration, etc., will be checked to ensure that they are within the specified or Manufacturer's recommended limits, whichever is more stringent.
- .8 On satisfactory completion of the one (1) hour demonstration, the equipment will be stopped and critical parameters will be rechecked.
- .9 The equipment will be restarted and run continuously for three (3) days.
- .10 Performance tests will be conducted either concurrent with or subsequent to the running test, as practicable and agreed between the Contract Administrator, the Manufacturer's Representative and the Contractor.
- .11 Performance tests shall be as dictated in the Technical Specifications for each item of equipment or as reasonably required by the Contract Administrator to prove adherence to the requirements listed in the Specification.
- .12 The Contractor shall submit the results of the performance tests to the Contract Administrator, documented and summarized in a format acceptable to the Contract Administrator. The Contract Administrator reserves the right to request additional testing.

EQUIPMENT INSTALLATION

No equipment shall be accepted and handed over to the City prior to the satisfactory completion of the performance test(s) and receipt of the test reports.

- .13 All temporary power, heating, or any other ancillary services required to complete the initial demonstration, running test and performance tests are the responsibility of the Contractor.
- .14 Should the initial demonstration, running test or performance tests reveal any defects, then those defects shall be promptly rectified and the demonstration, running tests, and/or performance tests shall be repeated to the satisfaction of the Contract Administrator. Additional costs incurred by the Contractor, the Contract Administrator, or the City, due to repeat demonstration, running tests, and/or performance tests shall be the responsibility of the Contractor.
- .15 On successful completion of the demonstration, running test, and performance tests, Form 103 shall be signed by the Manufacturer's Representative, the Contractor, and the Contract Administrator.
- .16 While onsite to complete Form 103 with a representative for the City and the Contract Administrator, the Contractor shall also provide the training specified in Section 01650.

TRAINING

1. DESCRIPTION

- .1 This Section contains requirements for training the City personnel, by persons retained by the Contractor specifically for the purpose, in the proper operation and maintenance (O&M) of the equipment and systems installed under this Contract.
- .2 One training session is required.

2. QUALITY ASSURANCE

- .1 Training includes instruction of City's personnel in equipment operation and preventive maintenance and instruction of mechanics, electricians, instrumentation and communications technicians in normal maintenance up to major repair.
- .2 Training sessions will be conducted by qualified, experienced [two (2) years minimum], factory-trained representatives of the various equipment Manufacturers and supply Contractors.

3. LOCATION

- .1 Conduct training sessions for the City's O&M personnel on the operation, care, and maintenance of the equipment and systems installed under this Contract. Training will take place at the Site of the Work and under the conditions specified in the following paragraphs. Vendor O&M manuals will be reviewed and accepted at least seven (7) days prior to the date scheduled for the individual training session or Substantial Performance (whichever comes first).
- .2 Field training sessions will take place at the Site of the equipment.

4. FORMAT AND CONTENT

- .1 Training will occur at the location of the equipment or system for each training session. As a minimum, cover the following topics for each item of equipment or system:
 - .1 Familiarization
 - .2 Safety
 - .3 Operation
 - .4 Troubleshooting
 - .5 Preventive maintenance
 - .6 Corrective maintenance
 - .7 Parts
 - .8 Local representatives

TRAINING

5. TRAINING

5.1 General Requirements

- .1 Conduct training in conjunction with the operational testing and commissioning periods.

5.2 Operator Hands-On Training

- .1 As a minimum, hands-on equipment training for operations personnel will include:
 - .1 Discussing, demonstrating, and performing standard operating procedures.
 - .2 Discussing and performing the preventive maintenance activities.
 - .3 Discussing and performing start-up and shutdown procedures.
 - .4 Performing the required equipment exercise procedures.
 - .5 Performing routine disassembly and assembly of equipment if applicable.
 - .6 Identifying and reviewing safety items and performing safety procedures, if feasible.

5.3 Maintenance Hands-On Training

- .1 Hands-on equipment training for maintenance and repair personnel will include:
 - .1 Locating and identifying equipment components.
 - .2 Reviewing the equipment function and theory of operation.
 - .3 Reviewing normal repair procedures.
 - .4 Performing routine start-up and shutdown procedures.
 - .5 Reviewing and performing the safety procedures.
 - .6 Performing City approved practice maintenance and repair job(s), including mechanical and electrical adjustments and calibration and troubleshooting equipment problems.
 - .7 Reviewing and using equipment Manufacturer's manuals in the hands-on training.

5.4 Equipment and Systems for Training

- .1 As a minimum, provide training for the following equipment and systems:
 - .1 City supplied Disconnect
 - .2 New Medium Voltage Vacuum Circuit Breaker
- .2 Coordinate and finalize with the Contract Administrator on training schedules and duration of each training session.

TRAINING

5.5 Training Completion Forms and Payment

- .1 Form T1: To be completed for initial training. One (1) form is to be used for each equipment/system for which training has been provided.

END OF SECTION

ELECTRICAL GENERAL REQUIREMENTS

1. GENERAL

1.1 Work Included

- .1 Complete an operational electrical system as required by the Drawings and as herein specified.
- .2 The intent of the Drawings and Specifications is to include all labour, Products, and services necessary for complete Work, tested and ready for operation.
- .3 Symbols used to represent various electrical devices often occupy more space on the Drawing than the actual device does when installed. In such instances, do not scale locations of devices from electrical symbols. Install these devices with primary regard for usage of wall space, convenience of operation, and grouping of devices.
- .4 These Specifications and the Drawings and Specifications of all other Divisions shall be considered as an integral part of the accompanying Drawings. Any item or subject omitted from either the Specifications or the Drawings but which is mentioned or reasonably specified in and by the others, shall be considered as properly and sufficiently specified and shall be provided.
- .5 Provide all minor items and Work not shown or specified but which are reasonably necessary to complete the Work.
- .6 If discrepancies or omissions in the Drawings or Specifications are found, or if the intent or meaning is not clear, advise the Contract Administrator for clarification before submitting the bid.
- .7 Responsibility to determine which Division provides various Products and Work rests with the Contractor. Additional compensation will not be considered because of differences in interpretation of Specifications.

