



**THE CITY OF WINNIPEG**

# **BID OPPORTUNITY**

**BID OPPORTUNITY NO. 489-2008**

**SOUTH END WATER POLLUTION CONTROL CENTRE  
SNOW DUMP, FLOOD PROTECTION BERM AND ASSOCIATED WORKS  
CONTRACT NO. 1**

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## **PART B - BIDDING PROCEDURES**

### **B1. CONTRACT TITLE**

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- B1.2 SNOW DUMP, FLOOD PROTECTION BERM AND ASSOCIATED WORKS  
CONTRACT NO. 1

### **B2. SUBMISSION DEADLINE**

- B2.1 The Submission Deadline is 12:00 noon Winnipeg time, June 26, 2008.
- B2.2 Bids 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 C3.1, the Bidder may view the Site without making an appointment.

### **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 regularly and shortly before the Submission Deadline, as may be amended by addendum.

B5.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 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 may 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 B15.

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 COMPONENTS**

B7.1 The Bid shall consist of the following components:

- (a) Form A: Bid;
- (b) Form B: Prices;
- (c) Form G1: Bid Bond and Agreement to Bond, or  
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or  
a certified cheque or draft;

B7.2 Further to B7.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B6.

B7.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely, to constitute a responsive Bid.

B7.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.

B7.4.1 Samples or other components of the Bid 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.

B7.5 Bidders are advised not to include any information/literature except as requested in accordance with B7.1.

B7.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, may result in the Bid being determined to be non-responsive.

B7.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B7.8 Bids 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 12 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 and the corporate seal, if the corporation has one, should be affixed;
  - (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 should be witnessed, except where a corporate seal has been affixed.
- 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 and the Contract, when awarded, shall be both joint and several.

## **B9. PRICES**

- B9.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.
- B9.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.
- B9.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

## **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; and
  - (b) be financially capable of carrying out the terms of the Contract; and
  - (c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.
- B10.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) be responsible and not be suspended, debarred or in default of any obligations 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>).

- B10.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) have successfully carried out work similar in nature, scope and value to the Work; and
  - (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
  - (c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);
- B10.4 Further to B10.3(c), the Bidder shall, within three (3) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:
- (a) a valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association or by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or
  - (b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template 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.>)
- B10.5 The Bidder shall 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.
- B10.6 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. BID SECURITY**

- B11.1 The Bidder shall provide bid security in the form of:
- (a) a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or
  - (b) an irrevocable standby letter of credit, in the amount of at least ten percent (10%) of the Total Bid Price, and undertaking 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 included in the Bid Submission (Form G2: Irrevocable Standby Letter of Credit and Undertaking); or
  - (c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.
- B11.1.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.
- B11.1.2 All signatures on bid securities shall be original, and shall be witnessed or sealed as required.
- B11.2 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly executed by the successful Bidder and the performance security furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.



- B11.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B11.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.
- B11.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.
- B11.3 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Bid Opportunity.

## **B12. OPENING OF BIDS AND RELEASE OF INFORMATION**

- B12.1 Bids 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.
- B12.1.1 Bidders or their representatives may attend.
- B12.1.2 Bids determined by the Manager of Materials, or his designate, to not include the bid security specified in B11 will not be read out.
- B12.2 Following the submission deadline, the names of the Bidders and their Total Bid Prices (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>.
- B12.3 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>.
- B12.4 The Bidder is advised that any information contained in any Bid 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.

## **B13. IRREVOCABLE BID**

- B13.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.
- B13.2 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 until a Contract for the Work has been duly executed and the performance security furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid.

## **B14. WITHDRAWAL OF BIDS**

- B14.1 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.
- B14.1.1 Notwithstanding C23.3, 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.
- B14.1.2 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 12 of Form A: Bid, and only such person, has authority to give notice of withdrawal.

- B14.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:
- (a) retain the Bid until after the Submission Deadline has elapsed;
  - (b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid; and
  - (c) if the notice has been given by any one of the persons specified in B14.1.3(b), declare the Bid withdrawn.

B14.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B13.2 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, including the right to retain the Bidder's bid security.

## **B15. EVALUATION OF BIDS**

B15.1 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.

B15.2 Further to B15.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid 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 or minor informalities or irregularities, if the interests of the City so require.

B15.3 Further to B15.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his Bid or in other information required to be submitted, that he is responsible and qualified.

B15.4 Further to B15.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.

B15.4.1 If there is any discrepancy between the Total Bid Price written in figures, the Total Bid Price written in words and the sum of the quantities multiplied by the unit prices for each item, the sum of the quantities multiplied by the unit prices for each item shall take precedence.

B15.4.2 Further to B15.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

## **B16. AWARD OF CONTRACT**

B16.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B16.2 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.

B16.2.1 Without limiting the generality of B16.2, 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.

B16.3 Subject to B16.2, 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.

B16.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his Bid upon written request to the Contract Administrator.

## **PART C - GENERAL CONDITIONS**

### **C0. GENERAL CONDITIONS**

- C0.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* 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>.
- C0.2 A reference in the Bid Opportunity to a section, clause or subclause with the prefix “**C**” designates a section, clause or subclause in the *General Conditions for Construction*.

## **PART D - SUPPLEMENTAL CONDITIONS**

### **GENERAL**

#### **D1. GENERAL CONDITIONS**

D1.1 In addition to the *General Conditions for Construction*, these Supplemental Conditions are applicable to the Work of the Contract.

#### **D2. SCOPE OF WORK**

D2.1 The Work to be done under the Contract shall consist of the construction of a snow dump, snow melt retention pond, flood protection berm, access road, fencing and all associated electrical works.

D2.2 The major components of the Work are as follows:

- (a) snow dump construction
  - (i) topsoil stripping
  - (ii) excavation
  - (iii) berm construction
  - (iv) sedimentation pond construction
  - (v) electrical installations
  - (vi) fence installation
  - (vii) topsoil and seeding
- (b) flood protection berm construction
  - (i) topsoil stripping
  - (ii) hauling and placing of excavated material from snow dump area
  - (iii) ditching
  - (iv) berm compaction
  - (v) topsoil and seeding
- (c) snow dump access road construction
  - (i) topsoil stripping
  - (ii) excavation
  - (iii) subgrade compaction
  - (iv) geotextile installation
  - (v) subbase installation
  - (vi) base course installation
  - (vii) electrical installation
- (d) restoration and clean-up

#### **D3. DEFINITIONS**

D3.1 When used in this Bid Opportunity:

- (a) "SEWPCC" means South End Water Pollution Control Centre

**D4. CONTRACT ADMINISTRATOR**

D4.1 The Contract Administrator is Stantec Consulting, represented by:

Hartley Katz, C.E.T., P. Eng.  
Senior Project Manager  
905 Waverley Street  
Winnipeg, MB R3T 5P4

Telephone No. (204) 489-5900  
Facsimile No. (204) 453-90125

D4.2 At the pre-construction meeting, Mr. Katz 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 C23.2.2, 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 following address or facsimile number:

The City of Winnipeg  
Chief Administrative Officer Secretariat  
Attn: Chief Administrative Officer  
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  
Attn: City Solicitor  
185 King Street, 3rd Floor  
Winnipeg MB R3B 1J1  
Facsimile No.: (204) 947-9155

## **D7. FURNISHING OF DOCUMENTS**

- D7.1 Upon award of the Contract, the Contractor will be provided with five (5) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him at cost.

## **SUBMISSIONS**

### **D8. AUTHORITY TO CARRY ON BUSINESS**

- D8.1 The Contractor shall 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, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

### **D9. SAFE WORK PLAN**

- D9.1 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 C4.1 for the return of the executed Contract.
- D9.2 The Safe Work Plan should 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 Branch internet site at <http://www.winnipeg.ca/matmgt>.

### **D10. INSURANCE**

- D10.1 The Contractor shall provide and maintain the following insurance coverage:
- (a) commercial general liability insurance, in the amount of at least two million dollars (\$2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, broad form property damage cover and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;
  - (b) automobile liability insurance for owned automobiles used for or in connection with the Work in the amount of at least two million dollars (\$2,000,000.00) at all times during the performance of the Work and until the date of Total Performance;
  - (c) an all risks Installation Floater carrying adequate limits to cover all machinery, equipment, supplies and/or materials intended to enter into and form part of any installation.
- D10.2 Deductibles shall be borne by the Contractor.
- D10.3 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract.
- D10.4 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.

## **D11. PERFORMANCE SECURITY**

- D11.1 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.
- D11.1.1 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.
- D11.2 If the bid security provided in his Bid was not a certified cheque or draft pursuant to B11.1(c), 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 letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

## **D12. SUBCONTRACTOR LIST**

- D12.1 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 the date specified in the General Conditions for the return of the executed Contract.

## **D13. SECURITY CLEARANCE**

- D13.1 Each individual proposed to perform the following portions of the Work:
- (a) any Work required within any building of the South End Water Pollution Control Centre; shall be required to obtain a Criminal Record Search Certificate from the police service having jurisdiction at his place of residence.
- D13.2 The Criminal Record Search shall include a Vulnerable Sector Search. This can be obtained by completing and providing the following in person to the Winnipeg Police Service Division 30 Clerk at Main Floor, 151 Princess Street:
- (a) Form P-612 Check the following boxes: Employment – Sensitive Position of Trust; and Other by inputting the Bid Opportunity Number in the space provided. This form can be found on the website at:  
[www.winnipeg.ca/police/BPR/forms/Criminal\\_Record\\_Check\\_P612.doc](http://www.winnipeg.ca/police/BPR/forms/Criminal_Record_Check_P612.doc)
  - (b) Form P-249 (Form 1 – Consent) can be found on the website at:  
[http://www.winnipeg.ca/police/BPR/forms/P-249\\_ConsentCrimRecordCheck.pdf](http://www.winnipeg.ca/police/BPR/forms/P-249_ConsentCrimRecordCheck.pdf)
  - (c) Two (2) pieces of identification as stated in Bureau of Police Records on the website at:  
[www.winnipeg.ca/police/BPR/id.stm](http://www.winnipeg.ca/police/BPR/id.stm)
  - (d) Fee for each individual applying for a Criminal Record Search. Fee schedule can be found on the website at:  
[www.winnipeg.ca/police/BPR/fees.stm](http://www.winnipeg.ca/police/BPR/fees.stm)



- D13.2.1 The original Criminal Record Search Certificate (Form P-253) will be provided by the Winnipeg Police Service to the individual applicant. The original has a validation sticker from the Winnipeg Police Service in the top right hand corner. The applicant shall:
- (a) Provide the original Criminal Record Search Certificate (Form P-253) to the Contract Administrator.
- D13.3 Prior to the commencement of any Work specified in D13.1, 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 such Work.
- D13.4 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 specified in D13.1.
- D13.5 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.
- D13.6 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 any Work specified in D13.1.

