



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 905-2007

**2007 INSTALLATION OF PUMPING UNITS AND UPGRADES TO THE BALTIMORE
WASTEWATER PUMPING STATION – CONTRACT NO. 40**

TABLE OF CONTENTS

PART A - BID SUBMISSION

Form A: Bid	1
Form B: Prices	4
Form G1: Bid Bond and Agreement to Bond	5
Form G2: Irrevocable Standby Letter of Credit and Undertaking	7

PART B - BIDDING PROCEDURES

B1. Contract Title	1
B2. Submission Deadline	1
B3. Site Investigation	1
B4. Enquiries	1
B5. Addenda	1
B6. Substitutes	2
B7. Bid Components	3
B8. Bid	3
B9. Prices	4
B10. Qualification	4
B11. Bid Security	5
B12. Opening of Bids and Release of Information	6
B13. Irrevocable Bid	6
B14. Withdrawal of Bids	6
B15. Evaluation of Bids	7
B16. Award of Contract	7

PART C - GENERAL CONDITIONS

C0. General Conditions	1
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PART D - SUPPLEMENTAL CONDITIONS

General

D1. General Conditions	1
D2. Scope of Work	1
D3. Contract Administrator	1
D4. Contractor's Supervisor	1
D5. Notices	1
D6. Furnishing of Documents	2

Submissions

D7. Authority to Carry on Business	2
D8. Safe Work Plan	2
D9. Insurance	2
D10. Performance Security	3
D11. Detailed Prices	3
D12. Detailed Work Schedule	4

Schedule of Work

D13. Commencement	4
D14. Critical Stages	4
D15. Substantial Performance	4
D16. Total Performance	5
D17. Liquidated Damages	5
D18. Scheduled Maintenance	5

Control of Work

D19. Job Meetings	5
D20. Prime Contractor – The Workplace Safety and Health Act (Manitoba)	6
D21. Traffic Control and Maintenance of Access	6

Payment

D22. Payment	6
Form H1: Performance Bond	7
Form H2: Irrevocable Standby Letter of Credit	9
Form I: Detailed Prices	11

PART E - SPECIFICATIONS

General

E1. Applicable Specifications and Drawings	1
E2. Equipment Supplied by City	2
E3. Equipment and Materials	2
E4. Salvage	2
E5. Dangerous Work Conditions	2
E6. Waterway By-Law	3
E7. Protection of Existing Trees	3
E8. Shop Drawings	4
E9. Operating and Maintenance Manuals	6
E10. Temporary Use of City Equipment	6
E11. Existing Pumping Station Operation During Construction	6
E12. Temporary Shutdown of the Pumping Station	6
E13. Flow Control and Temporary By-Pass Pumping	7
E14. Wet Weather Flows in Existing Sewer	9
E15. Mobilization and Demobilization	10
E16. Wet Well Clean Out	10
E17. Pumping Station Modifications and Mechanical Work	10
E18. Electrical	17
E19. Ventilation	34
E20. Miscellaneous Metal Fabrications	36
E21. Paint	38
E22. Pump Start Up	41
E23. Surface Restoration	41

PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 2007 INSTALLATION OF PUMPING UNITS AND UPGRADES TO THE BALTIMORE WASTEWATER PUMPING STATION – CONTRACT NO. 40

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, January 10, 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 Contractor Administrator or an authorized representative will be available at the Site to provide access to bidders at the dates and times listed below:

(a) Thursday, January 3, 2008 from 9:00 am to 10:00 am.

(b) Monday, January 7, 2008 from 2:30 pm to 3:30 pm.

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

B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in D3.1.

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.
- B9.1.1 Notwithstanding C12.2.3(c), prices on Form B: Prices shall not include the Manitoba Retail Sales Tax (MRST, also known as PST), which shall be extra where applicable.
- 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/or 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>); and

- (b) have successfully carried out work similar in nature, scope and value to the Work; and
- (c) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
- (d) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);

B10.3 Further to B10.2(d), 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>.)

B10.4 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.

B10.5 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.

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 installation of three (3) dry-pit wastewater pumping units at the Baltimore Wastewater Pumping Station. The Work shall also include modifications and upgrades to the station structural, mechanical, ventilation and electrical components.

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

- (a) Removal of two (2) existing dry-pit wastewater pumping units and piping.
- (b) Installation of three (3) 75 hp dry-pit wastewater pumping units.
- (c) Supply and installation of suction and discharge piping, gate valves, check valves and other fittings.
- (d) Supply and installation of MH risers on the wet-well chamber.
- (e) Supply and installation of new ventilation fan, blower motor and ducting.
- (f) Supply and installation of all electrical equipment and wiring as detailed.
- (g) Miscellaneous services for a complete installation including all permits, testing and start-up, in accordance with this specification.

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is:

Mr. Doug Berg, C.E.T.
Design and Construction Technologist
110-1199 Pacific Avenue, R3E 3S8
Telephone No. (204) 986-4452
Facsimile No. (204) 986-5345

D3.2 At the pre-construction meeting, the Contract Administrator will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D4. CONTRACTOR'S SUPERVISOR

D4.1 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.

D5. NOTICES

D5.1 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.

D5.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D5.3, D5.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D3.1.

D5.3 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

D5.4 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

D6. FURNISHING OF DOCUMENTS

D6.1 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

D7. AUTHORITY TO CARRY ON BUSINESS

D7.1 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.

D8. SAFE WORK PLAN

D8.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D8.2 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>.

D9. INSURANCE

D9.1 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 a contractual liability, unlicensed motor vehicle liability, non-owned automobile liability 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) all risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price, written in the name of the Contractor and The City of Winnipeg, at all times during the performance of the Work and until the date of Total Performance.

D9.2 Deductibles shall be borne by the Contractor.

D9.3 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.

D9.4 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.

D10. PERFORMANCE SECURITY

D10.1 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.

D10.1.1 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.

D10.2 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.

D11. DETAILED PRICES

D11.1 The Contractor shall provide the Contract Administrator with a detailed price breakdown (Form I: Detailed Prices) 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 C4.1 for the return of the executed Contract.

D11.2 The Contractor shall state a price for each item or sub-item of the Work identified on Form I: Detailed Prices. The detailed prices must be consistent with the price(s) provided in the Contractor's Bid.

D12. DETAILED WORK SCHEDULE

- D12.1 The Contractor shall provide the Contract Administrator with a detailed work schedule 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 C4.1 for the return of the executed Contract.
- D12.2 The detailed work schedule shall consist of the following:
- (a) a Gantt chart for the Work, acceptable to the Contract Administrator.
- D12.3 Further to D12.2(a), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

SCHEDULE OF WORK

D13. COMMENCEMENT

- D13.1 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.
- D13.2 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 D7;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the Safe Work Plan specified in D8;
 - (iv) evidence of the insurance specified in D9;
 - (v) the performance security specified in D10;
 - (vi) the Detailed Prices specified in D11;
 - (vii) the detailed work schedule specified in D12.
 - (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.
- D13.3 Commencement of the Work shall be at the discretion of the Contractor, provided the commencement date will allow the achievement of Substantial and Total Performance of the Work in accordance with the dates herein fixed for same.

D14. CRITICAL STAGES

- D14.1 The Contractor must ensure that two (2) new pumping units and related piping must be installed and ready to be put into active service by March 31, 2008.

D15. SUBSTANTIAL PERFORMANCE

- D15.1 The Contractor shall achieve Substantial Performance by April 15, 2008.
- 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 by June 30, 2008.
- 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 Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:
- (a) Substantial Performance – One thousand dollars (\$1000.00);
 - (b) Total Performance – Five hundred dollars (\$500.00).
- D17.2 The amounts specified for liquidated damages in D17.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days 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) Landscape Maintenance as specified in CW 3510;
- 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).

D21. TRAFFIC CONTROL AND MAINTENANCE OF ACCESS

D21.1 Traffic control shall be carried out in accordance with Section 3.7 of CW 1130 of the General Requirements.

D21.2 The Contractor shall maintain a minimum of one lane of traffic, in both travel directions, at all times.

D21.2.1 The Contractor shall provide a flag person to direct traffic without additional compensation at the request of the Contract Administrator.

D21.3 Do not stockpile materials in a location and manner that will obstruct the safe operation of motor vehicles past the site.

D21.4 The Contractor shall not park company or private vehicles inside the barricaded work zone in a manner that will block sightlines for vehicles and pedestrians approaching and crossing intersections.