1.2 Quality Assurances

- .1 Codes, Rules, Permits & Fees
 - .1 Comply with all laws, ordinances, rules, regulations, codes and orders of all authorities having jurisdiction relating to this Work.
 - .2 Comply with all rules of the Canadian Electrical Code (CEC), Canadian Standards Association (CSA) Standard C22.1 and the applicable building codes. Do Overhead Lines in accordance with CAN/CSA-C22.3 No. 1 and Underground Systems in accordance with CAN/CSA-C22.3 No. 7 except where specified otherwise.
 - .3 Quality of Work specified and/or shown on the Drawings shall not be reduced by the foregoing requirements.

ELECTRICAL GENERAL REQUIREMENTS

- .4 Immediately after award of Contract and prior to installation, verify location, arrangement and point of attachment for service and service entrance equipment with supply authority and inspection departments. Failure to do so will render this Division responsible for any corrections necessary without additional compensation.
 - .5 Give all required notices, submit Drawings, obtain all permits, licenses, and certificates and pay all fees required for this Work.
 - .6 Furnish a Certificate of Final Inspection and approvals from inspection authority to the Contract Administrator.
- .2 Standard of Workmanship:
- .1 Execute all Work in a competent manner and to present an acceptable appearance when completed.
 - .2 Employ a competent supervisor and a sufficient number of licensed tradesmen to complete the Work in the required time.
 - .3 Arrange and install Products to fit properly into designated building spaces.
 - .4 Unless otherwise specified or shown, install Products in accordance with recommendations and ratings of Manufacturers.

1.3 Submittals

- .1 Within seven (7) days of award of Contract, the Contractor shall submit a completed equipment procurement schedule which lists the Manufacturer and model of equipment, indicating the projected ordering, Shop Drawing submittal date and delivery dates of all products to meet the date specified for Substantial Performance.
- .2 Prior to delivery of any Products to the job Site and sufficiently in advance of requirements to allow ample time for checking, submit Shop Drawings for review as specified in CW1110. Submit Shop Drawings for all equipment as required in each Section of this Specification.
- .3 Prior to submitting the Shop Drawings to the Contract Administrator, the Contractor shall review the Shop Drawings to determine that the equipment complies with the requirements of the Specifications and Drawings.

1.4 Record Drawings

- .1 The Contractor shall keep one (1) complete set of white prints at the Site office, including all Addenda, Change Orders, Site Instructions, Clarifications, and Revisions for the purpose of Record Drawings. As the Work on-site proceeds, the Contractor shall clearly record in Red Pencil all As-Built conditions which deviate from the original Contract Documents. Record Drawings to include circuiting of all devices, conduit and feeder runs (complete with conductor size and number) and locations of all electrical equipment.

ELECTRICAL GENERAL REQUIREMENTS

- .2 Prior to Substantial Performance, the Contractor shall obtain CAD files of all electrical Drawings, using AutoCAD Release 2000 or better, and use the services of a competent CAD operator to transfer all As-Built information, including: Addenda, Change Orders, Clarifications, Revisions, Site Instructions, and Shop Drawings. Upon completion, the Contractor shall certify, in writing, that the As-Built Record Drawings are complete and that they accurately indicate all electrical services, including exposed as well as concealed items.
- .3 Contractor shall forward letter of certification and As-Built CAD Drawings to the Contract Administrator for final review. As-Built Drawings shall be submitted in electronic Drawings format to the Contract Administrator.

1.5 Operation and Maintenance Manuals

- .1 Within twenty-one (21) days of Substantial Performance, the Contractor shall submit a draft copy of the proposed contents of each maintenance manual to the Contract Administrator for review. Once the draft copy is approved, the Contractor will supply four (4) copies in suitably labelled, hard back, D-Ring type commercial binders, each complete with an index and tabbed title sheets for each section. Final copies of manuals shall be received by the Contract Administrator not less than seven (7) days prior to Substantial Performance.
- .2 All maintenance manual data shall be printed on 8 1/2" x 11" heavy bond, indexed, tabbed, punched and bound in the binders. Each manual shall have a title sheet which is labelled "Operation & Maintenance Manual", and lists the Project name, Contractor's & Contract Administrator's names, date submitted, and a Table of Contents for each volume. If a manual exceeds 75 mm in thickness, provide additional manuals as required.
- .3 Each section of the manual shall contain the following information:
 - .1 Systems Descriptions. A brief synopsis of each system typed and inserted at the beginning of each section. Include sketches and diagrams where appropriate.
 - .2 Descriptive and technical data.
 - .3 Operation and Maintenance (O&M) instructions for all electrical equipment and controls. (These operating instructions need not be Manufacturer's data but may be typewritten instructions in simple language to guide the City in the proper O&M of his installation.)
 - .4 Lubricating and servicing intervals recommended.
 - .5 A copy of all wiring diagrams complete with wire coding.
 - .6 List of spare parts of all electrical equipment complete with names and addresses of sales, Service Representatives, and Suppliers.
 - .7 Copy of test data
 - .8 Include type and accuracy of instruments used to obtain test data.

ELECTRICAL GENERAL REQUIREMENTS

- .9 Copy of final inspection certificate.
- .10 Copy of the purchase order, showing equipment make and model numbers issued to the Manufacturer complete with all Addenda. All cost details may be hidden.
- .11 Copy of all Manufacturer's Warranty certificates for equipment which has a Manufacturer's Warranty in excess of that specified in GC13.
- .12 Set of final reviewed Shop Drawings.
- .13 Names, addresses, phone numbers, and facsimile numbers of Contractor, Contract Administrators, Sub-contractors and Suppliers used on the Work together with a Specification reference of the portion of the Work they undertook.

1.6 Product Handling

- .1 Use all means necessary to protect the Products of this Division before, during and after installation and to protect Products and installed Work of all other trades.
- .2 Immediately make good any damage by repair or replacement at no additional cost to the City and to the approval of the Contract Administrator.
- .3 Remove advertising labels from all electrical equipment. Do not remove identification of certification labels.
- .4 Remove dirt, rubbish, grease, etc. resulting from this Work from all surfaces, including the inside of all cabinets, equipment enclosures, panelboard tubs, etc.