## **SCHEDULE OF WORK**

### **D14. COMMENCEMENT**

- D14.1 The Contractor shall not commence any Work until he is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.
- D14.2 The Contractor shall not commence any Work on the Site until:
- (a) the Contract Administrator has confirmed receipt and approval of:
    - (i) evidence of authority to carry on business specified in D8;
    - (ii) evidence of the workers compensation coverage specified in C6.15;
    - (iii) the Safe Work Plan specified in D9;
    - (iv) evidence of the insurance specified in D10;
    - (v) the performance security specified in D11;
    - (vi) the Subcontractor list specified in D12; and
    - (vii) the security clearances specified in D13.
  - (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.
- D14.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.
- D14.3 The City intends to award this Contract by July 17, 2008
- D14.3.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

**D15. SUBSTANTIAL PERFORMANCE**

- D15.1 The Contractor shall achieve Substantial Performance within thirty (30) consecutive Working Days of the commencement of the Work as specified in D14.
- D15.2 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.
- D15.3 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.

**D16. TOTAL PERFORMANCE**

- D16.1 The Contractor shall achieve Total Performance within thirty five (35) consecutive Working Days of the commencement of the Work as specified in D14.
- D16.2 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.
- D16.3 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.

**D17. LIQUIDATED DAMAGES**

- D17.1 If the Contractor fails to achieve Substantial and/or Total Performance in accordance with the Contract by the day fixed herein for Substantial and/or Total Performance, the Contractor shall pay the City one thousand dollars (\$1000.00) per Working Day for each and every Working Day following the day fixed herein for Substantial and/or Total Performance during which such failure continues.
- D17.2 The amount specified for liquidated damages in D17.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Substantial and/or Total Performance by the day fixed herein for same.
- D17.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

**D18. SCHEDULED MAINTENANCE**

- D18.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:
- (a) Seeding Maintenance Period as specified in CW 3520;
- D18.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

## **CONTROL OF WORK**

### **D19. JOB MEETINGS**

- D19.1 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.
- D19.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

### **D20. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)**

- D20.1 Further to C6.24, the Contractor 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).

## **MEASUREMENT AND PAYMENT**

### **D21. PAYMENT**

- D21.1 Further to C12, effective January 1, 2007 the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

**FORM H1: PERFORMANCE BOND**  
(See D11)

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. 489-2008

**SOUTH END WATER POLLUTION CONTROL CENTRE  
SNOW DUMP, FLOOD PROTECTION BERM AND ASSOCIATED WORKS  
CONTRACT NO. 1**

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 D11)**

\_\_\_\_\_  
(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. 489-2008

**SOUTH END WATER POLLUTION CONTROL CENTRE  
SNOW DUMP, FLOOD PROTECTION BERM AND ASSOCIATED WORKS  
CONTRACT NO. 1**

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)





## PART E - SPECIFICATIONS

### GENERAL

#### E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.2.1 *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>.
- E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.2.3 Further to C2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.
- E1.3 The following are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
1-0102A-D-D0001-001-00	Cover Sheet and Drawing List
1-0102A-D-C0001-001-00	Snow Dump – Site Plan and Sections
1-0102A-D-C0001-002-00	Snow Dump Access Road
1-0102A-D-C0001-003-00	Flood Protection Berm – Site Plan and Sections
1-0102A-D-E0001-001-00	Snow Dump – Electrical Site Plan and Details
1-0102A-D-E0001-002-00	Snow Dump – Electrical Details

#### E2. SOILS INVESTIGATION REPORT

- E2.1 Further to C3.1, a geotechnical report titled “Geotechnical Report South End Water Pollution Control Centre Proposed Expansion” and dated February 2008 was prepared by Dyregrov Consultants and is appended to this document in Appendix A.

### GENERAL REQUIREMENTS

#### E3. OFFICE FACILITIES

- E3.1 The Contractor will not be required to supply a field office for this Bid Opportunity.

#### E4. ELECTRICAL SCOPE OF WORK

- E4.1 Description
- A brief but not necessarily all inclusive list of electrical work to be performed under this contract is given herein.
  - The Contractor shall supply all labour, material, equipment, transportation, services and facilities necessary to make, test and place into operation a complete electrical installation as shown on the drawings and/or as specified herein.
  - Where the term "provide" is used herein, it shall mean "supply, install, adjust, test and place into operation".
  - All systems shall be completely assembled, adjusted, tested and demonstrated to be ready for operation to the satisfaction of the Contract Administrator.
  - The Contractor shall satisfy himself as to working space, storage space, access facilities and all other conditions pertaining to the Site, relating to the conduct of his operations, by the inspection of the Site and examination of the drawings.

#### E4.2 Extent of Work

- (a) This work shall consist of furnishing of all labour, material, equipment and all incidentals required for the new South End Snow Dump and all associated works.
- (b) Work shall include, but not be limited to:
  - (i) Provision of new electrical system as required.
  - (ii) Wire to and make connections to, all electrical equipment required, including panels, lights, receptacles, etc.

#### E4.3 General

- (a) All work to be carried out by qualified journeymen of the related trades.

#### E4.4 Installation

- (a) Install to make a complete and working system.

#### E4.5 Electrical Measurement and Payment

- (a) All electrical work described will be measured on a unit basis and paid for at the lump sum contract price for "Electrical Works"

### **E5. GENERAL ELECTRICAL PROVISIONS**

#### E5.1 Scope

- (a) Refer to E4 - Electrical Scope of Work for general description of electrical work to be carried out under this Contract.

#### E5.2 Examination of Drawings

- (a) The electrical drawings do not show all architectural, mechanical and civil details. All electrical schematics are shown diagrammatically unless otherwise noted. The Contractor shall review the mechanical and structural drawings to obtain building dimensions and details. Verify dimensions accurately by measurements.
- (b) To change the location of electrical equipment, submit a request in writing to the Contract Administrator for approval. If approved, such changes are to be made at no additional cost to the City.
- (c) No extra will be allowed for any additional labour or materials required for relocation of equipment due to interference with equipment of other trades, beams, joists, walls, etc.

#### E5.3 Approved Design and Installation

- (a) Equipment and material to be of approved design and manufactured in accordance with all governing regulations such as "Canadian Standards Association", "Canadian Electrical Code", "Provincial Department of Labour", "Underwriters Laboratory", etc. Equipment and material must bear applicable acceptance labels of all associations and governing bodies recognized by the municipal, provincial and federal authorities.
- (b) Install equipment in strict accordance with manufacturer's recommendations and governing rules, regulations and codes.
- (c) Where requirement conflict occurs, install all materials in accordance with the most severe requirements.
- (d) Material installed under this Division to be new and of uniform construction.
- (e) All installation to ensure maximum headroom, minimum interference with free use of surrounding areas, and best access to equipment.

- (f) To deviate major service runs from the location shown on the drawings, submit to the Contract Administrator suitable drawings showing such deviations together with reasons for deviations and obtain approval from the Contract Administrator before proceeding with the installation.

#### E5.4 Codes and Standards

- (a) Install all equipment in accordance with current editions of CSA 22.1 and 22.2, including all local amendments unless otherwise specified.
- (b) Perform all work in accordance with drawings, specifications, applicable municipal and provincial regulations, and any pertinent inspection bulletins issued by the electrical inspection authority having jurisdiction over the installation. In no instance shall the standard established by the drawings and specifications be reduced.
- (c) Provide a copy of all standards referred to in this Section for use on Site.

#### E5.5 Permits, Inspections and Fees

- (a) Deliver to the Contract Administrator all necessary interim and final certificates of inspection and approval which may be required by all inspection authorities having jurisdiction over the Work, as evidence that the Work installed conforms with the laws and regulations of all governing authorities.
- (b) Submit copies of all plans and specifications to the authority having jurisdiction for inspections as may be required prior to commencement of work to comply with the above.
- (c) Notify the inspection authorities in sufficient time for them to arrange to inspect the Work.
- (d) Pay all associated fees.

#### E5.6 Abbreviations

- (a) Abbreviations for electrical terms shall be to CSA Z85-1983.
- (b) Names used throughout these specifications are:

EEMAC	Electrical & Electronic Manufacturers Association of Canada (formerly CEMA)
CSA	Canadian Standards Association
FM	Factory Mutual
NEMA	National Electrical Manufacturers Association (U.S.)
JIC	Joint Industry Conference
IPCEA	Insulated Power Cable Contract Administrators Association
ISA	Instrument Society of America
CEC	Canadian Electrical Code
IEEE	Institute of Electrical and Electronic Contract Administrators
IES	Illuminating Contract Administrators Society
NBC	National Building Code
ANSI	American National Standards Institute

#### E5.7 Record Drawings

- (a) Submit record drawings in accordance with General Requirements.
- (b) The Contractor shall record all changes made during construction and provide record drawings to the City upon completion of the Work.
- (c) At the completion of the project, the Contractor shall submit one (1) set of record drawings on disk, accurately recording all changes, deviations and relocations necessitated by job conditions and equipment approved shop drawings all done on CADD using AutoCad Release 2000 or later to the satisfaction of the Contract Administrator.