PAYMENT

D22. PAYMENT

D22.1 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 D10)

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. BID Opportunity No. 905-2007

2007 INSTALLATION OF PUMPING UNITS AND UPGRADES TO THE BALTIMORE WASTEWATER PUMPING STATION – CONTRACT NO. 40

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 D10)

(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. BID Opportunity No. 905-2007
2007 INSTALLATION OF PUMPING UNITS AND UPGRADES TO THE BALTIMORE
WASTEWATER PUMPING STATION – CONTRACT NO. 40

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)

FORM I: DETAILED PRICES
 (See D11)

**2007 INSTALLATION OF PUMPING UNITS AND UPGRADES TO THE BALTIMORE WASTEWATER
 PUMPING STATION – CONTRACT NO. 40**

ITEM NO.	DESCRIPTION	SPEC. REF.	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT
1.	Removal of Existing Piping, Pumps and Motors	E17	each	1		
2.	Installation of New Piping, Pumps and Motors	E17	each	1		
3.	All Concrete Work and Miscellaneous Metal Fabrications	E17	each	1		
Total of items 1 through 3 above to equal Bid Price for Item No. 3 – “Pumping Station Modifications and Mechanical Work” – on Form B: Prices						

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>
	Cover Sheet
06794	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Plan Views
06795	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Section Views
06796	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Section Views
06797	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical Single Line Diagram
06798	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical Plan and Details
06799	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical Section, Schedules and MCC 6A
06800	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical Wastewater Pump: WP1 – Elementary Diagram
06801	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical Wastewater Pump: WP2 – Elementary Diagram
06802	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical Wastewater Pump: WP3 – Elementary Diagram
06803	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical Fan Blower – Elementary Diagram
06804	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical Layout Fan Blower – Control Station
06805	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical MCC 6A Control Cell 3A – Elementary Diagram and Wiring Schematic
06806	2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Electrical Instrument Loop Diagram CL-108-LT

- 06807 2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Plan and Details
- 06808 2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Handrail and Hatch Opening Details
- 06809 2007 Pumping Station Upgrades – Installation of New Pumping Units and Modifications to the Baltimore Wastewater Pumping Station – Column and Beam Details

E2. EQUIPMENT SUPPLIED BY CITY

- E2.1 The City will supply the following equipment:
- (a) Three (3) 113 l/s (1797 USgpm) dry-pit pumping units complete with pump supports,
 - (b) Two (2) 75 hp pump motors and driveshaft assemblies for installation, as indicated in this Specification and Drawings.
 - (i) The Contractor shall be required to supply and install one additional pump motor as detailed in E17.2.2.
- E2.2 Inspection of installation of the pumping units, upon completion, will be performed by a qualified technical representative from the manufacturer of the pumping units. The cost of the initial inspection will be paid for by the City.
- E2.3 Provide the Contract Administrator with seven (7) days notice of when pumps will be installed to allow for arrangements to be made with the pump supplier for initial start-up inspection.

E3. EQUIPMENT AND MATERIALS

- E3.1 The Contractor shall supply all equipment and materials necessary to execute the work, except for the equipment and material listed in E2 and as shown on the Drawings to be re-used.
- E3.2 Existing equipment and materials may be re-used only as specifically indicated in these specifications, as shown on the Drawings or as approved by the Contract Administrator.

E4. SALVAGE

- E4.1 All salvaged equipment and materials as determined by the Contract Administrator shall remain property of the City unless specifically noted otherwise. The Contractor shall deliver salvaged equipment and materials to the City of Winnipeg's "Y Yard" outdoor storage compound located at the North East corner of the intersection of Dugald Road and Van Bellegham Avenue, Winnipeg, Manitoba.
- E4.2 The Contractor shall notify the Contract Administrator at least 48 hours prior to delivery of salvaged equipment to allow for arrangements to be made to receive the salvaged equipment. All deliveries shall be made between 8:00 am and 3:30 pm on Business days.
- E4.3 The Contractor shall remove and haul all rejected salvage from the site and legally dispose of it.
- E4.4 Removal and delivery of salvageable and non-salvageable equipment and material shall be included in the Contract Unit Price for "Pumping Station Modifications and Mechanical Work".

E5. DANGEROUS WORK CONDITIONS

- E5.1 Further to clause C 6.26 of the General Conditions, the Contractor shall be aware that underground chambers, manholes, and sewers are considered a confined space and shall follow the "Guidelines for confined Entry Work" as published by the Manitoba Workplace Safety and Health Division.

- E5.2 The Contractor shall be aware of the potential hazards that can be encountered in underground chambers, manholes and sewers such as explosive gases, toxic gases and oxygen deficiency. The Contractor's Safe Work Plan should address these issues.
- E5.3 The air in a confined space must be tested before entry and continuously during the time that personnel are inside the space. Equipment for continuous monitoring of gases must be explosion-proof and equipped with a visible and audible alarm. The principal tests are for oxygen deficiency, explosion range and toxic gases. Testing equipment must be calibrated in accordance with manufacturer's specifications.
- E5.4 The Contractor shall ventilate all confined spaces including underground chambers, tunnels, pipes and shafts as required and approved by the Manitoba Workplace Safety and Health Act (the "Act"). If no ventilation is supplied, a worker must wear a respirator or supplied air to enter the confined space.
- E5.5 Workers must wear a respirator or supplied air at all times when entering an underground chamber, manhole or sewer where live sewage is present.
- E5.6 The Contractor shall provide a photoionization detector (PID) on site at all times to monitor potential hydrocarbon vapours in the confined spaces. The gas detector and safety equipment conforming to the Act shall be made available to the Contract Administrator for his use during inspections. In addition, the Contract Administrator shall collect discrete air samples for laboratory analysis.
- E5.7 The Contract Administrator may issue a stop work order to the Contractor if the above guidelines are not being followed. The Contractor shall not resume operations until the Contract Administrator is satisfied the Contractor is following the appropriate procedures. The Contractor shall have no claim for extra time or costs due to the stop work order for not following these safety guidelines.

E6. WATERWAY BY-LAW

- E6.1 The Contractor shall note that all Works within 107 metres (350 feet) of a riverbank are within the jurisdiction of the Waterway By-Law. The Contract Administrator, if required, will apply and pay for any Waterway Permits for the project. The Contractor shall adhere to restrictions imposed on the permit.
- E6.2 Under no circumstances will stockpiling of any material be permitted within 107 metres of a riverbank or dike.

E7. PROTECTION OF EXISTING TREES

- E7.1 Do not remove existing trees and take the following precautionary steps to avoid damage from construction activities to existing boulevard trees within the limits of the construction area.
- E7.1.1 Do not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.
- E7.1.2 Strap mature tree trunks with 25 x 150 x 2400 wood planks. Smaller trees shall be similarly protected using appropriately sized wood planks.
- E7.1.3 Excavations shall be carried out in a manner to minimize damage to existing root systems. Where roots must be cut to facilitate an excavation they shall be neatly pruned at the face of the excavation.
- E7.1.4 Work on site shall be carried out in a manner to minimize damage to existing tree branches. Where damage to tree branches does occur, the Contractor shall neatly prune the damaged branch.
- E7.1.5 American elm trees shall not be pruned between April 1st and August 1st and Siberian elm trees between April 1st and July 1st of any year under provisions of The Dutch Elm Disease Act.

E7.2 All damage to existing trees due to construction activities shall be repaired to the requirements and satisfaction of the City of Winnipeg, Parks and Recreation Department, Forestry Branch at the Contractor's expense.

E7.3 Costs for protection of trees shall be considered incidental to the contract works and shall be done at the Contractor's expense.

E8. SHOP DRAWINGS

E8.1 Description

- (a) This Specification shall revise, amend and supplement the requirements of CW 1100.
 - (i) The term 'shop drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, which are to be provided by the Contractor to illustrate details of a portion of the work.
 - (ii) The Contractor shall submit specified shop drawings to the Contract Administrator for review. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be show on all submissions for Engineering review.
- (b) Shop Drawings
 - (i) Original drawings are to be prepared by the Contractor, Subcontractor, Supplier, Distributor, or Manufacturer, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate sections.
 - (ii) Shop drawings for the following components shall bear the seal of a Manitoba registered Professional Engineer.
 - (a) Pump Motor
 - (b) Gate valves
 - (c) Check valves
 - (d) Shoring
 - (e) Reinforcing Steel
 - (f) Metal Fabrications
 - (g) Stem extensions
 - (h) Ventilation blower motor
 - (i) Electrical Equipment
- (c) Contractor's Responsibilities
 - (i) Review shop drawings, product data and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.
 - (ii) Verify:
 - (a) Field measurements
 - (b) Field construction criteria
 - (c) Catalogue numbers and similar data
 - (iii) Coordinate each submission with requirements of work and Contract Documents. Individual shop drawings will not be reviewed until all related drawings are available.
 - (iv) Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.
 - (v) Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review of submission, unless Contract Administrator gives written acceptance of specified deviations.
 - (vi) Responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.
 - (vii) The Contractor shall make any corrections required by the Contract Administrator and shall resubmit the required number of corrected copies of Shop Drawings. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.