2. PRODUCTS

2.1 Quality of Products

- .1 All Products provided shall be CSA Approved, Canadian Underwriters' Laboratory (CUL) approved where applicable, and new, unless otherwise specified.
- .2 If Products specified are not CSA approved, obtain special approval from the local regulatory authority. Pay all applicable charges levied and make all modifications required for approval.
- .3 Products provided, if not specified, shall be new, of a quality best suited to the purpose required and their use subject to approval by the Contract Administrator.

2.2 Uniformity of Manufacture

- .1 Unless otherwise specifically called for in the Specifications, uniformity of Manufacture shall be maintained for similar Products throughout the Work.

ELECTRICAL GENERAL REQUIREMENTS

2.3 Product Finishes

- .1 Finish all cabinets, panelboards, switchboards, equipment cabinets, cable trays, etc. in American National Standards Institute (ANSI) 61 grey enamel unless otherwise specified.
- .2 Apply primer on all items which are to be finished on the job.
- .3 Touch up all damaged painted finishes with matching lacquer, or, if required by the Contract Administrator, completely repaint damaged surface.

2.4 Non-Specific Date/Time Compliance

- .1 All equipment, hardware, software and firmware (for the purposes of this clause #, the "Product") delivered or deliverables resulting from any services provided are fully Date Compliant and the Product will not adversely or materially effect the daily business operations as a result of a date related computer problem (for the purposes of this clause #, the "Warranty"). Date Compliant means that the Product accurately and correctly processes and stores date/time data (including, but not limited to, calculating, comparing, displaying, recording, and sequencing operations) including year, century and leap year calculations.
- .2 Provide documentary proof of Date Compliance prior to Substantial Completion listing all equipment and certifying their compliance.
- .3 Notwithstanding any other remedy available under this agreement or at law for breach of the Warranty, any Product that is not Date Compliant shall, within twenty-four (24) hours of receipt of notice of the breach, be repaired or replaced at the Contractors sole cost and expense, including parts, labour, transportation, and insurance, so as to correct any failure to meet the Warranty.

3. EXECUTION

3.1 Separation of Services

- .1 Maintain separation between electrical wiring system and building piping, ductwork, etc. so that wiring system is isolated (except at approved connections to such systems) to prevent galvanic corrosion.
- .2 In particular, contact between dissimilar metals, such as copper and aluminum, in damp or wet locations is not permitted.
- .3 Do not support wiring from pipes, ductwork, etc. Hangers for suspended ceilings may be used for the support of wiring only when approval is obtained from the Contract Administrator and the ceiling installer, and approved clips or hangers are used.

ELECTRICAL GENERAL REQUIREMENTS

3.2 Equipment Identification

- .1 3 mm thick plastic lamicaid name plates, black face, white core, mechanically attached with self tapping screws, 6 mm high lettering, to be attached to the front face of the following equipment:
 - .1 Distribution Vacuum Breaker 5kV (indicate designation, voltage).
- .2 Install yellow plastic warning tape, 300 mm below grade, above all underground cables.
- .3 Provide permanent, corrosion resistant warning markers, suitable to the local inspection authority, imbedded in the surface of concrete slabs which are directly above high voltage cables.

3.3 Sealing of Wall and Floor Openings

- .1 All conduit and cable entries through outside walls of buildings, through partition walls separating electrical rooms from other areas, through fire separations, and through floors above grade shall be sealed to prevent passage of moisture, dust, gasses, flame, or to maintain pressurization.
- .2 Openings shall be sealed when all wiring entries shown on the Drawings have been completed.
- .3 Sealing material shall be fire resistant and shall not contain any compounds which will chemically affect the wiring jacket or insulating material. Cable penetrations through fire separations shall be sealed.

3.4 Insulation Resistance Testing

- .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
- .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
- .3 Check resistance to ground before energizing.
- .4 Carry out tests in presence of Contract Administrator.
- .5 Provide instruments, meters, equipment, and personnel required to conduct tests during and at conclusion of project.
- .6 Submit test results for Contract Administrator's review.

END OF SECTION

SCOPE OF WORK

1. GENERAL

- 1.1 Supply and Install all material, equipment, wiring, and labour necessary for the installation of the systems detailed on the Drawings in accordance with the latest edition of the Canadian Electrical Code (CEC).

2. WORK INCLUDED

2.1 General Requirements

- .1 General Clean-up.
- .2 All inspection and other permits, licenses required by various Inspection Agencies and local regulations related to Electrical Trade.
- .3 Special testing or inspection, additional to the above as specified or covered by a Cash Allowance.
- .4 Scaffolding.
- .5 Shop Drawings.
- .6 Project Record Documents (As-Built Drawings) where specified.
- .7 Operating and Maintenance (O&M) Data, where specified.

2.2 Materials

- .1 Bus systems including all forms of buses integral with the electrical power system, together with their associated insulation, supports, bus ducts, and protective devices.
- .2 Conductors, including all types of wires, conductors, cables, which form an integral part of the electrical power system.
- .3 Cables and bus support systems which are intended to enclose or support all forms of electrical conductors used for any purpose covered by this scope. This includes cable trays, raceways and all forms of rigid, flexible, metallic and non-metallic conduit, and including conduit for communication systems or others, which may be installed at a later date, or buried conduit for wiring work by others, only when such buried conduit is indicated in the Contract Documents.
- .4 Circuit breakers of all types and for all applications associated with electrical equipment which receives its power supply from the main, auxiliary, or emergency (including battery) system.