- (d) Include with the record drawings a list for each motor indicating motor or equipment number and name, nameplate voltage, horsepower and current, the size of overload and breaker or fuse protection provided.

#### E5.8 Definitions

- (a) The following are definitions of terms and expressions used in the specification:
  - (i) "Inspection Authority" means agent of any authority having jurisdiction over construction and safety standards associated with any part of electrical work on Site.
  - (ii) "Supply Authority" means electrical power company or commission responsible for delivery of electrical power to project.
  - (iii) "Electrical Code" means Canadian Electrical Code C22.1 or code in force at project location.
  - (iv) "Indicated" means as shown on contract drawings or noted in contract documents.
- (b) Refer to CSA C22.2 No.0 for "Definitions and General Requirements".

#### E5.9 Cooperation and Coordination

- (a) Schedule expediting of all materials and execution of the Work.
- (b) Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete shall be schedule 40 galvanized steel pipe, sized for free passage of conduit, and protruding 50 mm (2").
- (c) Cables, conduits and fittings to be embedded or plastered over neatly and close to building structure so furring can be kept to a minimum.
- (d) Arrange for holes through exterior walls and roof to be flashed and made weatherproof.

#### E5.10 Source Quality Control

- (a) Arrange for a plant inspection by Contract Administrator where specified.
- (b) Inform Contract Administrator of manufacturing progress and arrange inspections at appropriate times.
- (c) Action required by factory inspection shall not be construed as final acceptance.
- (d) Obtain a Certificate of Acceptance from the inspection authority on completion of the Work and provide it to the Contract Administrator.
- (e) The Contract Administrator may carry out inspections and prepare deficiency lists for action by the Contractor, during and on completion of project.

#### E5.11 Guarantee

- (a) Guarantee all work of the specification against all defects and labour and materials.

#### E5.12 Care, Operation and Start-Up

- (a) Instruct the City's operating personnel in the operation, care and maintenance of equipment.
- (b) Arrange and pay for services of manufacturer's factory service representative to supervise start-up of installation, check, test, adjust, balance and calibrate components.
- (c) Provide these services for such period, and for as many visits as necessary, to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

#### E5.13 General

- (a) All materials shall be fully approved by the Canadian Standards Association (CSA) for use as installed and meet the requirements of this specification in all respects.
- (b) Where there is no alternative to supplying equipment which does not have CSA approval, submit such equipment to Provincial Hydro inspection authorities for special inspection and obtain approval. Pay all associated fees.
- (c) Materials and equipment shall be of Canadian manufacture except where specified otherwise or where Canadian made materials or equipment do not exist.
- (d) Where two or more units of the same class or type of equipment are required, the units shall be the product of a single manufacturer, although components of equipment need not be products of the same manufacturer.
- (e) Use material and equipment available from regular production of manufacturer.
- (f) Control panels and component assemblies to be shop manufactured.

#### E5.14 Finish

- (a) Finish metal enclosure surfaces by removing rust and scale, cleaning, and applying rust resistant primer inside and outside with at least two coats of finish enamel.
- (b) Paint all outdoor electrical equipment "equipment green" finish to EEMAC-Y1.
- (c) Paint all indoor switchgear and distribution enclosure "light grey" to ASA 61 grey.
- (d) Clean, prime and paint exposed hangers, racks, fastenings, etc., to prevent rusting.

#### E5.15 Voltage Ratings

- (a) Operating voltages to be within those defined in CSA Standard C235-1969.
- (b) All motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment must be able to operate in extreme operating conditions established in above standard without damage to equipment.

#### E5.16 Wiring Terminations

- (a) Lugs, terminals, screws used for termination of wiring must be suitable for copper conductors.

#### E5.17 Enclosures

- (a) Minimum enclosure type to be used is EEMAC 3R unless otherwise specified.

#### E5.18 Manufacturers and CSA Labels

- (a) Manufacturers' nameplates and CSA labels are to be visible and legible after equipment is installed.

#### E5.19 Warning Signs

- (a) Provide warning signs with suitable background color and lettering as required to meet requirements of inspection authorities and Contract Administrator. Use decal signs, minimum size 178 mm x 250 mm.

#### E5.20 Plywood Mounting Boards

- (a) Surface wall mounted panelboards and other electrical equipment shall be installed on plywood mounting boards. Boards shall be provided under this section of the specifications, sized to suit equipment indicated and/or implied.
- (b) Plywood mounting boards shall consist of 20 mm fir plywood fastened securely to wall.
- (c) Plywood mounting boards, strapping and trim shall be treated with wood preservative prior to installation and painted with one coat of primer and two coats of grey enamel

ASA61. Painting shall be completed before any electrical equipment is mounted on the plywood.

- (d) Service entrance equipment shall be spaced from the plywood mounting boards to the satisfaction of the inspection authorities.

#### E5.21 Workmanship

- (a) Where sheet metal enclosures are not provided with knockouts, Greenlee punches shall be used in all cases. Cutting torches shall not be used for making holes.

#### E5.22 Installation

- (a) Determine manufacturers' recommendations regarding storage and installation of equipment and adhere to these recommendations.
- (b) Check all factory joints and tighten where necessary to ensure continuity.

#### E5.23 Mounting Heights

- (a) Mounting height of equipment is given from finished floor to top of equipment.
- (b) Exact mounting height of unnoted equipment must be verified with Contract Administrator before proceeding with installation.
- (c) Install electrical equipment at heights listed below unless otherwise indicated. (All heights in millimetres from finished floor unless indicated):
  - (i) Local Switches: 1420
  - (ii) Wall Receptacles: 450
  - (iii) Lighting Panels: 1800
  - (iv) Cabinets: 1800
  - (v) Emergency Lights: 2400 (minimum)
- (d) All dimensions indicated are to the top above finished floor elevations.

#### E5.24 Special Protection

- (a) Accept the responsibility to protect those working on the project from any physical danger due to exposed electrically energized equipment such as panel mains, outlet wiring, etc. Shield and mark all live parts "LIVE - 600 VOLTS" or with the appropriate voltage.
- (b) Arrange for the installation of temporary doors, barriers, etc., for all electrical equipment. Keep these doors locked at all times except when under direct supervision.

#### E5.25 Fireproofing

- (a) Where sleeves or openings are installed in walls, floors, roof or partitions to accommodate raceways, cables or bus duct, provide all necessary seals, fittings, barriers and fire-resistant materials to restore the installation to its original fire rating to the satisfaction of the Contract Administrator and the City's insurance underwriters.

#### E5.26 Equipment Identification

- (a) Supply and install identification nameplates on all equipment such as motor starters, safety switches, panelboards, pushbutton stations, etc. and any equipment not so supplied. All nameplates shall be securely fastened to equipment with galvanized steel screws.
- (b) All identification nameplates, except for motors, shall be laminated phenolic with minimum 6 mm (1/4 inch) black letters on white background, the wording of which shall be identical to that on the single line diagrams and the title of the equipment controlled. Motor nameplates to be of non-corroding metal stamped or engraved with black lettering on light background.

- (c) Warning nameplates shall be laminated phenolic with minimum 6 mm (1/4 inch) white letters on red background, the wording to be reviewed by the Contract Administrator. All warning nameplates to be screwed to equipment.
- (d) Warning nameplates required by inspection authorities shall be provided for all electrical switchgear and equipment and on access doors to electrical rooms, vaults, switchyards, etc. in accordance with the applicable Code regulations. Obtain all necessary details from the inspection authorities.
- (e) Where wording not specified on the drawings, obtain exact wording from the Contract Administrator.
- (f) Identify pull boxes, terminal cabinets and junction boxes enclosing cables or connections with nameplates indicating voltage, box number and circuit number.
- (g) Provide junction boxes, relay panels and miscellaneous equipment energized from two or more sources with a warning nameplate prominently displayed, noting number and location of sources and their voltage.
- (h) Provide a typewritten circuit directory with a clear plastic cover for each panelboard in a suitable holder on the inside of each panel door. Unless otherwise noted, the directory shall indicate breaker or switch circuit number, rating, load description and associated load data.
- (i) Manufacturer's nameplates and CSA labels to be visible and legible after equipment is installed.
- (j) Welding receptacle shall be 60A, 600V, 3 pole, 3 wire with threaded cap. Acceptable manufacturer is Crouse-Hinds No. AR337.

#### E5.27 Wiring Identification

- (a) Provide permanent indelible identifying markings, either numbered or colored plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring. Maintain phase sequence and identification throughout system, i.e. panelboards, starters, terminal blocks, disconnect switches.
- (b) Maintain identification system at all junction boxes, splitters, cabinets and outlet boxes.
- (c) Use color coded wires in communication cables, matched throughout system. All color coding must adhere to CSA C22.1.

#### E5.28 Touch-Up Painting

- (a) Be responsible for field touch-up painting of all shop painted electrical equipment installed in this Contract.
- (b) All surfaces to be painted shall be dry, clean, free from dust, dirt, grease, frost, rust, loose crystals or extraneous matter, tool and machine marks. Feather out edges of scratch marks to make patch inconspicuous.
- (c) Apply one or more coats of paint until the damaged surface has been restored to original finish condition. Do not apply succeeding coats until preceding coat is dry and hard. Sand lightly between coats with No. 00 sandpaper.
- (d) Be responsible for obtaining the necessary touch-up paint of the original type and quality from the equipment manufacturer.
- (e) Supervise priming and finish painting of all electrical equipment and material not shop painted.

#### E5.29 Sleeves and Openings

- (a) Provide sleeves and openings for exposed conduits, busways, and wireways, where they pass through walls or floors conforming to relevant fire codes where applicable.

- (b) Sleeves for individual conduits shall be galvanized or stainless steel.
- (c) Pack or fill sleeves and openings after the completed work is in place. Filling shall provide a waterproof seal to prevent leakage of water or other liquids through the sleeve or opening.
- (d) Sleeves and openings shall not displace reinforcing steel, and shall receive approval of the Contract Administrator prior to placement.