- (viii) After Contract Administrator's review and return of copies, distribute copies to sub-trades as appropriate.
 - (ix) Maintain one (1) complete set of reviewed shop drawings, filed by Specification Section Number, at the site of the work for use and reference of the Contract Administrator and Subcontractors.
- (d) Submission Requirements
- (i) Schedule submissions at least 14 Calendar days before dates reviewed submissions will be needed, and allow for a 14 Calendar day period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract Documents.
 - (ii) Submit five (5) paper prints of shop drawings. The Contractor is advised that the Contract Administrator will retain three (3) copies of all submittals and return two (2) copies to the Contractor.
 - (iii) Accompany submissions with transmittal letter, containing:
 - (a) Date
 - (b) Project title and Bid Opportunity number
 - (c) Contractor's name and address
 - (d) Number of each shop drawing, product data and sample submitted
 - (e) Specification Section, Title, Number and Clause
 - (f) Drawing Number and Detail/Section Number
 - (g) Other pertinent data
 - (iv) Submissions shall include:
 - (a) Date and revision dates.
 - (b) Project title and Bid Opportunity number.
 - (c) Name of:
 - (i) Contractor
 - (ii) Subcontractor
 - (iii) Supplier
 - (iv) Manufacturer
 - (v) Separate detailer when pertinent
 - (d) Identification of product of material.
 - (e) Relation to adjacent structure or materials.
 - (f) Field dimensions, clearly identified as such.
 - (g) Specification section name, number and clause number or drawing number and detail/section number.
 - (h) Applicable standards, such as CSA or CGSB numbers.
 - (i) Contractor's stamp, initialed or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.
- (e) Other Considerations
- (i) Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.
 - (ii) Material and equipment delivered to the site of the works will not be paid for at least until pertinent shop drawings have been submitted and reviewed.
 - (iii) Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.
 - (iv) No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions and review of shop drawings.
 - (v) Contractor to monitor the shoring for movement on a daily basis and provide a written weekly report showing the daily records to the Contract Administrator.

E8.2 Measurement and Payment

E8.3 Preparation and submittal of Shop Drawings will be included in the contract unit price for "Pumping Station Modifications and Mechanical Work".

E9. OPERATING AND MAINTENANCE MANUALS

- E9.1 Operation and maintenance instructions and technical data to be sufficiently detailed with respect to design elements, construction features, component function, correct installation procedure and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation. Technical data to be in form of approved shop drawings, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists.
- E9.2 Combine operating and maintenance information of various components in binders with the project name identified on the cover. Divide the manual into appropriate sections for the components the information pertains to.
- E9.3 Submit 3 complete copies of operating and maintenance manuals to the Contract Administrator for review. Revise initial manual as required by the Contract Administrator prior to final submission. Make corrections, additions or revisions as required by the Contract Administrator and re-submit 5 complete copies. If there are no corrections, additions or revisions required to the original submission, provide 2 additional complete copies to the Contract Administrator.
- E9.4 The cost of the operating and maintenance manual preparation and submission shall be included in the bid price for "Supply and Installation of Wastewater Pumping Station".
- (a) A holdback of 10% of the unit price provided for "Pumping Station Modifications and Mechanical Work" will be retained until the final accepted Operating and Maintenance Manuals have been provided to the Contract Administrator.

E10. TEMPORARY USE OF CITY EQUIPMENT

- E10.1 City facilities, systems and equipment shall not be used during construction without the Contract Administrator's written permission. The Contract Administrator reserves the right to withdraw said permission if, in his opinion, proper care and maintenance are not provided.

E11. EXISTING PUMPING STATION OPERATION DURING CONSTRUCTION

- E11.1 The Contractor is advised that the existing wastewater pumping station will be allowed to be taken out of operation only after the Contractor's schedule of activities to complete the Work is approved by the Contract Administrator. The Contractor shall plan his construction activities to allow for the minimum amount of disruption time to normal operating status of the station.
- E11.2 The Contractor shall cooperate with and provide full access at all times for City personnel to carry out maintenance and operational duties.

E12. TEMPORARY SHUTDOWN OF THE PUMPING STATION

- E12.1 Temporary shutdown of the wastewater pumping station will be allowed for the following work activities.
- (a) Removal of existing pumps, suction and discharge piping, valves and fittings inside the station.
- (b) Installation of new pumps, suction and discharge piping, valves and fittings inside the station.
- (c) Connection of new electrical controls to new pumps.
- (d) Modifications to the existing wet-well chamber.
- (e) Sequence work such that a minimum amount of shut-down time at the Station is used for the above mentioned activities (i.e. replace one pumping unit while the other pumping units are still on-line).

- E12.2 Allowable shutdown time indicated is approximate and the Contractor must monitor the upstream system at all times to ensure the stored level of wastewater will not exceed the critical basement elevation indicated on the Drawings.
- E12.3 Subject to unforeseen flow conditions, more than 8 hours of allowable shutdown time may be available during the night.
- E12.4 Schedule work activities requiring station shutdown to be done at night, if required by the Contract Administrator, when flow amounts are generally reduced, to maximize the amount of shutdown time available and reduce the risks associated with station shutdown.
- E12.5 Schedule several work activities to be completed in the same shutdown where possible to minimize the number of station shutdowns and amount of temporary by-pass pumping required.
- E12.6 Temporary by-pass pumping, as described in E13, must be installed and operational at all times during construction and ready to be put into service if liquid level in the sewer system reaches the critical basement elevation shown on the drawings or as determined by the Contract Administrator.
- E12.7 Temporary shutdown will include closing the sluice gate or installing a sewer plug in upstream of the station, pump turn off, forcemain draining (if required), pump start up and opening the sluice gate or removing the sewer plug.
- E12.8 Water and Waste Department, Collection System personnel will be available to provide assistance to the Contractor for temporary shutdown of the wastewater pumping station to facilitate completion of the Work.
- E12.9 There will be no charge to temporarily shutdown the wastewater pumping station for the work activity listed.
- E12.10 If an unreasonable number of station shutdowns are required to complete the same work activity due to the Contractor's method of operation, a fee of \$300.00 per hour for Collection System personnel may be charged to the Contractor and deducted from future Progress Payments.
- E12.11 The Contract Administrator reserves the right to cancel a planned station shutdown if in his opinion, flow conditions or the weather forecast would not allow for a shutdown of sufficient duration to complete the work activity. The Contractor shall reschedule the work activity to a more suitable time.
- E12.12 Consecutive back-to-back station shutdowns will not be allowed until the sewer system has returned to normal.

E13. FLOW CONTROL AND TEMPORARY BY-PASS PUMPING

E13.1 Description

- E13.1.1 This specification covers flow control in existing sewers and temporary by-pass pumping of flow during installation of the wastewater pumping units and station modifications.

E13.2 Materials

E13.2.1 Inflatable Rubber Sewer Plugs

- (a) Made of rubber, capable of remaining in place when inflated to the pressure required to withstand the expected sewer levels.
- (b) Provided with an inflation/deflation hose, monitoring pressure valve, removal rope or cable and safety chain all of sufficient length to reach to ground elevation for monitoring and removal.

E13.2.2 Temporary By-Pass Pumping Equipment

- (a) Non-clog, submersible pumping units, each sized to meet or exceed the required capacity. Complete with all required piping, fittings, floats and pump controls suitable for temporary installation in a sewer manhole.
- (b) Provide model and capacity curves to the Contract Administrator for approval.
- (c) Power supply to be suitably sized for pumping equipment complete with all required controls. Fuel to be in lockable, tamperproof container, approved by Contract Administrator.

E13.2.3 Fittings and Appurtenances

- (a) Fittings, couplings and appurtenances to be used for repairs to existing forcemains and sewers to be approved products for underground use in the City of Winnipeg.

E13.2.4 Bedding and Backfill

- (a) Bedding and initial backfill material to be sand in accordance with CW 2030.
- (b) Backfill excavations in pavement areas to be Class 3 in accordance with Clause 3.8.3 of CW 2030. Backfill in excavations in boulevard areas to be Class 5 in accordance with Clause 3.8.3 of CW 2030.