SCOPE OF WORK

2.3 Scope of Work

- .1 Receive, from the City, an exterior mounted fused load break switch rated at 1200A, 5 kV complete with 120 V electric heater and 5 kV fuses.
- .2 Install exterior mounted fused disconnect as indicated on Drawings. Provide concrete pad for new switch and extend existing station ground grid. Ground grid around new switch shall be installed as required by CEC.
- .3 Provide new 5 kV cables from existing 66 kV-5 kV 5 MVA transformer secondary to load break switch. Connection to existing transformer secondary to be made at time of switch over. Cables shall be installed above grade, within the existing substation, utilizing existing structure and new support structure as indicated on drawings. Connect cables to load break switch line side termination point.
- .4 Provide new 5 kV cables direct buried in trench from load break switch, secondary terminals, to south-west corner of existing Deacon Booster Pumping Station (DBPS). Core sleeve(s) in concrete exterior wall to allow cables to enter and be extended to existing 5 kV switchgear located on the south mezzanine. Trench and coring shall be the responsibility of this contractor. Cables shall be installed on a support system within the building and extended to the existing future #2 service feeder breaker.
- .5 Provide a 15A 120 V circuit from Pumping Station to 5 kV load break switch and connect electric heater supplied with switch.
- .6 Provide a new 5 kV medium voltage vacuum circuit breaker to be installed in existing 5 kV cubicle designated for the second feeder breaker. Breaker shall be complete with protective relay and analyzer as specified. Existing cubicle is manufactured by Schneider Electric.
- .7 Terminate new 5 kV cables at line side terminal of new 5 kV breaker.
- .8 Arrange to have substation 5 MVA transformer de-energized. Disconnect existing DBPS feeder cables at secondary termination of transformer and remove from termination cabinet. Install new 5 kV service cables to transformer secondary terminals. Complete all cable and switchgear testing successfully and re-energize transformer.

3. WORK EXCLUDED

3.1 General Requirements

- .1 Temporary power
- .2 Temporary light
- .3 Hoisting
- .4 Barriers

SCOPE OF WORK

4. UNITS OF MEASUREMENT

4.1 General

- .1 The Contract Documents have been prepared using the modified International System (SI) units of metric measurement. Whenever appropriate, available metric products shall be used unless otherwise specified herein.
- .2 Only metres (m) and millimetres (mm) are used. Generally, metres are used for measurements of 10 m or more, and millimetres for measurements below 10 m.
- .3 All measurements on Drawings are in millimetres unless otherwise indicated.

4.2 Conversions

- .1 The following three conversion methods were used in product and location dimensions:
 - .1 Hard Conversion: Industry available Products which are manufactured in metric measurements.
 - .2 Soft Conversion: Products which are still manufactured in Imperial units and are converted in Specifications using arithmetic conversion factors.
 - .3 Rationalized Conversion: Dimensions which are soft converted and rounded off for ease of measurements.
- .2 In cases where measurements may be open for interpretation, dual dimensions have been incorporated until hard conversions can be used exclusively.

5. CODES

5.1 General

- .1 All codes, standards, rules, regulations, bulletins, by-laws etc., shall be those that are currently enforced in the locality of job Site, unless otherwise specified herein.

END OF SECTION

INSTALLATION OF CABLES IN TRENCHES AND IN DUCTS

1. GENERAL (NOT APPLICABLE)

2. PRODUCTS

2.1 Cable Protection

- .1 Provide 600 x 600 x 50 concrete patio blocks above directed buried duct banks. Patio blocks to be coloured RED for identification.

2.2 Markers

- .1 Concrete type cable markers: 600 x 600 x 100 mm with words: "cable", "joint", or "conduit" impressed in top surface, with arrows to indicate change in direction of cable and duct runs.

3. EXECUTION

3.1 Direct Burial of Cables

- .1 After the compacted sand bed is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Do not pull cable into trench.
- .2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements.
- .3 Make termination and splice only as indicated leaving 0.6 m of surplus cable in each direction.
 - .1 Make splices and terminations in accordance with Manufacturer's instructions using approved splicing kits.
- .4 Underground cable splices not acceptable.
- .5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.
- .6 Maintain 75 mm minimum separation between cables of different circuits. Maintain 300 mm horizontal separation between low and high voltage cables. When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position. At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm between high voltage cables. Maintain 300 mm minimum lateral and vertical separation for fire alarm and control, cables when crossing

INSTALLATION OF CABLES IN TRENCHES AND IN DUCTS

other cables, with fire alarm and control cables in upper position. Install treated planks on lower cables 0.6 m in each direction at crossings.

- .7 After sand protective cover is in place, install continuous row of concrete patio as indicated to cover length of run.

3.2 Markers

- .1 Mark cable every 150 m along cable or changes in direction. Markers to be placed where cable enters and exits trench.
- .2 Where markers are removed to permit installation of additional cables, reinstall existing markers.
- .3 Install concrete patio type markers.
- .4 Lay concrete markers flat and centered over cable with top flush with finish grade.

3.3 Field Quality Control

- .1 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .2 Check phase rotation and identify each phase conductor of each feeder.
- .3 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megaohms.
- .4 Pre-acceptance test.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 5000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .5 Acceptance Tests
 - .1 Ensure that terminations and accessory equipment are disconnected.
 - .2 Ground shields, ground wires, metallic armour, and conductors not under test.
 - .3 High Potential (Hipot) Testing.
 - .1 Conduct Hipot testing at test voltage in accordance with Manufacturer's or Insulated Power Cable Engineers Association (IPCEA) recommendations.
 - .4 Leakage Current Testing.

**INSTALLATION OF CABLES IN
TRENCHES AND IN DUCTS**

- .1 Raise voltage in steps from zero to maximum values as specified by IPCEA manufacturer for type of cable being tested.
- .2 Hold maximum voltage for specified time period by IPCEA .
- .3 Record leakage current at each step.
- .5 Provide Contract Administrator with list of test results showing location at which each test was made, circuit tested, and result of each test.
- .6 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

**HV POWER CABLES &
15 KV SHIELDED CABLE TERMINATIONS**

1. GENERAL

1.1 Description

- .1 Complete supply, installation and termination of power cables rated 5000 V.

1.2 Codes and Standards

- .1 Insulated cables to Canadian Standards Association (CSA) C22.2 No. 38, CSA C68.3 and Insulated Cable Engineers Association (ICEA) 5-66-524

2. PRODUCTS

2.1 Insulated Cables

- .1 Single or three conductors sized as indicated, copper stranded, with semi-conducting cross-linked polyethylene (XLPE) conductor shield.
- .2 Insulation of chemically cross linked, thermosetting polypropylene material, rated RW-90 or RWU-90, 100 kV B.I.L.
- .3 Insulation shielding of semi-conducting XLPE over insulation and served wire or copper tape shield.
- .4 Cable jacket thermosetting low temperature black, with separator tape between shield and jacket.
- .5 Suitable for grounded neutral, 133% insulation level.
- .6 Short circuit rating 60 kA, 1 cycle; 14 kA, 30 cycles.
- .7 90°C normal, 130°C emergency rating, 250°C short circuit rating.