#### E5.30 Cutting and Patching

- (a) Do all drilling, cutting, fitting and patching necessary for the running and securing of conduits, wireways, and other electrical equipment.
- (b) Provide supports necessary for same.
- (c) Provide bracing and anchorage of work subject to Contract Administrator's approval.
- (d) No cutting of the structural members or of the fireproofing shall be done without the written consent of the Contract Administrator.
- (e) Caulk and flash all conduits passing through walls, roofs or other surfaces exposed to weather or as indicated on the drawings to prevent the passage of water and/or sewer gases.

#### E5.31 Hangers and Supports

- (a) Provide hangers, angles, channels, and other supports necessitated by field conditions to install all items of electrical equipment. Design of supports and methods of fastening to building structures shall be subject to the Contract Administrator's approval.
- (b) All local motor control devices are to be grouped and mounted on a free-standing frame of galvanized steel construction easily accessible and as close to the motor as possible.
- (c) Provide weight-distribution facilities, where required, so as not to exceed the load-bearing capacities of floors or walls that bear the weight of, or support, electrical items.
- (d) Paint all exposed parts of hangers and supports with an anti rust inhibiting primer.
- (e) Equipment shall not be held in place by its own weight. Provide base anchor fasteners in each case.

#### E5.32 Protection of Equipment

- (a) Protect conduit and wireway openings against the entrance of foreign matter by means of plugs or caps.
- (b) Fixtures, materials, equipment, or devices damaged prior to final acceptance of the Work shall be restored to their original condition or replaced by the Contractor.

#### E5.33 Testing of Electrical Systems

##### E5.33.1 General

- (a) Prior to the Contract Administrator's acceptance, all electrical equipment, materials and systems installed shall be subject to an inspection and applicable performance tests supervised by the Contract Administrator to ensure that the operation of the system and components satisfy the requirements of the Specifications.
- (b) Ensure that the system and its components are ready prior to the inspection and test for acceptance.
- (c) All testing shall be conducted by fully qualified personnel only. Tests requiring initial power energization of a system shall not be made without notification of the Contract Administrator. Tests, checks and the like carried out by or on behalf of the Contractor shall be documented and certified at no additional cost to the City. Submit six copies of the test certificates to the Contract Administrator. Carefully check wiring for each



system and/or part of a system to ensure that the system will function properly as indicated by wiring and schematic diagrams, description of operation, etc.

- (d) Carefully check wiring for each system and/or part of a system to ensure that the system will function properly as indicated by wiring and schematic diagrams, description of operation, etc.
- (e) Manually operate alarms and control devices to check whether their operation during normal and abnormal operating conditions causes the proper effect.
- (f) Supply the necessary labour and for all electrical systems equipment for operational tests required and make final adjustments to the electrical controls at no additional cost to the City.
- (g) Perform tests on auxiliary or specialized systems with the assistance of the manufacturer's representative. Upon successful conclusion of the tests, obtain a certificate from the manufacturer stating that the system has been installed to their satisfaction and that it is in good working order.
- (h) Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to values and settings as indicated.
- (i) Supply all instruments, meters and personnel required for the tests.

#### E5.34 Cable and Wire 1000 Volt and Below

- (a) Tests on cables in this voltage range shall be limited to insulation resistance measurements using a 500V megger for systems up to 350V and a 1000V megger for 351-600V systems.
- (b) Record all test results in a log book and submit to the Contract Administrator for reference. Replace or repair all circuits which do not meet minimum requirements specified in the CEC, Table 24. Insulation resistance of the following circuits shall be measured:
  - (i) Power, lighting and motor feeders (with equipment disconnected): phase-to-phase, phase-to-neutral and phase-to-ground.
  - (ii) Control circuits: measure to ground only.
  - (iii) Do not perform megger tests on control circuits containing transistorized or solid-state components.
  - (iv) Where power factor correction equipment is installed, it may be necessary to disconnect the capacitors from the system prior to testing to avoid overvoltage.

#### E5.35 Ground System

- (a) Test the grounding system efficacy for compliance with CSA Standard C22.1 and Supply Authority requirements. Verify that the ohmic resistance values specified therein are not exceeded.
- (b) Notify inspection and supply authorities that they may be present to witness Contractor testing and provide any assistance required by these authorities for their own testing procedures.

#### E5.36 Training

- (a) Provide for the training of the City's representatives in the operation, maintenance and testing of all systems and equipment including the provision of qualified manufacturer's technical representatives for specialized systems.
- (b) Provide these services for such period, and for as many visits as necessary to put installation in working order, and to ensure that operating personnel are conversant with all aspects of its care and operation.

## **E6. CONDUIT, CONDUIT FASTENINGS AND CONDUIT FITTINGS**

### **E6.1 Scope**

- (a) Furnish all labour, materials, supervision, equipment and services specified, indicated or requested to install a complete conduit raceway system. The raceway systems shall be comprised of the supply and installation of all conduits, fittings, supports, hangers and miscellaneous support materials and hardware required.

### **E6.2 Quality Assurance**

- (a) Rigid PVC (Unplasticized) conduit to CSA C22.2 No. 211.2-M1984. Liquid-tight flexible metal conduit to CSA C22.2 No. 56-1977.

### **E6.3 Location of Conduit**

- (a) The drawings do not show every specific conduit run. All wiring shall be surface or run in the slab unless otherwise indicated in the specifications and/or shown on the drawings. All devices shall be surface mounted type except as shown.

### **E6.4 Conduits**

- (a) Conduit shall be Rigid PVC Minimum size to be 12 mm.
- (b) Liquid-tight flexible metal conduit for motor and equipment connections.
- (c) EMT conduit shall not be utilized anywhere in the installation.

### **E6.5 Conduit Fastenings**

- (a) Two hole PVC straps to secure surface conduits.
- (b) Beam clamps to secure conduits to exposed steel work.

### **E6.6 Conduit Fittings**

- (a) Couplings, terminal adapters, female adapters shall be of the IPEX type of equal. PVC fittings shall be installed in all areas.

### **E6.7 Expansion Fittings for PVC Conduit**

- (a) All conduits entering outlet boxes and devices that are located in walls subject to movement shall be terminated by means of liquid-tight flexible conduit, approximately 450 mm in length between the PVC conduit and the outlet box or device which is being supplied. All conduits, bus duct, wireways, etc., passing through or across expansion joints of the building shall be installed with the use of approved expansion fittings.

### **E6.8 Fish Cord**

- (a) Polypropylene

### **E6.9 General Installation Requirements**

- (a) Install surface mounted conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- (b) Cut conduit ends square and ream to remove burrs and sharp edges. Ensure that conduits butt in couplings and other fittings.
- (c) Bends and offsets shall have a minimum radius of curvature not less than the minimum bending radius of the cable to be installed.
- (d) Temporarily plug all conduits terminating in cabinets and boxes where moisture and foreign matter may enter.
- (e) Blow all conduits through with clean compressed air to clear all foreign matter and moisture prior to the installation of wires or cables.
- (f) Install fish cord in all conduits.

- (g) Group exposed conduits together wherever possible and run parallel to building lines, supported from structural members and protected by the flanges of the structural member where practical.
- (h) Support horizontal and vertical runs of individual exposed conduits by one-hole or two-hole conduit straps and suitable fasteners or beam clamps for mounting to building structure or bracket. Make no holes in building structural members for supporting conduits without the permission of the Contract Administrator.
- (i) Securely fasten exposed conduits in place at regular intervals with hangers, supports or straps. Provide additional supports at each elbow and terminations at a box or cabinet.
- (j) Perforated metal straps used to support conduits are unacceptable.
- (k) Install conduits at least 150 mm (6") clear of all steam pipes and flues, and 1 m (39") clear of heaters. Do not bend over sharp objects or improperly form.
- (l) The maximum length of straight conduit run shall be 30 M (100 feet) between pull boxes or other terminations. This length shall be reduced by 10 M (32 feet) for each 90 degree bend or 5 M (12.5 feet) for each 45 degree bend or offset. Conduit runs shall not include more than the equivalent of two 90 degree bends between pull boxes except where indicated otherwise on the drawings.
- (m) Where conduits pass through roof, seal with flashing and make weatherproof. For conduits passing through exterior walls, above or below grade, seal with waterproof sealing compound.

## **E7. WIRE AND CABLE**

### **E7.1 Scope**

- (a) Furnish all labour, materials, supervision, equipment and services specified herein, indicated or requested to install the complete wiring system including but not limited to:
  - (i) Low voltage wire and cable (1000 V and below)
  - (ii) Control wiring
- (b) The wiring system shall include all wiring, terminations, wire markers, cable tags, cable ties, splice fittings, insulating tapes, connectors and miscellaneous materials necessary to complete the wiring system.

### **E7.2 Low Voltage Wire 1000 Volt and Below**

- (a) All wire shall have stranded, annealed copper or compact stranded 8000 Series aluminium alloy conductors, 600 volt rating, cross-linked polyethylene (XLPE) insulation, minus 40°C, 90°C maximum conductor temperature, limited flame spread.
- (b) The wiring shall be suitable for installation in wet environment and rated RW-90.
- (c) For direct buried installations or for installation in direct buried polyethylene pipe, the cable shall be cross-linked polyethylene, rated RWU-90.
- (d) Minimum conductor size shall be #12 AWG unless otherwise specified. #14 AWG may be used for control wiring, #6 for aluminium.
- (e) Use GTF fixture wire, 600 volt, 125 C, flexible copper conductor for all connections between lighting fixtures and outlet boxes.

- (f) Color coding of insulated conductors shall conform to the following:

Single Phase Systems

Phase A	Red
Phase B	Black
Neutral	White
Ground	Green

Three Phase Four Wire Systems

Phase A	Red
Phase B	Black
Phase C	Blue
Neutral	White
Ground	Green

- (g) Insulated ground conductors forming part of a multi-conductor cable assembly shall have green color coding.
- (h) Cable and wire shall be as manufactured by Alcatel Canada Wire Inc., Phillips Cables Ltd., Pirelli Cables Inc., Alcan Cable Inc.