E13.3 Construction Methods

E13.3.1 General

- (a) Maintain level of sewage in existing sewers below the critical basement elevation shown on the Drawings at all times. The Contract Administrator will provide a mark at a convenient location for reference.
- (b) Allowable shutdown times shown on the drawings are approximate and the Contractor must monitor the upstream system at all times to ensure the stored level of wastewater does not exceed the critical basement elevation.
- (c) Provide a flow control plan to the Contract Administrator for review before construction starts.
- (d) Diversion of wastewater flow directly or indirectly to the environment, Land Drainage Sewers or Storm Relief Sewers will not be allowed.

E13.3.2 Expected Wastewater Flow to the Baltimore Pumping Station

- (a) The expected peak dry weather flow (PDWF) to the Baltimore Pumping Station is 170 l/s (2695 US gpm).
- (b) Critical Basement elevation is 228.470 m.
- (c) Combined sewers can receive flow of an undetermined amount from watermain breaks, snow melt, rain and other unforeseen sources. The Contractor will be responsible to monitor the flow in the sewer and adjust or halt work activities accordingly due to unforeseen flow above the amount identified for PDWF.

E13.3.3 Inflatable Sewer Plugs

- (a) Only inflatable rubber sewer plugs shall be used to plug sewers.
- (b) Clean sewer pipe as required to properly install inflatable sewer plug(s) in accordance with the manufacturer's instructions at the locations shown on the Drawings to isolate the installation location. Installation of inflatable sewer plugs at other locations to be approved by the Contract Administrator before construction starts.
- (c) Secure inflatable sewer plugs at or near the ground surface.
- (d) Continuously monitor air pressure while sewer plug is in place and have proper inflation equipment available at all times.

E13.3.4 Temporary By-Pass Pumping

- (a) Provide a minimum of two submersible pumps at all times, each with a capacity equal to or greater than the listed PDWF. Both pumps are to be installed and available for

operation. A replacement pump with the required capacity shall be immediately provided if one of the two original pumps has to be removed from the site for repairs.

- (i) A combination of smaller sized pumps may be used concurrently if the total discharge flow of the pumps meets the PDWF volume identified in E13.3.2(a) and providing replacement pumps are available on-site to maintain the PDWF volume.
- (b) Surface mount, vertical lift suction pumps are not acceptable.
- (c) Temporary by-pass pumping can be installed in manholes "A" and "B" as shown on the Drawings.
- (d) Provide detailed information for pumping equipment to be used including pump capacity and dimensions, depth of submergence, pump controls and installation details to the Contract Administrator for review before construction starts.
- (e) Power supply to be approved by the Contract Administrator before set-up. Locate the power supply where it will not adversely affect local residences. Location to be approved by the Contract Administrator before construction starts.
- (f) Provide suitable traffic ramps approved by the Contract Administrator if the by-pass pumping discharge pipe and power supply cables are laid across vehicle or pedestrian traffic areas.
- (g) Provide a check valve on the by-pass pumping discharge pipe to prevent cycling when the pumping station is activated.
- (h) The Contractor is advised that the pumping station will remain in service while the work is being completed, except for planned temporary shutdowns as described in E12. The Contractor shall cooperate and coordinate with the City to allow full access at all times for City staff to carry out maintenance and operational duties.
- (i) Arrange construction activities and schedule to be able to remove temporary inflatable sewer plug(s) and restore pumping station operation at the end of each day's work.
- (j) If a temporary pump in use fails, it must be replaced immediately with the standby pump and if the flow level in the sewer rises to the mark established by the Contract Administrator, the inflatable sewer plug shall be deflated and flow allowed to go the pumping station or additional temporary pumping must be provided.
- (k) The Contractor shall ensure temporary by-pass pumping equipment and materials will be properly insulated and heated, if required, to be protected from freezing and to maintain proper functioning during cold weather.
- (l) Temporary by-pass pumping equipment and materials shall remain on-site until station construction is completed as described in these Specifications and to the satisfaction of the Contract Administrator.

E13.4 Measurement and Payment

- E13.4.1 Flow control and temporary by- pass pumping will be measured on a unit basis and paid for at the Contract Unit Price for "Flow Control and Temporary By-Pass Pumping", installed in accordance with this specification, accepted and measured by the Contract Administrator.

E14. WET WEATHER FLOWS IN EXISTING SEWER

- E14.1 In the event the flow in the sewer system is expected to exceed the amount indicated for PDWF due to wet weather runoff, the Contract Administrator may suspend work activities that require temporary by-pass pumping and temporary shutdown of the wastewater pumping station. Suspension of these activities will continue until the high flow diminishes in the sewer system.
- E14.2 In the opinion of the Contract Administrator, if suspension of work activities that require temporary by-pass pumping and temporary shutdown of the wastewater pumping station cause a delay in completion of the Work through no fault of the Contractor, the completion date of the Work will be adjusted accordingly.

E14.3 There shall be no claim for additional costs or time due to Station shut-downs from high wet weather flows.

E15. MOBILIZATION AND DEMOBILIZATION

E15.1 Mobilization and demobilization will include but not be limited to start-up costs, equipment set-up and removal, storage facilities set-up and removal and site cleanup.

E15.2 Mobilization and demobilization will be measured on a unit basis and paid for at the Contract Unit Price for "Mobilization and Demobilization" in accordance with this specification, accepted and measured by the Contract Administrator.

E15.3 50% of the Mobilization and Demobilization unit price will be paid on the first progress payment.

E15.4 The remaining 50% of the Mobilization and Demobilization unit price will be paid subsequent to the completion of the work and restoration and clean up of all sites.

E16. WET WELL CLEAN OUT

E16.1 The Contractor shall be responsible for the clean out of the wet well before starting construction and as construction progresses. Clean out shall be done by mechanical or manual methods and shall remove grit, tallow and other build-ups to the satisfaction of the Contract Administrator.

E16.2 The Contractor shall also ensure that all concrete rubble and construction material is removed from the wet well after completing the works and prior to station startup.

E16.3 The Contractor shall be responsible to maintain a clean wet well in the station during construction.

E16.4 Costs for clean out of pumping station wet well shall be included at the Contract Unit Price for "Pumping Station Modifications and Mechanical Work".

E17. PUMPING STATION MODIFICATIONS AND MECHANICAL WORK

E17.1 Description

E17.1.1 This Specification covers the piping, equipment, materials and structural modifications to the existing pumping station.

E17.1.2 The Contractor shall remove the existing pumping units, piping, equipment and materials as required and install new pumping units, piping, equipment and materials as shown on the drawings or as indicated by the Contract Administrator.

E17.1.3 All equipment and material shall be supplied by the Contractor except as listed in E2.

E17.2 Materials

E17.2.1 Pumping Units

(a) Shall be supplied by the City as indicated in section E2 .

E17.2.2 Pump Motors

(a) Two (2) pump motors and driveshaft assemblies shall be supplied by the City as indicated in section E2.

(b) The Contractor shall be responsible to supply and install a third pump motor, complete with drive shaft assembly, base or stand and any other accessories required for connection to the third pumping unit.

(i) The pump motor and drive shaft assembly supplied by the Contractor shall be of the identical manufacturer's make, model, and will be of the same size and

capacity as the pump motors and drive shaft assemblies supplied by the City for installation as indicated in section E2.

(ii) The pump motor supplied shall be of the following:

- Manufacturer: TECO-Westinghouse Motors (Canada) Inc.
- Cat. No.: PDH07506TE5
- Model: OPTIM HE PLUS
- Poles: 6
- HP: 75
- Hertz: 60
- Volts: 575
- RPM: 1200
- Frame: 405T
- Encl.: TEFC

(c) Submit shop drawings of the pump motor and driveshaft assembly in accordance with E8 of this specification.

E17.2.3 Piping and Fittings

- (a) All piping shall be Class 52 ductile iron or ASTM Carbon steel Schedule 80 thickness.
- (b) Cast Iron fittings shall conform to AWWA C110.
- (c) Fabricated fittings shall conform to ASTM A53 carbon steel grade B, Schedule 80 wall thickness.
- (d) Steel fittings shall be ASTM A234 grade B carbon steel, Schedule 80 wall thickness. Dimensions shall be to ANSI B16.9.
- (e) All welded steel flanges shall be in conformance with AWWA C207, Class B.

E17.2.4 Large Diameter Flanges and Adaptor Flanges

- (a) Thread-on flanges for Ductile Iron Pipe: AWWA C115 or ASME B16.1
- (b) Adaptor flanges: Ductile Iron, Grade 65-45-12, conforming to the current ASTM Standard A536 for Ductile Iron Castings. Bolt holes shall be drilled in accordance with AWWA C115 or ASME B16.1.
- (c) Clamping screws on adaptor flanges shall be zinc-plated, heat treated steel with a minimum tensile strength of 28 Mpa.
- (d) Submit shop drawings in accordance with E8 of this specification.