2.2 Ground Conductor

- .1 Minimum 2/0 AWG stranded soft drawn bare copper, 600 V, green insulation.
- .2 Alternatively, for multi-conductor cables, provide a stranded copper ground conductor, integral with the cable and sized according to Table 17 of the Canadian Electrical Code (CEC), Part I.

2.3 Connectors

- .1 Where not provided with equipment, supply suitable compression type connectors for use on copper conductors.

**HV POWER CABLES &
15 KV SHIELDED CABLE TERMINATIONS**

2.4 Stress Cones

- .1 Refer to Section 16121 - Power Cable and Overhead Conductors 1001-15000 V.

3. EXECUTION

3.1 Insulated Cables

- .1 Do not splice cables. A continuous length is required for all feeds.
- .2 Install in accordance with Manufacturer's recommendations, observing requirements for minimum bending radius and pulling tensions.
- .3 Submit certified Manufacturer's data sheets.

3.2 Terminations

- .1 Form stress relief cones in accordance with Section 16121 - Power Cable and Overhead Conductors 1001-15000 V.
- .2 Install compression connectors using tools provided by the connector manufacturer in accordance with the Manufacturer's recommendations.

3.3 Tests

- .1 The electrical contractor is to test cables prior to energization, as follows:
 - Megger
 - Highpot
 - 25 kV DC ICEA
 - Radar scan shield test

END OF SECTION

**POWER CABLES AND
OVERHEAD CONDUCTORS 1001-15000 V**

1. GENERAL

1.1 Related Work

- .1 Connectors and Terminations: Section 16153

2. PRODUCTS

2.1 Teck Power Cable 1001 - 15000 V

- .1 Bare copper grounding conductor, size as indicated.
- .2 Copper circuit conductors, size and number as indicated.
- .3 Strand shielding
- .4 Insulation: chemically cross-linked thermosetting polyethylene rated RW90 5 kV to Insulated Cable Engineers Association (ICEA) S-66-524.
- .5 Insulation shielding: semi-conducting non-metallic tape over insulation and served wire shield over tape to ICEA S-19-81.
- .6 Separator tape over conductor assembly.
- .7 Inner jacket of polyvinyl chloride (PVC).
- .8 Interlocked galvanized steel armour.
- .9 Overall PVC jacket rated minus 40°C.

3. EXECUTION

3.1 Installation

- .1 Install primary cables in trenches in accordance with Section 16106 - Installation of Cables in Trenches and in Ducts.

END OF SECTION

CONNECTORS AND TERMINATIONS

1. GENERAL

1.1 Inspection

- .1 Obtain inspection certificate of compliance covering high voltage stress coning (if applicable) from the Consultant and include it with As-Built Drawings and maintenance manuals.

1.2 Product Data

- .1 Submit Product data sheets in accordance with Section 16010 - Electrical General Requirements.

2. PRODUCTS

2.1 Connectors and Terminations

- .1 Copper 2 hole long barrel compression connectors as required and sized for conductors.
- .2 Contact aid for aluminum cables where applicable.

3. EXECUTION

3.1 Installation

- .1 Install stress cones, terminations, and splices in accordance with the Manufacturer's instructions.
- .2 Bond and ground as required.

END OF SECTION

GROUNDING

1. GENERAL

1.1 Description

- .1 Supply and install a complete grounding system. Securely and adequately ground all components of the electrical system in accordance with the requirements of all related sections in the latest Canadian Electrical Code (CEC), Manitoba Electrical Code 8th Edition and the local Electrical Inspection Branch.
- .2 The system shall consist of cables, ground rods, supports, and all necessary materials, and inter-connections to provide a complete system. Connect ground cable to existing grounding equipment at existing sub station. Measured resistance to ground of the network shall not exceed 5 ohms.
- .3 All ground conductors shall be run in conduit.

2. PRODUCTS

- .1 Cables 2/0 and smaller to be connected to ground bars via Burndy Quiklug Type QA-2B connectors. Connections for cables larger than 3/0 shall be thermoweld.
- .2 All ground wires to be stranded copper TWH complete with a green jacket unless otherwise shown.
- .3 Ground rods shall be 20 mm x 3000 mm copper clad.
- .4 Cable to pipe connectors to be made with Burndy GAR connectors.
- .5 In the main electrical room, provide a copper ground bar complete with lugs suitable to terminate all ground cables.

3. EXECUTION

3.1 Grounding – General

- .1 Connect new ground cables to existing ground points at existing substation.
- .2 Connect new ground cables to existing equipment at the electrical sub distribution. Insure that the new temporary grounding system meet all requirement of the CEC, latest edition. Ground wire shall be green TWH.
- .3 Expansion joints and telescoping sections of raceways shall be bonded using jumper cables as per CEC.
- .4 Install rigid conduit sleeves where ground wires pass through concrete slabs.

GROUNDING

- .5 Insure all grounding for services to the electrical system ground are secure.

END OF SECTION

FASTENINGS AND SUPPORTS

1. GENERAL

1.1 Work Included

- .1 Supply and install all hangers, supports and inserts for the installation shown on the Drawings and specified herein, as necessary to fasten electrical equipment securely to the building structure.

2. PRODUCT

2.1 Framing and Support System

.1 Materials:

- .1 Intermediate duty supporting structures shall employ P1000 Unistrut or equal together with the Manufactures connecting components and fasteners for a complete system.
- .2 Heavy duty supporting structures to be fabricated and welded from steel structural members and prime painted before installation.

.2 Finishes:

- .1 Outdoors, wet locations: Hot dipped galvanized.
- .2 Indoors, dry locations: Galvanized when available, prime painted if not available.
- .3 Nuts, bolts, machine screws: Cadmium plated.

.3 Unistrut:

- .1 Section P1000 or as required for load and span, with mounting screws, or approved. P1000 or equal is a minimum standard for supporting conduits 50 mm and larger.

2.2 Concrete and Masonry Anchors

- .1 Materials: Hardened steel inserts, zinc plated for corrosion resistance. All anchor bolts must be galvanized.
- .2 Components: non-drilling anchors for use in predrilled holes, sized to safely support the applied load with a minimum safety factor of four.
- .3 Manufacturer: Hilti (Canada) Limited or approved equal.