E7.3 Teck Cable/ACWU90

- (a) Conductors:
- (i) Grounding Conductor: copper or 8000 series Aluminium
  - (ii) Circuit conductors: copper or 8000 series Aluminium, size as indicated
- (b) Insulation:
- (i) Chemically cross-linked thermosetting polyethylene rated RW90, 600 volt.
- (c) Inner Jacket: polyvinyl chloride material (Teck cable)
- (d) Armor: interlocking aluminium
- (e) Overall covering PVC material, color black, flame retardant, FT4 rated, AG14.
- (f) Fastenings:
- (i) One hole aluminum straps to secure surface cables 50 mm and smaller. Two hole straps for cables larger than 50 mm. All straps to have inert spacers between spacer and concrete.
  - (ii) Channel type supports for two or more cables.
  - (iii) 3/8" diameter threaded rods to support suspended channels.
- (g) Connectors:
- (i) Watertight approved for Teck or ACWU90 cables.
- (h) Lugs:
- (i) Dual rated AL7CU or AL9CU listed by CSA for use with Aluminum or Copper conductors and sized to accept aluminium conductors of the ampacity specified.

E7.4 Wiring Accessories

- (a) Wire markers, black letters on white background, shall be heat shrink type as manufactured by Critchley.
- (b) Cable markers for cables or conductors greater than 13 mm (1/2 inch) diameter, shall be strap-on type, rigid PVC, black letters on white background, with PVC covered aluminum straps, as manufactured by Electrovert Cat. No. 510.
- (c) Terminal blocks shall be minimum 600 volt rated, modular, sized to accommodate conductor size used, as manufactured by Weidmuller, Phoenix, Allen-Bradley.

- (d) Where screw-type terminals are provided on equipment, field wiring shall be terminated with insulated fork tongue terminals, as manufactured by Thomas & Betts, Sta-Kon.
- (e) Splice connectors for wire sizes #14-10 AWG inclusive, shall be of the compression spring type, as manufactured by Ideal Waterproof Type DP.
- (f) Splice connectors for wire sizes #8 AWG and larger shall be split-bolt type, sized to suit number and size of conductors, as manufactured by Burndy Servit Type KS.
- (g) Cable ties shall be nylon, one-piece, self-locking type, as manufactured by Thomas & Betts, Burndy, Electrovert.
- (h) Electrical insulating tape as manufactured by 3M Scotch 88.
- (i) Cable grips shall be provided for all vertical and catenary cable suspension installations to reduce cable tension at connectors or at cable bends. The cable grips shall be selected to accommodate the type and geometry of cable supported and shall be of the single wave, variable mesh design, as manufactured by Kellems, Arrow-Hart.
- (j) Cable pulling lubricant shall be compatible with cable covering and shall not cause damage and corrosion to conduits or ducts.

#### E7.5 Installation

- (a) Install all wire according to the drawings with a minimum size of #12 AWG unless indicated otherwise.
- (b) Pull wire into ducts and conduits in accordance with the manufacturer's recommendations, using patented wire grips suitable for the type of wire or using pulling eyes to be installed directly onto the conductors.
- (c) Limit pulling tensions to those recommended by the manufacturer to avoid overstressing wire.
- (d) Utilize adequate lubricant when pulling wires through ducts and conduits to minimize wear on cable jackets.
- (e) Make connections to equipment "pig-tails" with mechanical, insulated, screw-on connectors for wire sizes #14-10 AWG. For wire sizes #8 AWG and larger utilize split-bolt connectors, taped with three layers minimum of insulating tape. For both copper and aluminium terminations, wire through the conductor, apply joint compound anti-oxidant, and torque to lug manufacturer's recommended torque levels.
- (f) No splices shall be permitted in cable or wiring runs without the written permission of the Contract Administrator, and shall only be permitted in junction boxes.
- (g) Neutral conductors shall be identified. Paint or other means of coloring the insulation shall not be used.
- (h) Unless otherwise specified, make all wiring taps, splices and terminations with identified compression screw type terminal blocks, securely fastened to avoid loosening under vibration or normal strain. Make connections for interior and exterior lighting circuits and 120 volt, 15 amp convenience receptacle circuits using screw-on or split-bolt connectors and insulating tape.
- (i) Determine the exact length of cable required to avoid splices.
- (j) Identify each conductor by specified markers at each termination indicating the circuit designation or wire number.
- (k) Identify each cable by attaching a suitable marker, stamped or indelibly marked with the cable number, at each end of the cable and in all junction boxes and pull boxes.

## **E8. WIRE AND BOX CONNECTORS**

### **E8.1 Scope**

- (a) This section covers the supply and installation of all wire and box connectors.

### **E8.2 Quality Assurance**

- (a) Solder lugs to CSA C22.2 No. 19-1935 (R1981).
- (b) Wire connectors to CSA C22.2 No. 65-M1988.
- (c) Connectors shall be copper or copper alloy.
- (d) Bushing stud connectors to EEMAC 1Y-2-1961 and shall be suited for conductor type.
- (e) Clamps or connectors for cable to CSA-C22.2 No. 18, 1972.

### **E8.3 Materials**

- (a) All lugs, terminals and screws used for termination of wiring must be suitable for copper conductors.
- (b) Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
- (c) Fixture type splicing connectors: with current carrying parts of copper sized to fit copper 10 AWG or less.
- (d) Clamps or connectors for flexible conduit, as required.
- (e) All cable terminations shall be with compression type connectors.

### **E8.4 Installation**

- (a) Remove insulation carefully from ends of conductors.
- (b) Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65-M1988.
- (c) Install fixture type connectors and tighten. Replace insulating cap.
- (d) Install crimp type connectors to the satisfaction of the Contract Administrator.
- (e) Install box connectors to CSA requirements.

## **E9. FASTENINGS AND SUPPORTS**

### **E9.1 Scope**

- (a) This section covers the supply and installation of all fastenings and supports for equipment mounted under the electrical contract.

### **E9.2 Materials**

- (a) Expansive screw anchors, shields, or other fastening items containing lead or other material that might loosen or melt under fire conditions shall not be used. All fastenings used in the sewage lift station shall be corrosion resistant stainless steel.
- (b) Power-actuated fasteners and devices shall not be used.
- (c) Support channels, length as required, U shaped, size as required, of stainless steel.
- (d) Support equipment, conduit or cable clips, spring loaded bolts, cable clamps etc., to be purpose-built accessories to basic channel members.
- (e) Two-hole PVC straps to secure surface conduits 50 mm and smaller.
- (f) Beam clamps to secure conduit to exposed steel work.

- (g) Support individual cable or conduit runs with 6.0 mm diameter galvanized steel threaded rods and spring clips.
- (h) Support two or more cables or conduits on channels supported by 6.0 mm diameter stainless steel threaded rod hangers where direct fastening to building construction is impractical.

### E9.3 Installation

- (a) Install fastenings and supports as required for each type of equipment, cables and conduit to manufacturer's installation recommendations.
- (b) Provide metal brackets, frames, hangers, clamps and related support structures where indicated or as required to support conduit and cable runs.
- (c) Do not use wire lashing or perforated strap to support or secure raceways or cables.
- (d) Provide adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- (e) Do not use supports of other equipment installed for conduit or cable support except with permission and approval of the Contract Administrator.
- (f) Any aluminum support bracket or channel that is in direct contact with concrete is required to have inert spacers to reduce chemical reaction between support and concrete.

## E10. OUTLET PULL, SPLITTER AND JUNCTION BOXES

### E10.1 Scope

- (a) Furnish all labour, materials, equipment and services specified, indicated or requested to install the electrical boxes specified herein and on the drawings.

### E10.2 Outlet Boxes

- (a) Size boxes in accordance with CSA C22.1-1986.
- (b) 100 mm square or larger outlet boxes as required for special devices.
- (c) Gang boxes where wiring devices are grouped.
- (d) Blank cover plates for boxes without wiring devices.
- (e) Outlet boxes to be PVC.
- (f) All outlet boxes shall be supplied with ground stud.
- (g) Outlet boxes to be Series FS or FD as manufactured by Ipex.
- (h) Surface mounted outlet boxes shall be EEMAC 12 unless otherwise indicated.
- (i) All outlet boxes to CSA C22.2 No. 18-M1987.

### E10.3 Installation

- (a) Install boxes to clear all building and mechanical services equipment. Where two or more devices are shown at one location, utilize multi-gang boxes. Supply all outlet boxes with covers as required.
- (b) Size all boxes to accommodate the number of conduits, conductors and terminal blocks. Provide junction boxes with 20% spare terminal blocks.
- (c) Securely fasten surface-mounted boxes to the building or mounting structure and support independently of the conduits entering the box.
- (d) Install junction and pull boxes mounted on brick, concrete or block walls with 3 mm (1/8 inch) thick lead or nylon washers between box and wall face.

- (e) Provide pull boxes sized to CEC requirements, in all conduit raceway systems to limit length of straight conduit runs to 30 m (100 ft). Reduce this length by 7.5 m (25 ft) for each 90 degrees bend or 4 m (12 ft) for each 45 degree bend or offset.
- (f) Mark location and size of all pull boxes on the record drawings.

#### E10.4 Application

- (a) Location of outlets indicated may be changed by the Contract Administrator at no extra cost or credit, providing distance moved does not exceed 3000 mm, and notice is given before installation is completed.

#### E10.5 Mounting Heights

- (a) Refer to General Electrical Provision.
- (b) Exact mounting height of unnoted equipment must be verified with the Contract Administrator before proceeding with installation.

### **E11. WIRING DEVICES**

#### E11.1 Scope

- (a) This section covers the supply and installation of all receptacles, toggle switches, and cover plates.
- (b) All wiring devices shall be at the same manufacturer throughout the Contract.