E17.2.5 Miscellaneous Metal Fabrications

- (a) See section E20.

E17.2.6 Pipe Supports and Hangers

- (a) Pipe supports and hangers to be as shown on the Drawings and in accordance with E20.

E17.2.7 Fasteners

- (a) Flange nuts and bolts shall be ASTM A276, Type 316 stainless steel sized to requirements of flange. Thread-on bolts to extend past nut a minimum of 6 millimetres.
- (b) Anchors shall be Kwik-bolt or Rawl Stud ASTM A276, Type 316 stainless steel. Embedment depth and size, where not shown on the Drawings, to be as required for load being carried or resisted.

E17.2.8 Gaskets

- (a) Flange gaskets shall be full faced rubberized cloth gaskets, 3mm in thickness.
- (b) Rubber gaskets for adaptor flanges shall conform to AWWA C111, Standard for Rubber-gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings.

E17.2.9 Cast-in-Place Concrete

- (a) Concrete to be in accordance with CW 2160 and CSA A23.1.
- (b) Concrete mix design shall be in accordance with performance alternative and shall have the following properties:
 - (i) Class of exposure: S-1
 - (ii) Minimum compressive strength at 28 days: 35 MPa
 - (iii) Maximum slump: 80mm (\pm 20mm)
 - (iv) Air Content: 5% – 8%
 - (v) Maximum Water/Cement Ratio: 0.40
- (c) Lean-Mix concrete design for proportioning of fine aggregate, coarse aggregate, cement, and water shall be as follows:
 - (i) Cement: Type 50
 - (ii) Minimum compressive strength at 28 days: 15 MPa
 - (iii) Slump: 80mm
 - (iv) Air Content: nil
 - (v) Maximum Water/Cement Ratio: 0.49

E17.2.10 Grout,

- (a) Grout to be S.P.I. Rapid Repair Grout, Sika Grout 212 or an approved equal.

E17.2.11 Bonding Agent

- (a) Bonding agent to be Acryl-Stix or approved equal.

E17.2.12 Reinforcing Steel

- (a) Reinforcing steel and dowels to be in accordance with CW2160 and CAN/CSA G30.18, Grade 400 except as amended or supplemented herein.
- (b) Epoxy resin for bonding dowels to hardened concrete to be ASTM C881, Type 1, Grade 3.
- (c) Bar accessories:
 - (i) To be made from a non-corroding material,
 - (ii) Shall not stain, blemish or spall the concrete surface for the life of the concrete.
 - (iii) Accessories shall include bar chairs, spacers, clips, wire ties (18 gauge min.), or other similar devices approved by the Contract Administrator. Bar accessories are not shown on the Drawings and the supply and installation of of these accessories shall be incidental to the Contract Work.
 - (iv) Shall be approved by the Contract Administrator.
 - (v) Bar chairs shall be PVC, galvanized bar chairs are not acceptable.
- (d) Submit shop drawings in accordance with E8 of this specification.

E17.2.13 Pre-Cast Concrete Manholes

- (a) In accordance with section 2.7 of CW 2130 and as shown on the Drawings.

E17.2.14 Manhole Frame and Covers

- (a) Large diameter Titan TF-114 cast iron frames and covers or an approved equal. Covers shall be unmarked. Frames to be 225 millimetres high unless shown differently on the Drawings.

E17.2.15 Backfill

- (a) In accordance with CW 2030. Class of Backfill to be shown on the Drawings.
- E17.2.16 Paint
 - (a) See section E21.
- E17.2.17 Pump Level Controls and Alarm
 - (a) Contractor to maintain and use existing Displaced Pressure Cell system for level control and pump activation for the new pumps.
 - (b) Contractor to use existing Flygt Ball system Station High Water Alarm.
- E17.2.18 Gate Valves
 - (a) Cast iron body with flanged ends equipped with outside rising stem, screw and yoke; bronze trimmed cast iron wedge; bronze stem, double O-ring stem seals and 50 millimetre square operating nut.
 - (b) Flanges shall conform in dimension and drilling to ANSI/ASME B16.1, Class 125.
 - (c) Direction of opening shall be counter clockwise and shall be clearly stamped or indicated with raised letters and arrow.
 - (d) Manufacturer's nameplate shall be attached to the valve body with stainless steel fasteners.
 - (e) Gate valves shall be as manufactured by Clow Canada, Crane, Mueller Canada or approved equal.
 - (f) Submit shop drawings of gate valves in accordance with E8 of this specification.
- E17.2.19 Check Valves
 - (a) Ductile iron body with flanged ends and removable inspection cover manufactured and tested in accordance with AWWA C508.
 - (b) Flanges shall conform in dimension and drilling to ASME B16.1, Class 125.
 - (c) ASTM D2000-BG, Buna - N (NBR) sewage resistant rubber flap and Type 302 stainless steel disc accelerator.
 - (d) Attach manufacturer's nameplate to the valve body with stainless steel fasteners.
 - (e) Acceptable product: Val-Matic Series 500 or approved equal.
 - (f) Submit shop drawings of check valves in accordance with E8 of this specification.
- E17.2.20 Wet Well Valve Stem Extension, Guides and Brackets
 - (a) Stem Extension: 38 millimetre diameter ASTM A276 Type 304 stainless steel, schedule 40 pipe with a 50 millimetre operating nut, as detailed on the Drawings.
 - (b) Guides and Brackets: ASTM A276, Type 304 stainless steel suitable for keeping the extension plumb and centered in the valve box while not interfering with the operation of the valve stem.
 - (c) Submit shop drawings of the valve stem extension, guides and brackets in accordance with E8 of this Specification.
- E17.2.21 Ventilation
 - (a) See section E19.
- E17.3 Construction Methods
 - E17.3.1 General
 - (a) Install the new station piping and pumping equipment as indicated in this specification and shown on the Drawings. Make no changes, revisions or substitutions to the layout without obtaining written approval from the Contractor Administrator.
 - (b) Be aware of and contend with the wastewater in the existing forcemain when preparing to make the required piping modifications.

- (c) Prior to pumping unit installation, provide a portable sewage pump and discharge hose to remove remaining wastewater in the wet well. The wastewater shall be directed to the upstream manhole or to a sewage hauler for disposal.
- (d) Excavation for construction shall be by the shored excavation method and the Contractor shall prepare for the Contract Administrator's review of a Construction Method submission detailing the following:
 - (i) Construction sequence to be followed including all methods to ensure no damage occurs to existing structures or adjacent properties within or adjacent to an excavation.
 - (ii) Shoring system to be used.
 - (iii) Specialized equipment to be used.
 - (iv) Any design revisions proposed to accommodate the Contractor's proposed construction method.
 - (v) Water control considerations including details on the Contractor's proposed method of groundwater and surface runoff water control.
 - (vi) The Contractor shall respond to any concerns that may be raised by the Contract Administrator after review of the Construction Method submission.

E17.3.2 Flow Control and Temporary By-Pass Pumping

- (a) Provide flow control measures and temporary by-pass pumping as shown on the Drawings and in accordance with E13 of this Specification.

E17.3.3 Excavation

- (a) Excavation in accordance with CW 2030. Remove any existing pre-cast riser and manhole sections as excavation progresses. Take care not to damage any adjacent structural components.
- (b) Cover and provide safety precautions acceptable to the Contract Administrator for excavations not backfilled.
- (c) Remove excavated material from the site immediately. Excavated material shall not be stockpiled on-site unless it is determined by the Contract Administrator to be suitable for use as backfill.
- (d) Excavation for installation of new precast manhole sections – place a minimum 75 millimetre thick lean mix concrete slab at the bottom of the excavation to provide a clean working base upon completion of the excavation to the required limits. Allow the concrete to set for twenty-four (24) hours before setting up forms or placing reinforcing steel.
 - (i) Supply and place lean mix concrete, as directed by the Contract Administrator, as backfill for any portions of the excavation, carried beyond the required limits of excavation. The limits of excavation shall be considered to be the inside face of the shoring system and the underside of the working base slab.
- (e) All working areas below grade shall be kept adequately and securely supported during and after excavation until the shoring and bracing is in place to prevent loss of ground or injury to any person from falling material.

E17.3.4 Locating Ground Services

- (a) The contractor shall be responsible for locating the existing wet well and a precast manhole on top of it.
- (b) Costs for locating the wet well shall be considered to incidental to the Contract Work.