2.3 Conduit Supports

- .1 General: Malleable iron one-hole conduit straps where exposed to weather. Stamped steel two-hole straps indoors.

FASTENINGS AND SUPPORTS

- .2 Structural Steel: Crouse-Hinds “Wedgetite” supports or equivalent manufactured by Appleton.
- .3 Masonry, concrete, stone, etc.: Anchors.
- .4 Unistrut: Unistrut conduit clamps.

2.4 Cable Supports and Clamps

- .1 General: As per conduit supports, except that for single conductor cables, suitable non-ferrous, or approved stainless steel, or aluminum clamps shall be used.

3. EXECUTION

3.1 General

- .1 Do not cut or drill beams, joists or structural steel unless written permission of the Consultants is obtained.
- .2 Distance between conduit or cable supports not to exceed code requirements.
- .3 Supports to be suitable for the real loads imposed by equipment.
- .4 Supports to be securely fastened, free from vibration and excessive deflection or rotation. Maximum deflections are 4 mm over a 1 metre span and 8 mm over a 2 metre span.
- .5 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with Manufacturer’s installation recommendations.
- .6 Provide conduit rack with 25% spare capacity for multiple runs.
- .7 Provide channel support with fittings for vertical runs of conduit and cables.

3.2 Installation

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .4 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole malleable iron or steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.

FASTENINGS AND SUPPORTS

- .3 Beam clamps to secure conduit to exposed steel Work.
- .5 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support two (2) or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .6 Use plastic anchors for light loads only. Use metal anchors for all other loads.
- .7 Shot driven pins may only be used with written approval of the Structural Engineer.
- .8 Do not support heavy loads from the bottom chord of open web steel joists.
- .9 For surface mounting of two or more conduits or conductors use channels at 1.0 m oc spacing.
- .10 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .11 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .12 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .13 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Consultant.

END OF SECTION

**MEDIUM-VOLTAGE
VACUUM CIRCUIT BREAKERS**

1. GENERAL

1.1 Product Data

- .1 Submit Product data in accordance with Section 16010 - Electrical General Requirements.

2. PRODUCTS

2.1 Circuit Breakers

- .1 Indoor vacuum circuit breaker, 3 pole, single break, power operated, draw out breaker element, sized as indicated.
- .2 Circuit breaker shall be operated by a motor-charged spring stored energy mechanism. The spring may be charged manually in an emergency or during maintenance procedures.
- .3 Circuit breakers shall have three (3) vacuum interrupter assemblies that are separately mounted on 5 kV class insulators. The breaker front panel shall be removable when the compartment door is open for ease of inspection and maintenance of mechanism.
- .4 Breaker shall be electrically operated by 115 V AC close and AC capacitor trip.
- .5 Breaker shall be complete with control switcher and red and green indicating lights to indicate breaker contact position.
- .6 Control voltage shall be derived from within equipment.

2.2 Rating – Switch Gear, Switch and Circuit Breaker

- .1 The 5 kV switchgear assembly rating shall be as follows:
- | | | |
|----|--|-------------------------------------|
| .1 | Maximum voltage | 4.76 kV |
| .2 | Basic impulse level | 60 kV |
| .3 | Available system 3 phase short circuit current to be confirmed with original coordination study. | 63 kA |
| .4 | Nominal system voltage | 4.16 kV 3 phase 3 wire solid ground |
| .5 | Main cross bus continuous current rating | 1200 A |
- .2 The 5 kV breaker rating shall be as follows:
- .1 Circuit breaker nominal 3 phase MVA class 350

MEDIUM-VOLTAGE VACUUM CIRCUIT BREAKERS

- .2 Short circuit current to be confirmed in short circuit coordination study in conjunction with the original study completed with the installation of the Deacon Ultraviolet (UV) Lighting Disinfection Project – Installation of UV Disinfection System Tender No. 556-2003. This study will be available to this Contractor buy the City.

2.3 Construction

- .1 The switchgear assembly shall consist of deadfront, completely metal – clad vertical section with drawout vacuum circuit breaker.

2.4 Bus

- .1 All buses shall be silver plated copper.
- .2 Ground bus conductor shall be silver plated copper.
- .3 Bus supports to be high strength and high creep, finned supports providing a minimum of 356 mm of creep between phase and ground.

2.5 Medium Voltage Protective relays

- .1 Relays for phase time overcurrent, instantaneous overcurrent and ground fault protection, American National Standards Institute (ANSI) 50/51, 50/51G, or 50/51N, shall be incorporated into a single device.
- .2 The relay shall be a solid-state microprocessor-based multifunctional type that operates from the 5 ampere secondary output of current transformers. The relay shall provide ANSI 50/51N protective functions for each of the three (3) phases, and ANSI 50/51N or 50/51G ground fault protection functions as shown on the plans or as determined by the coordination study. The relay shall be true rms sensing of each phase and ground. Ground element shall be capable of being utilized in residual, zero sequence, ground source connection schemes, or deactivated.
- .3 The primary current transformer rating being used for phase and ground protection feeding the device shall be programmable for current transformers with primary current ratings from 5 through 5,000 amperes.
- .4 Both the phase and ground protection curves shall be independently field-selectable and programmable with or without load. Curves shall be selectable from the following:

Institute of Electrical and Electronic Engineers (IEEE): Moderately inverse, very inverse, extremely inverse

International Electrotechnical Commission (IEC): A, B, C or D

Thermal: Flat, I_t , I^2t , I^4t

MEDIUM-VOLTAGE VACUUM CIRCUIT BREAKERS

Thermal curves shall be similar to those on low voltage trip units for close coordination with downstream devices. Selectable short delay pickup and short delay time settings shall also be provided. The phase instantaneous overcurrent trip shall have field-programmable pickup points from 1.0 to 25 times current transformer primary rating or NONE. In addition, a field-selectable (ON or OFF) discriminator circuit shall be included such that when phase instantaneous overcurrent has been programmed to NONE, the discriminator circuit shall protect against currents exceeding eleven (11) times current transformer primary rating, only when the breaker is being closed and shall be deactivated after approximately eight (8) cycles.