#### E11.2 Receptacles

- (a) This specification applies to single and duplex receptacles and receptacles of other voltage and ampacity as indicated on the drawings.
- (b) Type EEMAC 5-15R, 125V, 15A, U-ground, heavy duty specification grade to CSA C22.2 No. 42-M1984.
- (c) Receptacle shall have heavy duty nylon face with steel reinforcing plate in centre.
- (d) Receptacle shall have spring loaded back wiring.
- (e) Receptacle shall have raised ground for safety.
- (f) Receptacle contacts shall have spring steel clips to reduce contact fatigue.
- (g) Receptacle shall be suitable for No. 10 AWG back and side wiring.
- (h) All screws shall be combination slotted socket head design to accept #6 socket head screwdriver on all screws.
- (i) Acceptable manufacturer is Bryant, Arrow Hart, Levton No. 5262 duplex receptacle.

#### E11.3 Weatherproof Cover Plates

- (a) Weatherproof covers for duplex receptacles shall be self closing, two spring loaded independent doors, PVC complete with non-corrosion stainless steel springs and stainless steel mounting screws.
- (b) Weatherproof covers for light switches shall be plunger style, PVC complete with non-corrosive stainless steel mounting screws.
- (c) Covers shall be complete with EPDM gasketry material suitable for -45°C to 85°C.
- (d) Acceptable manufacturers are IPEX, Leviton.

#### E11.4 Installation

- (a) Switches:
  - (i) Install single throw switches with handle in "UP" position when switch is closed.
  - (ii) Utilize gang type outlet box where more than one switch is required in one location.



- (b) Receptacles:
  - (i) Install all 15A receptacles with "U" ground slot up.
  - (ii) Install receptacles in gang type outlet box when more than one receptacle is required in one location.
  - (iii) Mount receptacles at height specified in Section 16010 or as indicated.
  - (iv) The location of all outlets as shown on the electrical plans is approximately correct at the time of planning, but as these drawings do not shall all structural details, measure any work requiring accurate dimensions either on the project or from the architectural details.
  - (v) The location of outlets shown on the drawings may be changed by the Contract Administrator at no extra cost to the City, providing the distance does not exceed 3000 mm and the information is given before installation.
- (c) Cover Plates:
  - (i) Install all cover plants prior to energization.
  - (ii) Cover plates shall be straight and true.
  - (iii) Flush-mounted cover plants shall be flush with the wall.
  - (iv) Do not use cover plants meant for flush-mounted outlet boxes on surface-mounted boxes.

## **E12. DISCONNECT SWITCHES**

### **E12.1 Scope**

- (a) This section covers the supply and installation of all motor and equipment disconnect switches.

### **E12.2 Submittals**

- (a) Submit shop drawings in accordance with the general provisions including the following information:
  - (i) Scale drawing of switch and enclosure
  - (ii) Switch voltage rating

### **E12.3 Unfused Disconnect Switches**

- (a) Provide unfused disconnect switches, voltage and amperage rated to suit loads.
- (b) Disconnect shall be front-operational, heavy duty, industrial grade, quick-make, quick-break type.
- (c) Make provision for padlocking in the "OFF" position.
- (d) Mechanically interlocked door to prevent opening when handle in "ON" position.
- (e) "ON/OFF" switch position indication on switch enclosure cover.
- (f) Disconnect enclosures shall be EEMAC 12 unless otherwise indicated.

### **E12.4 Manufacturers**

- (a) Disconnects for all equipment specified shall be as manufactured by Cooper Crouse-Hinds GHG series, Arrow Hart AH series, Cutler-Hammer HD series, Schneider Canada Square "D"CHU series.

### **E12.5 Installation**

- (a) Install disconnect switches as per manufacturer's recommendations.
- (b) Mount switches at 1400 mm above finished floor to the underside of the switch enclosure.

E12.6 Identification

- (a) Provide lamacoid nameplates on front face of switch identifying equipment.

**E13. GROUNDING**

E13.1 Scope

- (a) Furnish all labour, materials, equipment and services specified, indicated or requested to install a complete grounding system. The grounding system shall include ground rods, all wiring, ground bus, thermit welds, mechanical fittings, connectors, links and miscellaneous materials necessary to complete a grounding system acceptable to the inspection authorities.

E13.2 Quality Assurance

- (a) Grounding equipment to CSA C22.2 No. 41-M1987.
- (b) Copper grounding conductors to ASA A7.1 1964.

E13.3 Ground Conductors

- (a) Ground conductors shall be concentric stranded, soft drawn copper. Insulated conductors, where required by inspection authorities or specified, shall be type TW, 600 volt rating, green color.
- (b) Where direct buried bare ground conductor comes into contact with corrosive material, the conductor shall be tinned.

E13.4 Ground Clamps

- (a) Ground clamps for connecting ground conductors to metal water piping not suitable for thermit weld connections shall be sized to accommodate the system ground conductor and the water pipe, as manufactured by T & B, Burndy.

E13.5 Compression Connections

- (a) Compression devices shall be of pure wrought copper material, factory fitted with oxide inhibiting compound and shall meet latest IEEE 80 Standard, as manufactured by T & B, Burndy.

E13.6 Mechanical Connections

- (a) Mechanical connectors shall be of bronze, copper or brass construction with stainless steel hardware selected and sized specifically for the particular application and shall meet latest IEEE standard.

E13.7 Ground Rods

- (a) Ground rods shall be 19 mm (3/4") diameter, 3 m (10 feet) long, copper clad steel construction with the copper exterior coating permanently bonded to the steel core.

E13.8 Installation

- (a) Make all conductor joints, splices and connections with permanent type thermit welds or mechanical compression connectors utilizing hydraulic tools.
- (b) Make ground connections to building steel or flat metallic surfaces with thermit welds. Locate connections where they will not be subject to mechanical damage and, where possible, be accessible for inspection.
- (c) Protect grounding conductors or bus subject to mechanical damage by rigid steel conduit or steel guards which shall be effectively grounded at both ends to the ground conductor they are protecting, regardless of their length.
- (d) Make connections to ground bus using mechanical clamp type connectors.

- (e) Securely bond metal enclosures, motor frames, steel supports for starters, panels, switches, etc., which are not rigidly secured to and in contact with grounded structural steel of a building or conduit system, or which are subject to excessive vibration, to building steel or conduit system with stranded copper conductors.
- (f) Install ground conductors passing through masonry walls, floors, foundations, etc. in 25 mm (1") rigid PVC conduit sleeves. Where sleeves are installed in walls or floors below grade, seal the sleeves watertight after installation of ground conductor.

#### E13.9 Equipment Grounding

- (a) Install grounding connections to typical equipment included in, but not necessarily limited to the following list: service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steelwork, distribution panels, outdoor lighting, telephone backboard.

#### E13.10 Tests

- (a) Perform tests in accordance with general provisions.
- (b) Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the Contract Administrator and inspection authority having jurisdiction.
- (c) Perform tests before energizing electrical system.
- (d) Disconnect ground fault indicator during tests.
- (e) Perform tests in presence of the Contract Administrator.
- (f) Submit written test results to the Contract Administrator.

### **E14. PANELBOARDS**

#### E14.1 Scope

- (a) This section covers the supply and installation of all distribution and power panelboards, including mounting hardware and breakers or fuses.

#### E14.2 Quality Assurance

- (a) All equipment to CSA Standard C22.2 No. 29-M1989.
- (b) Fault current ratings to be indicated on nameplates.

#### E14.3 Submittals

- (a) Submit shop drawings in accordance with the general provisions.

#### E14.4 Panelboards

- (a) Panelboards shall be supplied by one manufacturer.
- (b) 120/208V, 3 phase, 4 wire power panelboard bus and breakers to be rated 10,000 amps (symmetrical) interrupting capacity.
- (c) Panelboard mains, number of circuits, and number and size of branch circuit breakers shall be as indicated on the drawings.
- (d) The main bus bars shall be copper and shall be equipped with solderless lugs for incoming cables. Neutral to be of same ampere rating as mains.
- (e) Distribution section to accommodate circuit breakers. Breakers shall be the interchangeable trip type.
- (f) Doors shall have spring hatches and cylinder locks, and all locks shall be keyed alike with two keys per panelboard.
- (g) EEMAC 12 rated enclosure, to be mounted in outdoor panel.

- (h) Distribution panelboard acceptable manufacturer shall be Schneider Canada Square "D" type NQOD, Cutler-Hammer Pow-R-Line Series.
- (i) Power panelboard acceptable manufacturer shall be Schneider Canada Square "D" In-Line, Cutler-Hammer Pow-R-Line series, Siemens type NDP.

#### E14.5 Circuit Breakers

- (a) Refer to Circuit Breakers for breaker specification.
- (b) Breakers shall be numbered with odd numbers on left and even numbers on right sides of the panel.
- (c) Breakers shall be the bolt-on type and shall provide instantaneous trip on over-currents and time-delay trip on overloads.
- (d) Breakers shall be compatible with fault current rating of the panel.
- (e) Breakers shall be of the thermal magnetic tripping type.
- (f) Main breaker shall be separately mounted on top or bottom of panel to suit cable entry as required. When mounted vertically, down position should open breaker.

#### E14.6 Plant Assembly

- (a) Install circuit breakers in panelboards before shipment.

#### E14.7 Installation

- (a) Locate panelboards as indicated on the drawings and mount securely, plumb true and square.
- (b) Install each panelboard 1980 mm above finished floor measured to the top of the enclosure.
- (c) Install panelboards mounted on brick, concrete or block walls on plywood backboards or use 3 mm thick lead washers between enclosure and wall face. Where practical, group panels on common backboard.
- (d) Make all field wiring connections and terminations. Connect loads to circuits as indicated and connect neutral conductors to common neutral bus with respective neutral identified.

#### E14.8 Equipment Identification

- (a) Provide nameplate for each panelboard engraved as directed.
- (b) Provide complete circuit directly with typewritten legend showing location and load of each circuit.