E17.3.5 Excavation Security Fence

- (a) Further to Clause 3.1 of CW 1130, completely cover the excavation and provide a security fence to completely surround the excavation when unattended in accordance with the following:

- (i) Security fence shall be chain link fence or approved equal, a minimum 1.80 metres high with metal support posts embedded far enough into the ground and spaced close enough together so the fence will not sag or collapse.
- (ii) Attach fencing securely to posts.
- (iii) Secure the gate or end of the fencing to a post with chain and a padlock.
- (iv) Provide alternate security fence proposal to Contract Administrator for approval.

E17.3.6 Shoring

- (a) The type, strength, and amount of shoring and bracing shall be such as the nature of the ground and attendance conditions may require, taking into account property lines, existing slopes, utilities and roadways.
- (b) Shoring and bracing shall be so spaced and dimensioned as to prevent caving, loss of ground, surface settlement, or squeezing of the soil beyond the neat lines of excavation. It shall be free from defects that might impair its strength or suitability for the work. Sheeting/shoring and bracing shall conform to the latest revisions of the "Construction Safety Act" of the Department of Labour of the Government of Manitoba.
- (c) Supporting design calculations as required to facilitate review of the submission for conformance with the Contract Documents.
- (d) Submit Shop Drawings and design calculations for the shoring/excavation system designed and sealed by a Professional Engineer registered or licensed to practice in the Province of Manitoba and experienced in the structural design of shoring systems. The designer of the shoring system shall inspect the system during construction and certify, in writing to the Contract Administrator, that construction is in conformance with the approved design.
- (e) Shoring and bracing shall be installed such that the structure size, wall thickness, and any work relating to the construction of the manhole risers as shown on the drawings can be achieved subsequent to installation of the shoring system.
- (f) Shoring and bracing shall remain in place until concrete has attained 75% of the design strength.

E17.3.7 Backfill

- (a) Place and compact backfill material as indicated on the Drawings in accordance with CW 2030. Do not place backfill material in a frozen state. Supply heating and hoarding in accordance with CW 2160 if required to ensure material does not freeze before compaction is complete.
- (b) Notify the Contract Administrator at least one (1) full working day in advance of any backfilling operation. No Backfill shall be placed against concrete until approved by the Contract Administrator and in no case before field cured test cylinders show the concrete strength to be 75% of that specified

E17.3.8 Construction Sequence

- (a) Arrange construction activities and sequence to be able to remove temporary inflatable sewer plug(s) and restore pumping station operation as soon as possible after completion.

E17.3.9 Existing Pump Level Controls and Alarms

- (a) Maintain and protect existing pump controls and float type alarms, located in the wet well or in the other areas of the Station, during the execution of the work until all the equipment is ready for installation.

E17.3.10 Pumping Unit and Piping Installation

- (a) The existing station pumping setup consists of only two pumps (pumps # 1 and #2) with respective piping. There is existing suction piping through the wet-well wall but no existing pump in the pump # 3 location as indicated on the drawings.

- (b) Remove all existing piping as indicated in the Specifications and on the Drawings and replace with new piping.
- (c) Installation to be as follows:
 - (i) Prepare and arrange for temporary shutdown of station in accordance with E12 and have temporary by-pass pumping operations in accordance with E13.
 - (ii) Where steel pipe is used for fittings or filler pipes, it shall be field measured and fitted before fabrication.
 - (iii) Piping and fitting welds shall be full penetration butt type in accordance with ANSI/ASME B31.9. Welders shall be fully qualified and licensed by Provincial Authorities. Welds which do not penetrate fully will not be accepted.
 - (iv) Weld steel flanges on both the inside and the outside in conformance with AWWA Standard C207.
 - (v) All pipe and equipment shall be adequately protected from on-site welding procedures.
 - (vi) Pumping units shall be installed as per the manufacturer's installation specifications, complete with all required accessories, at the location indicated on the drawing.
- (d) After all three pumps and piping have been completed; all pipes and pipe welds shall be cleaned and prepared for application of primer and paint in accordance with E21.

E17.3.11 Concrete Work

- (a) Make neat openings in walls and floor slabs using concrete coring and cutting equipment and methods.
- (b) Fill openings left in concrete after removal of piping or other equipment with watertight, non-shrink grout. Finish new surfaces flush with the existing surface and match the surrounding surface texture. Primer and paint shall be applied in accordance with E21 if the surrounding surfaces have a paint finish.
- (c) Mix and apply grout in accordance with the manufacturer's instructions.
- (d) Mix and apply bonding agent in accordance with the manufacturer's instructions.
- (e) Neatly grout any concrete surface that has been broken and had the aggregate exposed with a smooth finish similar in texture to that of the surrounding concrete.
- (f) Apply concrete bonding agents between new concrete or grout and existing concrete surfaces. Remove all loose, pitted and scaled concrete and apply bonding agent in accordance with the manufacturer's instructions
- (g) De-scale exposed reinforcing steel and have all rust removed before applying grout.

E17.3.12 Reinforcing Steel

- (a) Reinforcing steel shall be placed accurately in the positions shown on the Contract Drawings. Carefully adjust the location of reinforcing steel adjacent to openings to frame those openings in accordance with good practice, and maintain the bar spacing intent.
- (b) Splices in reinforcing steel shall be made only where indicated on the Contract Drawings. Prior approval of the Contract Administrator shall be obtained where, in the opinion of the Contractor, other splices must be made. All splices shall have laps of at least 40 bar diameters. Welded splices shall not be used.
- (c) A minimum of twenty-four (24) hours notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of reinforcing steel.
- (d) Quality Control
 - (i) The Contractor shall provide, without charge, the samples of reinforcing steel required for quality control tests and provide such assistance and use of tools and construction equipment as is required.

- E17.3.13 Pre-Cast Concrete Manhole Riser Sections
- (a) Install pre-cast concrete manhole riser sections as shown on the Drawings and in accordance with Clauses 3.8 and 3.9 of CW 2130.
- E17.3.14 Miscellaneous Metal Fabrications
- (a) See section E20.
- E17.3.15 Paint
- (a) See section E21.
- E17.3.16 Ventilation
- (a) See section E19
- E17.3.17 Cleanup
- (a) Cleanup construction debris and materials inside the Station, including the wet-well at the end of each day and before pumping station operation is restored.
- E17.4 Measurement and Payment
- E17.4.1 Pumping station modifications and mechanical work installations will be measured on a unit basis and paid for at the Contract Unit Price for "Pumping Station Modifications and Mechanical Work" as supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

E18. ELECTRICAL

E18.1 Description

E18.1.1 This Specification covers the supply and installation of electrical requirements including, but not limited to, power supply, service panels, motor starters, disconnects, lighting, controls, wiring devices, fittings and fastenings, wires and cables and other materials for the wastewater pumping station.

E18.1.2 This Specification also covers the services required for the testing and assistance in commissioning of electrical equipment and systems for the wastewater pumping station

- (a) Include any necessary calibration equipment and certification that test equipment is properly calibrated.

E18.1.3 Submit Shop Drawings for all materials and equipment in accordance with E8 and as indicated in the Specifications.

E18.2 Materials

E18.2.1 Provide labour, materials, transportation, equipment and facilities, etc., required for the complete electrical installation as indicated or implied on the Drawings and Specifications.

E18.2.2 Electrical equipment shall be new, of type and quality specified. Equipment and material to be CSA certified and manufactured to standards described. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval the appropriate Inspection Departments.

- (a) Factory assembled control panels and component assemblies shall be CSA certified.

E18.2.3 All equipment shall be suitable for the environment (hazardous / corrosive areas, etc.) in which it is installed. In cases where equipment suitability is questionable (i.e. the Contract Administrator) the Contractor shall prove that the equipment is suitable (via manufacturer assurance of compliance) or shall replace the equipment at no extra cost.

E18.2.4 Approved Equals / Alternatives

- (a) The listing of manufacturer and his respective type or catalogue number as the basis of design, is to establish the construction features, sizes, quality and accessories of an item of equipment in addition to the characteristics specified.

- (b) Approval of equivalent products will be granted on the basis of the manufacturer and general design only. Such approval does not relieve the Contractor from providing all the necessary components and finishes as called for on the Drawings or in the Specifications to meet the functional requirement and intent of the design.
- (c) The Contractor shall make allowances in his bid for the cost of any associated changes made necessary by the selection of an approved product other than that named as the basis of designs. Additional costs due to the departure from equipment named shall be borne by the Contractor.

E18.2.5 Voltage Ratings

- (a) Operating voltages: to CAN3-C235-83.
- (b) Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above Standard. Equipment to operate in extreme operating conditions established in above Standard without damage to equipment.