- .5 The relay shall be field-configurable to have either of the following function combinations assigned to its two type "a" contacts: 1) one contact assigned ANSI 51 phase and ANSI 51 ground and the other contact assigned ANSI 50 phase and ANSI 50 ground; 2) one contact assigned ANSI 51/50 phase and the other contact assigned 51/50 ground.
- .6 The relay shall have a built-in alphanumeric display capable of displaying the following information with metering accuracy of +/- 1% of full scale (I_n) from $0.04 \times I_n$ to $1 \times I_n$ and +/- 2% of full scale (I_n) from $1 \times I_n$ to $2 \times I_n$:
 - .1 Individual phase currents.
 - .2 Ground current.
 - .3 Cause of trip.
 - .4 Magnitude and phase of current causing trip.
 - .5 Phase or ground indication.
 - .6 Peak current demand for each phase and ground since last reset.
 - .7 Current transformer primary rating.
 - .8 Programmed phase and ground set points.
- .7 Relay shall have the following features:
 - .1 Integral manual testing capability for both phase and ground protection function. Testing shall be selectable to either operate contact outputs or not operate output contacts.
 - .2 Continuous self-testing of internal circuitry.
 - .3 Unit failure alarm contact for customer use.
 - .4 Programmable lockout/self reset after trip function.
 - .5 Programmable setpoints for device curve selection.

**MEDIUM-VOLTAGE
VACUUM CIRCUIT BREAKERS**

- .6 Programmable inputs, such as current transformer ratios.
- .7 Access to program and test modes shall be via sealable hinged cover for security.
- .8 Relay shall be suitable for operating temperatures from -30°C to 55°C. Relay shall be suitable for operating with humidity from 0 to 95% relative humidity (non-condensing).
- .9 Relay shall have Modbus communication capability. Relay shall be capable of the following over the communication network:
 - .1 Ability to transmit all information contained in the relay such as currents, setpoints, cause of trip, magnitude of trip current, and open-close trip status.
- .10 Relay alarm and/or trip contacts shall not change state if power is lost or an undervoltage occurs. These contacts shall only cause a trip upon detection of an overcurrent or fault condition based upon programmed settings. A “protection OFF” alarm shall be provided which is normally energized when the relay is powered and the self-diagnostics indicates the unit is functional. Upon loss of power or relay failure, this alarm relay shall be de-energized providing a failsafe protection OFF alarm.
- .11 The relay shall be suitable for operating on control power with a nominal input voltage of 12 to 240 V AC 60 Hz. When AC control power schemes are shown on the Drawings, in addition to control power transformer or remote control power shown or herein specified, dual-source power supply shall be included.
- .12 Provide a dual-source power supply (DSPS) for each relay when operated from standard 120V AC, or, 50/60 Hz, auxiliary control power which is normally connected and available. The DSPS shall operate solely from the breaker main current transformers (CTs) during a fault condition, if the normally connected auxiliary AC voltage is not available. A battery or uninterruptible power supplies (UPS) as power shall not be required for reliable tripping under all fault conditions. The DSPS shall operate anytime there is a fault, even after an extended power outage. When the standard auxiliary power supply is not available, the DSPS shall provide enough power to operate the overcurrent relay in the tripped state with currents greater than 1.8 per unit rated secondary current, 9A with a single-phase current, 1.2 per unit secondary current or 6A with three-phase currents. There shall be no effect on the overcurrent relay trip time accuracy when the DSPS switches from normal AC voltage to fault-current power.
- .13 Provide the relay in a drawout case allowing for removal and replacement of the relay unit without disruption of the wiring. The drawout case shall have quick release operation with two-stage disconnect operation. The removal of the relay inner chassis shall disconnect the trip circuits and short the CT secondaries before the unit control power is disconnected. All voltage inputs, discrete inputs and contact outputs shall be disconnected while maintaining security against false tripping. Upon insertion of the relay inner chassis, the control power connections shall be made before the trip circuits are activated to provide additional security against false tripping. Drawout case terminals shall accommodate a bare wire connection, spade or ring terminals. A spare self-shortening contact on the terminal block shall be

MEDIUM-VOLTAGE VACUUM CIRCUIT BREAKERS

available to provide alarm indication and/or tripping of circuit breaker upon removal of the relay from the case.

2.6 Microprocessor Based Metering Equipment

- .1 Power System Analyzer and Meter
 - .1 Where indicated on the drawing, provide a digital line Power Quality Meter and Analyzer device. The Analyzer and meter shall be Underwriters Laboratories Inc. (UL), Canadian Standards Association (CSA), and Canadian Underwriters Laboratories (CUL) listed and meet ANSI C12.20 (0.5%) energy revenue metering accuracy standard.
 - .2 The metering equipment shall provide direct reading metered or calculated values of the items listed below and shall auto range between units, kilounits and megaunits for all metered values. The device shall be capable of displaying the frequency distribution in graphic form and shall be capable of displaying the Waveform in graphic form. The device shall be capable of displaying multiple parameters at once, including four (4) user-configurable custom screens, displaying any seven (7) of the parameters listed.
 - .1 AC current (amperes) in A, B, and C phase, 3-phase average, Neutral (N) and Ground (G) (provide neutral and ground current transformer). Accuracy +/- 0.2%.
 - .2 AC voltage (volts) for A-B, B-C and C-A, phase average, A-N, B-N and C-N, average phase to N, and N to G. Accuracy +/- 0.2%.
 - .3 Real Power (Watts), Reactive Power (vars), Apparent Power (VA), Real Energy (WH), Reactive Energy (VARH), Apparent Energy (VAH) for each phase and system. Accuracy +/- 0.4%. Forward/Reverse indication shall be provided.
 - .4 Frequency (Hertz) Accuracy +/- 0.4%.
 - .5 Demand values for System Current (Amperes), System Real Power (Watts), System Reactive Power (vars), and System Apparent Power (VA).
 - .6 Power Factor for both Displacement and Apparent.
 - .7 Percent Total Harmonic Distortion (THD) for all Currents and Voltages.
 - .8 K-Factor, Transformer Derating Factor, and Crest Factor.
 - .3 This device shall provide the following advanced analysis features:
 - .1 Onboard logging capability, including the ability to log a total of 24 parameters with intervals ranging from 0.13 seconds (every eight cycles) to twice a week (5,040 minutes). Four (4) separate trends shall be available.