### **E15. CIRCUIT BREAKERS**

#### E15.1 Scope

- (a) This section covers the supply and installation of all magnetic and thermal magnetic circuit breakers.
- (b) Specific circuit breaker voltage, phase, ampacity, pole numbers, interrupting capacity, breaker type and setting are indicated elsewhere in the specifications or on the drawings.

#### E15.2 Quality Assurance

- (a) All equipment to CSA Standard 22.2, No. 5-M1986.

#### E15.3 Submittals

- (a) Submit shop drawings in accordance with these provisions, including:
  - (i) Component function, make and model no.

- (ii) Breaker voltage and amperage.
- (iii) Breaker phase, number of poles & number of wires.
- (iv) Indication of solid neutral if required.

- (b) Submit time-current characteristic curves for breakers with ampacity of 15 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

#### E15.4 Breakers – General

- (a) Bolt-on moulded case circuit breakers, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- (b) Common-trip breakers with single handle for multipole applications.
- (c) Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-10 times current rating.
- (d) Circuit breakers with interchangeable trips as indicated.
- (e) Circuit breakers shall be lockable in “Off” position.

#### E15.5 Thermal Magnetic Breakers

- (a) Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping.

#### E15.6 Magnetic Breakers

- (a) Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping.

#### E15.7 Enclosures

- (a) All breakers shall be housed in an EEMAC 3R rated panelboard.

#### E15.8 Manufacturers

- (a) For circuit breakers protecting fans, heating elements, transformers and panelboards, acceptable manufacturer is Schneider Canada Federal Pioneer FHL, Cutler-Hammer Series C, Siemens type SB.
- (b) For circuit breakers protecting electric motors, acceptable manufacturer is Schneider Canada Square “D” Mag-Guard MCP, Culter-Hammer Series C HMCP, Siemens.

#### E15.9 Installation

- (a) Install circuit breakers in panelboard as indicated.

### **E16. LIGHTING FIXTURES**

#### E16.1 Scope

- (a) This section covers the supply and installation of lighting fixtures and lamps.

#### E16.2 General Requirements

- (a) Supply and install where shown and as specified on the drawing, all lighting fixtures c/w suspension devices, lamps and other attachments as specified or required to give the best appearance and mechanical installation.
- (b) All fixtures shall carry the approval of the Canadian Standards Association and/or the approval of the Inspection Department having jurisdiction.
- (c) All fixtures, stem hangers, ballast compartments, canopies, reflectors, wireways, brackets, etc., used in conjunction with the fixtures shall be factory finished, baked white enamel, unless otherwise specified.

- (d) All fixtures which have minor scratches after installation shall be "touched up" with an approved enamel to match the fixture finish to the complete satisfaction of the Contract Administrator.
- (e) Snow dump lighting shall meet the following criteria:
  - (i)  $\geq 4.0$  lux average illuminance
  - (ii)  $\leq 4.5$  average/min
  - (iii)  $\leq 20$  max/min
  - (iv) Light Loss Factor = 0.7

#### E16.3 Submittals

- (a) Submit shop drawings in accordance with these provisions showing information such as width, depth, finish, etc. of each fixture in addition to all pertinent lamp data.

#### E16.4 Lamps

- (a) Incandescent:
  - (i) Bulb Shapes "A" and "PS", medium base, inside frosted, extended service, minimum 2500 hours rated life, rated 130 volts, wattage as indicated.
- (b) Fluorescent:
  - (i) T8 lamps with minimum CRI85.
- (c) High Pressure Sodium:
  - (i) Rated as indicated medium or mogul screw base, initial lumens as follows:
  - (ii) 70 Watts: 6000
  - (iii) 100 Watts: 8800
  - (iv) 150 Watts: 15000
  - (v) 200 Watts: 22000
  - (vi) 250 Watts: 27500
  - (vii) Average rated life 24000 hrs.

#### E16.5 Fluorescent Ballasts

- (a) Fluorescent ballasts shall be CSA and CBM certified electronics.
- (b) Designed for the operation of lamps in the lighting fixtures as specified, rated 120 volts, 60Hz integrated circuit design for use with one or two F32T8 lamps as indicated.
- (c) Designed to provide over 95% power factor with 95% of rated lamp lumen.
- (d) Non PCB, thermally protected capacitor.
- (e) Class P, automatic reset thermal protector.
- (f) Input:
  - (i) 1-lamp, maximum 32W
  - (ii) 2-lamp, maximum 65W
- (g) Class A sound rating.
- (h) Total harmonic distortion less than 10%.
- (i) Shall meet FCC limits on EM and RF interference.
- (j) Three year warranty from date of substantial completion.
- (k) Acceptable manufacturer is Advance System V or approved equal.

#### E16.6 High Pressure Sodium Ballasts

- (a) High pressure sodium ballasts to ANSI C82.4 - 1985.
- (b) Voltage rating as indicated, totally enclosed and designed for 40°C ambient temperature.

- (c) Designed to provide minimum 95% power factor with 95% of the rated lamp lumen.
- (d) Non PCB capacitor.
- (e) Plus 10% to minus 10% of nominal input voltage range.
- (f) Minimum starting temperature -34°C at 90% line voltage.
- (g) Mounting as indicated.

#### E16.7 Fixture Schedule

- (a) Type "A"
  - (i) Outdoor pole mounted HPS floodlight, CSA approved or ULC listed, Suitable for wet location, IP55 or higher rating construction, c/w heavy-duty die-cast housing, corrosion resistant hardware, aiming degree indicator, heat and shock resistant tempered glass lens. Lamp shall be 1000W, 208V HPS. Luminaires shall be 208V complete with isolated ballast.

GE Lighting Systems PF1K-01-S-3-6X2  
Lithonia Lighting TFA 1000S RN 208 LPI CSA

#### E16.8 Installation

- (a) As per C.E.C. Section 22 and Section 30.
- (b) Unit shall conform to building lines being parallel or perpendicular.
- (c) Installation of all lighting equipment shall comply with the relevant Section of this Specification and the Canadian Electrical Code.
- (d) At the completion of construction and acceptance of the Work, all lighting fixtures shall be clean, complete with all necessary accessories and provided with the required operating lamp(s).
- (e) The Contractor shall meet the Contract Administrator on site to verify/aim floodlights and to measure lighting levels on completion of the work. Note that the site visit will be required after dark.

### E17. WOOD POLES

#### E17.1 Description

- (a) The poles for mounting of the snow dump lighting shall be 18.2m wood poles of class 3 type.
- (b) Wood poles:
  - (i) To conform to CAN/CSA – 015
  - (ii) Preservatives to conform to CAN/CSA – 080
  - (iii) Specifications and dimensions to meet ANSI-051
- (c) The 18.2m wood poles shall be set to a minimum depth of 2.6m. Diameter of the holes shall be 400mm larger than butt of pole. Poles shall be tamped in with limestone using hydraulic tamper. Limestone for backfill shall be  $\frac{3}{4}$  down.
- (d) Anchors shall be 280mm (11") power installed screw anchors complete with 25 x 2130mm (1" x 7") rod and twin eye nut.
- (e) Guy wires shall be a minimum of 5/16" 160 grade galvanized steel.
- (f) All guy wires shall be insulated with 25kV guy insulators and made pre-formed guy grips.
- (g) The contractor shall provide and install yellow poly guy shields on all guy wires.

## **E18. CONTROL PANELS**

### **E18.1 Scope**

- (a) This section covers the supply and installation of the Lighting Power Panel.

### **E18.2 Quality Assurance**

- (a) Control equipment to CSA C22.2 No. 14-M1987.

### **E18.3 Submittals**

- (a) Submit shop drawings in accordance with these provisions and include schematic, wiring diagrams, and mounting information.

### **E18.4 Operator Control Stations**

- (a) All enclosures and devices shall be rated EEMAC 12 in non-hazardous environments or EEMAC 3R outdoor environments, unless otherwise noted.

### **E18.5 Pushbuttons**

- (a) Heavy duty oiltight, operator flush, black, with 1-NO and 1-NC contacts rated at 10 A, 120 VAC, labels as indicated. Stop pushbuttons colored red, provision for padlocking in depressed position.
- (b) Acceptable manufacturer shall be Telmeccanique, Allen-Bradley.

### **E18.6 Indicating Lights**

- (a) Heavy duty Oiltight, push to test transformer type, lens color as indicated, supply voltage: 120 V (ac), labels as indicated.
- (b) Acceptable manufacturer shall be Telmeccanique, Allen-Bradley.

### **E18.7 Selector Switches**

- (a) 2 or 3 position as required, labelled as indicated heavy duty oiltight, operators as indicated, contact arrangement as indicated, rated 120 V (ac), 10 A.
- (b) Acceptable manufacturer shall be Telmeccanique, Allen-Bradley.

### **E18.8 General**

- (a) 2 or 3 position as required, labelled as indicated heavy duty oiltight, operators as indicated, contact arrangement as indicated, rated 120 V (ac), 10 A.
- (b) Acceptable manufacturer shall be Telmeccanique, Allen-Bradley.

### **E18.9 Construction**

- (a) Minimum EEMAC 3R construction for all panels unless otherwise specified.
- (b) Unless otherwise specified fabricate floor mounted panels, indicated, of high grade, cold rolled smooth sheet metal steel no thinner than 3 mm thick with all doors and edges neatly turned and finished smoothly. Visible welding seams will not be accepted.
- (c) Construct rigid panels and racks with an angle iron or channel supporting frame, suitably braced and stiffened to prevent any deformation during shipping or installation, and provide a surface free from dents, warping or other deformation. Provide a four-sided channel iron mounting base with front recess.
- (d) Provide flush fitting, gasketed doors hung on piano type hinges with three point latches and locking-type handles (CSA Type 12 construction).
- (e) Provide pans and rails for mounting terminal blocks, relays, wiring and other necessary devices.