E18.2.6 Electric Motors, Equipment and Controls

- (a) The electrical contractor shall provide all power, controls cabling and devices as required for a full functioning and complete system.
- (b) Control wiring and conduit includes all conduit, wiring, and connections which are related to control systems.

E18.2.7 Conduits

- (a) Shall be rigid, threaded, aluminium conduit.
 - (i) Rigid Metal conduit to: CSA C22.2 No. 45.
- (b) Shall be flexible, liquid tight, aluminium conduit c/w PVC jacket.
 - (i) Flexible metal conduit to: CSA C22.2 No. 56.
- (c) Fittings and raceways to CSA C22.2 No. 18-M.
- (d) Drawings do not indicate all conduit runs. Those indicated are in diagrammatic form only.
- (e) All non-armoured cable shall be run in aluminium conduit.

E18.2.8 Conduit Fastenings

- (a) One hole aluminium straps to secure surface conduits 50 mm and smaller. Two hole aluminium straps for conduits larger than 50 mm.
- (b) Channel type aluminium supports for two or more conduits at 1.4 m on centre. Maximum support spans as per the CEC.

E18.2.9 Conduit Fittings

- (a) Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- (b) Factory "ells" where 90° degree bends are required for 25 mm and larger conduit.
- (c) Aluminium threaded, watertight sealing fittings and couplings shall be used.
- (d) Aluminium watertight threaded hubs for connection to boxes or panels.
- (e) Approved manufacturer: Thomas & Betts.

E18.2.10 Fish Cord

- (a) Shall be polypropylene.

E18.2.11 Building Wires

- (a) Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG, except where indicated on the Drawings.
- (b) Copper conductors: size as indicated, with 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.

E18.2.12 Control Cables

- (a) Type LVT: soft annealed copper conductors, 16 AWG twisted shielded, control and instrumentation cable (CIC) run in conduit. Cables complete with thermoplastic insulation, outer covering of thermoplastic jacket.

E18.2.13 Teck 90 Cable, 1000 Volt

- (a) Conductor and ground wire:
 - (i) Class B stranded copper.
 - (ii) Insulation – RW90 XLPE
- (b) Inner Jacket – PVC
- (c) Armour – Aluminium
- (d) Outer Jacket – PVC, black colour for 1000 volt
- (e) Flexibility at low temperature – suitable for installation at -40° C
- (f) Flame spread rating – FT4
- (g) Standards – CSA C22.2 No. 131 and 174, HL-CD rated where required

E18.2.14 Cable Fittings

E18.2.15 Teck cable approved manufacturers:

- (a) Thomas & Betts Star Teck ST series, aluminium.
- (b) Thomas & Betts watertight aluminium connector c/w aluminium sabre tooth armour grounding ring.

E18.2.16 Motor Starters to 600 Volt

- (a) NEMA rated contactors and motor starters.
- (b) Submit Shop Drawings in accordance with E8 and indicate the following:
 - (i) Mounting method and dimensions,
 - (ii) Starter size and type,
 - (iii) Layout of identified internal and front panel components,
 - (iv) Enclosure types,
 - (v) Wiring diagram for each type of starter,
 - (vi) Interconnection diagrams.
- (c) Provide five (5) copies of Operation and Maintenance data for motor starters to be included with the Operation and Maintenance manuals as indicated in E9.

E18.2.17 Full Voltage Magnetic Two-Speed Starters

- (a) Enclosed in a Nema 1 wall mounted enclosure, supply and install a two-speed non-combination magnetic starter, size 1, 600 V, 3Ø, as indicated on the Drawings and complete with the following components:
 - (i) Contactor solenoid operated, rapid action type.
 - (ii) Motor overload protective device in each phase, and for each speed selection, manually reset from outside the enclosure.
 - (iii) Eutectic (thermal) overloads. Solid state overloads are not acceptable.
 - (iv) Wiring and schematic diagram inside starter enclosure in visible location.
 - (v) Identify each wire and terminal for external connections within starter, with permanent number marking identical to diagram.
- (b) Accessories:
 - (i) Selector switches: Hi / Low remote mounted speed switch.
 - (ii) Indicating lights: Red run light – High speed
White run light – Low speed.

- (iii) 1 – N/O and 1 – N/C spare auxiliary contacts.
 - (iv) Control transformer.
 - (v) Overloads
- (c) Apply finishes to the enclosure in accordance with the Specifications.
- (d) Standard of Acceptance: Square D, Class 8810. Approved equals by: Eaton Cutler Hammer, Allen Bradley.

E18.2.18 Soft Starters

- (a) MCC mounted soft starter of size, type, rating and enclosure type as indicated with components as follows:
- (i) Thyristor based speed control.
 - (ii) Adjustable maximum starting current: 1.5 to 7 times.
 - (iii) Overload protective (solid state) provided by soft start, manually reset from outside the enclosure.
 - (iv) Wiring and elementary schematic diagram inside the starter enclosure in visible location.
 - (v) Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
 - (vi) Switched power factor correction unit.
- (b) Accessories:
- (i) Two configurable, programmable relay outputs.
 - (ii) Four logic inputs.
 - (iii) Indicating lights: Red run light.
 - (iv) Permitting padlocking in the "OFF" position.
- (c) Standard of Acceptance: Square D Altistart. Approved equals by: Eaton Cutler Hammer, Allen Bradley.

E18.2.19 Control Transformers

- (a) Single phase, dry type, control transformers with primary voltage as indicated and 120 V secondary, complete with primary and secondary fuses, installed with starter and soft starts as indicated.
- (b) Size control transformer for control circuit load plus 20 percent spare capacity.
- (c) Provide control fuses on primary and secondary of all transformers using ceramic type.

E18.2.20 Overload Relay

- (a) Eutectic alloy or bimetallic type, sized as per the motor nameplate information.

E18.2.21 Circuit Breakers - General

- (a) Include time-current characteristics curve for breakers with 100 Amp and over at system voltage.
- (b) Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation.
- (c) Common-trip breakers: with single handle for multi-pole applications.
- (d) Short circuit level for 600 volt breakers to be 22 kA minimum and 240 volt breakers to be 10 kA minimum.
- (e) Submit shop drawings in accordance with E8.
- (f) Thermal Magnetic Breakers: Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

- (g) Acceptable manufacturers: Cutler-Hammer, Square D and Siemens or approved equal.

E18.2.22 Panelboards

- (a) Shall be able to accommodate breakers as indicated in E18.2.21.
- (b) Panelboards: product of one manufacturer. Square D, NQOD Style panelboard. Approved equals by Cutler-Hammer and Siemens.
 - (i) Install circuit breakers in panelboards before shipment as per manufacturer's recommendations.
 - (ii) In addition to CSA requirements, manufacturer's nameplate must show fault current that panel, including breakers, has been built to withstand.
 - (iii) Shall be factory mounted integral to the MCC.
- (c) 100 A, 120/208 V, 3Ø panelboard: bus and breakers rated for 10 kA symmetrical interrupting capacity or as indicated.
- (d) Sequence phase bussing with odd numbered breakers on left side and even numbered breakers on right side, with each breaker identified by permanent number identification as to circuit number and phase.
- (e) Panelboards: Copper mains, 24 branch circuits with number and size of branch circuit breakers as indicated.
- (f) Two keys for each panelboard and key panelboards alike.
- (g) Bussing shall be copper, complete with a fully rated neutral copper bus
- (h) NEMA Type 1 enclosure.
- (i) Complete with lockable front cover door, and two keys.
- (j) Submit Shop Drawings in accordance with E8 and include electrical detail of panel, branch, breaker type, quantity, ampacity and enclosure dimension.
- (k) Panelboard Breakers
 - (i) Breakers shall be bolt-on type.
 - (ii) Breakers with thermal and magnetic tripping in panelboards unless otherwise indicated.
- (l) Panelboard Equipment Identification
 - (i) Provide equipment identification in accordance with E18.2.2.
 - (ii) Nameplate for each panelboard to be size 4, engraved.
 - (iii) Nameplate for each circuit in distribution panelboards to be size 2, engraved.
 - (iv) Complete circuit directory with typewritten legend showing location and load of each circuit.

E18.2.23 Transformers

- (a) Dry-type transformers: to CSA C9.
- (b) KVA rating: as indicated on single line drawings
- (c) H insulation system class, 150° C temperature rise.
- (d) Impedance: standard.
- (e) Windings shall be copper.
- (f) Transformer core and coils to be mounted on anti-vibration pads.
- (g) Enclosure: shall be mounted within the MCC enclosure.
- (h) Voltage Taps: four – 2 ½ %, 2 FCAN and 2 FCBN.
- (i) Provide equipment identification in accordance with E18.2.2.
- (j) Acceptable manufacturers: Hammond, REX, Cuttler-Hammer and Schneider.