**MEDIUM-VOLTAGE
VACUUM CIRCUIT BREAKERS**

- .2 Trend Analysis Screens displaying the minimum and maximum values for each metered value, with all parameters time stamped to 10 millisecond resolution.
 - .3 Time-of-use metering capability to store energy usage data for time-of-use revenue metering.
 - .4 Demand Analysis Screens displaying present demand and peak demands for phase currents and power. Peak demands shall display time and date stamped to within 10 millisecond resolution. Demand Window Selection for metered demand values shall be selectable as a fixed or sliding window, a synch, pulse initiation, or a communication system initiation.
 - .5 Harmonic Analysis Screens shall be capable of being function key triggered to capture a high-speed waveform of two (2) cycles of data sampled at 128 samples per cycle, simultaneously recording all currents and voltages. Data captured shall include the magnitude and the direction of the harmonic source from 1st through the 50th harmonic.
 - .6 Event/Alarm Analysis Screens shall display data recorded for up to ten (10) event/alarm conditions. For each event/alarm a description of the event/alarm, date, and time of event/alarm shall be recorded (10 mS resolution).
 - .7 The metering equipment shall be capable of transmitting all data at time of the event via Modbus communications to a personal computer for creating and displaying wave forms.
 - .8 The meter shall have the ability to store the last 504 meter events in non-volatile memory. Each event will be date and time stamped with 10 millisecond accuracy. The meter shall provide the ability to view the events via the local display or via Modbus communications.
 - .9 Event/Alarm Condition Levels shall be capable of being triggered by up to seven (7) of any of sixty-one (61) conditions when the programmed threshold is exceeded. All shall have programmable time delays from 0.1 to 60 seconds except voltage disturbance, which shall be programmable from 0 to 3,600 cycles.
- .4 This metering equipment shall be capable of receiving the following inputs:
- .1 Instrument Transformers: Input ranges of this device shall accommodate external current transformers with ranges from 10,000/5 through 5/5 amperes. Provide external current transformers for each phase, neutral and ground circuit with rating as indicated on the drawing or sized for incoming service or associated feeder. The unit shall be capable of overranging up to eight (8) times nominal current rating. Provide fused external potential transformers for up to 500 kV.
 - .2 Control Power: The device shall also be capable of being supplied from a separate control power source with input range of 100 to 240V AC.

MEDIUM-VOLTAGE VACUUM CIRCUIT BREAKERS

- .3 Dry Contacts: Three (3) dry discrete input contacts shall be capable of being monitored, which may be programmed by the user to perform any of the following functions. The status of the input contacts shall be locally displayable and accessible through the communications port.
 - .1 Trigger an Event/Alarm Analysis including Harmonic Analysis information for display on the device and information for Waveform Analysis and display at a personal computer.
 - .2 Act as a synchronizing pulse input to synchronize demand windows with a utility provided synchronizing pulse.
 - .3 Actuate a relay output.
 - .4 Reset a relay output, peak demand, Minimum/Maximum, or Event Analysis records.
- .5 Furnish Relay Output Contacts with four (4) Form C normally open/normally closed (NO/NC) relay output contacts which shall be capable of being independently programmed for the following functions:
 - .1 Act as a kWH, kVARH, or kVAH pulse initiator output.
 - .2 Actuate on one (1) or more Event/Alarm conditions, including discrete inputs and Communication Command signal.
- .6 Furnish one (1) 4 to 20 mA analog input and four (4) 4 to 20 mA outputs.
- .7 The device shall be fully programmable from the faceplate, including alarm relay and power quality (e.g., harmonic distortion) settings. Programming shall be password protected.

2.7 Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 – Electrical General Requirements.
- .2 Label Size: 7

2.8 Acceptable Manufacturers

- .1 Schneider Electric – Analyzer – CM4000.
- .2 Schneider Electric – Protective Relay – SEPAM 1000+.

**MEDIUM-VOLTAGE
VACUUM CIRCUIT BREAKERS**

3. EXECUTION

3.1 Factory Testing

- .1 Standard factory tests shall be performed on circuit breaker elements in accordance with the latest version of ANSI, CSA, and National Electrical Manufacturer's Association (NEMA) standards.

3.2 Field Quality Control

- .1 Provide services of a quality factory-trained Manufacturer's Representative to assist the Contractor in installation and start-up of equipment specified under this Section.

3.3 Installation

- .1 Breaker, Protective Relay and Analyzer shall be installed in existing cubical which was installed in Ultraviolet (UV) Disinfection contract in 2004.
- .2 Confirm interconnection and wiring equipment is in place and ready for connection of new breaker, relay and analyzer.
- .3 Check factory-made connectors for mechanical security and electrical continuity.
- .4 After finishing Work, remove foreign material, including dust, before energizing substation.

END OF SECTION

**MEDIUM-VOLTAGE
LOAD INTERRUPTER SWITCH**

1. GENERAL

1.1 Scope

- .1 The Contractor shall install the medium-voltage load interrupter outdoor padmounted switchgear received from the City. Installation shall be as herein specified and indicated on Drawings.

1.2 Delivery, storage and handling

- .1 Equipment shall be handled and stored in accordance with Manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

2. PRODUCTS (NOT USED)

3. EXECUTION

3.1 Installation

- .1 Install in accordance with Manufacturer's supplied instructions.
- .2 Connect switch terminals as shown on the Drawings.
- .3 Locate, install and connect the City supplied fuses.

END OF SECTION

**STARTING OF ELECTRICAL
EQUIPMENT AND SYSTEM**

1. GENERAL

1.1 Related Work (Not Applicable)

1.2 Coordination

- .1 Coordinates starting of electrical equipment and systems with testing, adjusting and balancing, and demonstration and instruction of:
 - .1 Electrical equipment and systems specified in Division 16
- .2 Where any equipment or system requires testing, adjusting or balancing prior to starting, ensure that such Work has been completed prior to starting of electrical equipment and systems.

2. PRODUCTS (NOT APPLICABLE)

3. EXECUTION

3.1 Energizing Main Electrical System

- .1 Prior to energizing main electrical system:
 - .1 Verify supply authority voltage and phase rotation.
 - .2 Close and open all devices to ensure proper mechanical operation.

END OF SECTION