- (f) Use rear connected fittings to hold equipment and instrument cases on the panel, but where not possible; any front fixing required shall be only by means of chrome-plated, brass or stainless steel machine screws.
- (g) Panel surfaces shall be thoroughly cleaned and degreased before painting. One primer coat shall be covered by two finished paint coats. Refer to Division 9 - Finishes.
- (h) The surface finish shall be free of runs, drops, ridges, waves and laps. The paints shall be applied in such manner as to provide an even film covering corners and crevices. The interior finish shall be white and the exterior finished will be selected after award of the contract.
- (i) Panel Accessories: a metal pocket, 250 mm wide x 150 mm high x 25 mm deep, to hold pertinent drawings and manuals on the lower half of the inside door.

#### E18.10 Internal Works

- (a) Provide an individual switch for disconnection and a fuse for isolation of all panel mounted instruments requiring a 120-volt supply.
- (b) Make all wiring connections in the shop from the equipment mounted on the panel to numbered terminal blocks conveniently located in the panel, including the power supply for all instruments. Conductors shall be extra flexible stranded copper of gauges sufficient to carry the required currents, and shall in no case be smaller than #16 AWG extra flexible.
- (c) Wire connections to all relays and instruments shall be made using easily removable good quality mechanical clips.
- (d) Identify all wiring by means of plastic slip-on type markers. Install all wiring neatly and laced or bunched into cable form using plastic wire clips, and where practical, contained in plastic wiring channels with covers.
- (e) Provide Weidmuller terminal blocks #SAK 2.5, T7 Carrier & EK 2.5N Grounding, tubular clamp, 300 V, complete with track. Each terminal shall be clearly indelibly marked with the wire number connection to it. Each field connecting conductor shall be served by one terminal. Provide 20% spare unit terminals, with a minimum of two spare terminals. Provide all necessary terminal block accessories such as manufactured jumpers and marking tape.
- (f) Mount all internally mounted equipment on a hinged sub-chassis or mount on a rack and arrange for ease of access and removal when necessary.
- (g) Arrange all terminal blocks in the panel in groups such that all low level signals such as 4-20 mA DC are located in one area, followed by contact closure type signals (limit switches, etc.), that do not subsequently energize starters, etc. but are for status indication, and the remainder that contain powered circuits, 120 volt, 50 Hz, are to be arranged in such a manner and location so as to prevent interference into the low level signal.
- (h) Submit proposed terminal block layout and identification scheme for review prior to manufacture.
- (i) Provide suitable spaces around the terminal blocks for incoming and outgoing conductors or cable assemblies.
- (j) Provide plastic cable troughs equal to Panduit complete with snap-on covers for containing the cables. Cables are not to be bunched and tied, but laid in.

#### E18.11 Panel Manufacturer

- (a) Panel assembly, subcomponents and all internal components shall be CSA approved. Cabinet construction shall be performed by an established panel manufacturer who shall comply with all building codes, factory, and Department of Labour regulations and has CSA approval as manufacturer for all components of the Work including

control panels, MCCs, service entrance, etc. Local approvals for panel construction including CSA will not be accepted.

- (b) Acceptable panel manufacturer shall be Manco Control Systems Inc., Celco Controls.

#### E18.12 Alternate Panel Manufacturer

- (a) Bid Opportunity shall be based on the panel manufacturer specified. Alternate approvals shall be in accordance with B6 - Substitutes.
- (b) Proposed alternate panel manufacturer must submit package at time of Bid Submission for review and evaluation by the Contract Administrator containing the following information and material:
  - (i) Separate requests for approval as equal for all monitoring and control equipment (including system software) to be used not listed as approved in this specification. Provide complete technical data including manufacturer make and model number to allow for a thorough review of the system and equipment being proposed.
  - (ii) List of five (5) recent water and/or sewage treatment plant projects successfully completed by the firm as a panel manufacturer.
  - (iii) List of references from satisfied clients, Contractors and Project Administrators attesting to the firms product quality and performance in addition to the firms reputation, service, professionalism, and ability to meet deadlines.
  - (iv) Complete listing of all in house personnel to be working directly on the project indicating experience working with the proposed equipment and control system of this type and experience working specifically on water and sewage treatment plant control systems. Detail years of relevant experience complete with listing of specific projects.
  - (v) Documentation confirming full CSA approval as manufacturer for all components of the Work (e.g. control panels, MCCs, service entrance, etc.).

#### E18.13 Lighting Control Panel

- (a) Provide Lighting Control Panel as indicated complete with the following:
  - (i) Post mounted EEMAC 3R rated outdoor insulated enclosure, 10 gauge, hinged lockable doors.
  - (ii) 60A, 3P, 208V main disconnect
  - (iii) Lamacoid identification nameplates on all components.
  - (iv) Terminal strips (identified) for all wiring.
  - (v) Distribution panelboard.
  - (vi) Circuit breakers as required.
  - (vii) Contactors, sized to suit.
  - (viii) Relays, OMRON MK3PN-5-S c/w PF113A bases.
  - (ix) Push to test LED type pilot lights, selector switches, pushbuttons, Telemecanique XB2B series.

E18.13.1 Panel finish shall be white epoxy paint for interior and ASA61 light grey enamel for exterior.

#### E18.14 Spare Parts

- (a) Provide one spare pushbutton, pilot light and selector switch for each type of switches and color of lights supplied.

#### E18.15 Installation

- (a) Install pushbutton stations, control and relay panels, control devices as indicated and interconnect as indicated.

#### E18.16 Tests

- (a) Perform tests in accordance with these provisions.
- (b) Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at a time and check out operation of section.
- (c) Upon completion of sectional test, undertake group testing.
- (d) Check out complete system for operational sequencing.
- (e) Submit one copy of test results to the Contract Administrator.

#### E18.17 Start-Up and Commissioning

E18.18 Perform all panel start-up and commissioning in accordance with these provisions.

### **E19. RELOCATION OF AIRFIELD BUILDINGS**

E19.1 All Airfield buildings will be relocated by the Winnipeg Radio Control Club.

### **E20. TRAFFIC SIGNAGE**

E20.1 All permanent traffic control signage will be supplied and installed by the City.

E20.2 Pond danger signage, posts, nuts, bolts, brackets, or any other items required for the installation of the pond danger signage shall be supplied and installed by the Contractor.

E20.3 Steel post shall be 38 mm nominal diameter steel pipe, as follow:

- (i) Schedule 40 steel pipe conforming to the latest revision of CAN3-Z245.1.
- (ii) O.D. = 48.3 mm
- (iii) Wall thickness = 3.7 mm
- (iv) Galvanized
- (b) Pond Danger Sign
  - (i) A fully reflectorized white sign with black letters.
  - (ii) Rounded corners but conforming to the nominal dimensions for height and width noted on the Drawings.
  - (iii) Consistent with City of Winnipeg requirements for "Warning and Information Signs" outlined in Section 5.00 of the "Manual of Temporary Traffic Control in Work Areas on City Streets".

### **E21. FLAP GATE**

#### E21.1 Materials

Flap Gate to conform to the following:

- (a) Seat and Cover: Cast Iron ASTM A48 Class 30
  - (i) Seating Faces: Cast Iron ASTM A48 Class 30
  - (ii) Bushing: Bronze C93200
  - (iii) Arm Link: Hot Dipped Galvanized Structural Steel
  - (iv) Fasteners: Nuts and Bolts – Stainless Steel 316
  - (v) Mounting Flange: ASTM A36 Minimum
  - (vi) Cast Iron Paint:
    - ◆ Surface Preparation to SSWPC-SP10
    - ◆ Two Coats Ameron Amerlock 400
    - ◆ 125 micrometres per coat total dry film thickness

- (vii) Adaptor Flange:
  - ◆ Two coats dry galv.
- (viii) Pre-approved material: Armtec Model 10C Flap Gate c/w adaptor flange for corrugated pipe installations.

(b) Operating and Maintenance Manuals

- (i) Provide five (5) copies of all the manufacturer's brochures and technical literature detailing correct installation procedure and recommended operating and maintenance instructions. Manuals shall be bound with the project title and gate description identified on the front cover. One set of manuals shall be provided for each size of gate. Final payment for flap gates will not be made until the above information has been provided to the Contract Administrator.

**E21.2 Construction Methods**

(a) Installation

- (i) Install cast iron flap gates and adaptor flange as shown on the drawings and in accordance with the manufacturer's recommendations.

**E21.3 Measurement and Payment**

- (a) Supply and installation of flap gates will be measured on a unit basis and paid at the contract unit price bid per size of flap gate installed.

**E22. SEWPCC BUILDING ACCESS**

**E22.1 Access to the interior of the SEWPCC for the electrical modifications will be restricted to the following times:**

- (a) Monday to Friday, 7:30 A.M. to 3:30 P.M.
- (b) Saturday and Sunday, No access will be permitted.

**E23. REMOVAL OF EXCESS TOPSOIL**

**E23.1 Further to CW 3170 clause 9.2 a) and CW 3110 clause 3.2.4, all excess topsoil, if any, remaining after the completion of all Works is to be hauled off site to a location of the Contractor's choice.**

**E23.2 There will be no measurement or payment for hauling any excess topsoil, if any, off site. Hauling any excess topsoil, if any, offsite will be considered incidental to the Works.**

**E24. SNOW DUMP GATE**

**E24.1 Further to CW 3550, Snow Dump Gate to conform to the following:**

- (a) Frame to ASTM-A120 galvanized steel pipe, standard weight with 45 mm O.D. outside frame and 35 mm O.D. pipe for bracing.
- (b) Joints - electrically welded.
- (c) Hardware - heavy duty galvanized hinge, latch and latch catch for padlock.
- (d) Size of gate is shown on the drawings.

**E25. REMOVAL OF EXISTING CULVERT**

**E25.1 Further to CW 3610, excavation, removal, hauling offsite, and disposal of the existing culvert will not be measured for payment. Removal of existing culvert will be incidental to the Work.**