- (k) Submit to Contract Administrator or Consultant copies of standard factory test certificates of each transformer and type of test of each transformer in accordance with CSA C9.
- (l) Submit Shop Drawings in accordance with E8 and indicate the following:
 - (i) Dimensioned drawings showing enclosure, mounting devices, terminals, taps, internal and external component layouts.
 - (ii) kVA rating.
 - (iii) Primary and secondary voltages.
 - (iv) Frequency.
 - (v) Phase.
 - (vi) Polarity or angular displacement.
 - (vii) Full-load efficiency.
 - (viii) Regulation at unity pf.
 - (ix) BIL.
 - (x) Insulation type.
 - (xi) Sound Rating.
 - (xii) MCC mounting arrangement.

E18.2.24 Motor Control Centre

- (a) Standards: CAN/CSA – Q9000, Quality Management and Quality Assurance Standards – Guidelines for selection and use.
- (b) Rating: 400 A, 600 V, 60 Hz, 3 Phase, 3 wire.
- (c) Compartmentalized vertical sections with common power busbars.
- (d) Floor mounting, free standing, enclosed dead front.
- (e) Indoor CSA 1 gasketed enclosure, front mounting.
- (f) Class I, Type B wiring.
- (g) Ground fault indication c/w MCC panel mounted lights.
- (h) Standard of Acceptance: Square D Model 6 LVMCC – Industrial Package. Approved equals by Cuttler-Hammer and Allen Bradley.
- (i) Vertical Section Construction
 - (i) Independent vertical sections fabricated from rolled flat steel sheets bolted together to form a rigid, completely enclosed assembly.
 - (ii) Each vertical section to be divided into compartment units, minimum 305 high and as indicated.
 - (iii) Each unit to complete top and bottom steel plate for isolation between units.
 - (iv) Horizontal wireways, equipped with cable supports across top and bottom, extending full width of motor control centre and isolated from busbars by steel barriers.
 - (v) Vertical wireways c/w doors for load and control conductors extending full height of vertical sections and equipped with cable tie supports. Installation wiring to units accessible with doors open and units in place.
 - (vi) Openings, with removable cover plates, in sides of vertical sections for horizontal wiring between sections.
 - (vii) Incoming cables to enter at top with terminals as required.
 - (viii) Provision for outgoing cables to exit through top and/or bottom, with terminals.
 - (ix) Removable lifting means.
 - (x) Provision for future extension of both ends of motor control centre, including busbars, without need for further drilling or field preparation.

- (xi) Divide assembly for shipment to site, complete with hardware and instructions for re-assembly.
- (xii) Incoming section to be designed for cable top entry.
- (j) Sills: Continuous 25 mm epoxy coated steel floor sills for mounting bases with 19 mm diameter holes for bolts.
- (k) Busbars
 - (i) Main horizontal and branch vertical, three phase high conductivity tin plated copper busbars in separate compartment bare self –cooled, extending the entire width and height of motor control centre, supported on insulators and rated:
 - Main horizontal busbars: 600 A
 - Branch vertical busbars: 300 A
 - (ii) Branch vertical busbars for distribution of power to units in vertical sections.
 - (iii) No other cables, wires, equipment in main and branch busbar compartments.
 - (iv) Brace buswork to withstand effects of short circuit current of 22kA rms symmetrical.
 - (v) Bus supports: with high dielectric strength, low moisture absorption, high impact material and long creepage surface designed to discourage collection of dust.
- (l) Ground Bus: Copper ground bus extending entire width of motor control centre.
- (m) Control Units
 - (i) Provide starters in accordance with the Specifications for same.
 - (ii) Provide circuit breakers in accordance with Specifications for same.
- (n) Control Unit Compartments
 - (i) Units EEMAC size 1 and smaller, circuit breaker units 30 A and smaller, plug-in type with self-disconnect. Guide rail supports for units to ensure that stabs make positive contact with vertical bus. Provision for the units to be installed or removed, off load, while buses energized.
 - (ii) Unit mounting:
 - Engaged position – unit stabbed into vertical bus.
 - Withdrawn position – unit isolated from vertical bus but supported by structure.
 - Provision for positive latching in either engaged or withdrawn position and padlocking in withdrawn position.
 - Stab-on connectors free floating tin plated clips, self aligning, backed up with steel springs.
 - (iii) External operating handle of circuit switch interlocked with door to prevent door opening with switch in “ON” position. Provision for Padlocks to lock operating handle in “OFF” position and lock door closed.
 - (iv) Hinge unit doors on same side.
 - (v) Overload relays manually reset from front with door closed.
 - (vi) Soft start overload reset button to be manually reset from front with door closed.
 - (vii) Devices and components by one manufacturer to facilitate maintenance.
 - (viii) Pull apart terminal blocks for power control to allow removal of starter units without removal of field wiring.
- (o) Motor Control Centre Equipment Identification in accordance with E18.2.2.
- (p) Submit Shop Drawings in accordance with E8 and indicate the following:
 - (i) Outline dimensions.
 - (ii) Configuration of identified compartments.

- (iii) Floor anchoring method and dimensioned foundation template.
- (iv) Cable entry and exit locations.
- (v) Dimensioned position and size of busbars and details of provision for future extension.
- (vi) Schematic and wiring diagrams.
- (q) Provide five (5) copies of Operation and Maintenance data for motor control centres to be included with the Operation and Maintenance manuals as indicated in E9.
 - (i) Include data for each type and style of starter
 - (ii) Provide manufacturer's type test certificates including short circuit fault damage certification up to short circuit values specified under bus bracing.

E18.2.25 Electrical Controls

- (a) Ensure all equipment is new and CSA approved.
- (b) Local Control Stations
 - (i) Heavy duty control stations, in EEMAC 4X enclosure as indicated on the drawings, complete with back plate, DIN rail terminal blocks, legend plates, selector switch and all other accessories as required.
 - (ii) Approved manufacturers are Weidmuller, Hoffman, Allen Bradley Bulletin 800H.
- (c) Control Relays
 - (i) Control relays as indicated on the schematic and wiring diagrams.
 - (ii) Approved manufacturer is Ormon.
- (d) Control Panels: as part of the MCC, shall be custom built and factory installed by the supplier of the MCC. Control devices, terminal blocks, wiring, etc. are as indicated on the drawings. Where an item is to be relocated from the existing control panel, the Contractor shall field install, field calibrate, and program the device so as to provide a complete and functioning system.

E18.3 Construction Methods

E18.3.1 Electrical Demolition Work

- (a) Disconnect, provide demolition and remove the existing motor control centre (MCC) located below grade (at the same location as the new MCC).
- (b) Remove all associated soft starters, and other un-used devices.
- (c) Disconnect existing branch circuits from the electrical panelboard mounted within the MCC.
- (d) Remove the existing Precision Digital process meter from the existing MCC control / alarm cell and install in the new MCC.
- (e) All equipment and materials removed during demolition shall be returned to the City of Winnipeg.

E18.3.2 New Work

- (a) Site confirm, locate and hydro excavate the existing service trench from the CSTE to the Wastewater Pumping Station. Enlarge trench and provide parallel cable, identical to the existing cable. Provide new neutral lugs in existing CSTE (drill hole in bus bar, etc – obtain Department of Labour certification).
 - (i) Contract CSTE modifications to J.R. Stephenson and include all modifications in bid submission.
 - (ii) For work to take place during winter conditions, Hydro excavation will require winter provisions to complete the work.
 - (iii) Temporary power to be provided by contractor for lighting, building heating, construction requirements and all electrical power requirements.

- (b) Provide new service entrance rated fuse disconnect switch and new MCC as indicated on the Drawings. Provide parallel cabling in conduit from fused disconnect switch to the new MCC. New cabling and conduit shall be identical and parallel to the existing cable/conduit. Provide all requirements in order to move the MCC into the lower level of the Wastewater Pumping Station, including, but not limited to, rental of a hoist, lift and any other equipment for transportation and placement. Coordinate use of Station access with the Contract Administrator.
- (c) Extend and connect 120/208 V branch circuits into the new MCC mounted electrical panel. Provide cabling and conduit as required. For cable runs that are too short, supply and install new cables.
- (d) Provide instrumentation and controls, and all required cables/wiring and conduit as indicated on the Drawings or in the Specifications.
- (e) Provide warning labels indicating arc flash energies and PPE requirements on all equipment where arc flash levels are indicated on the single line drawing. This includes the existing CSTE, the incoming fused disconnect switch, the MCC, etc.
- (f) Provide testing and commissioning of the alarms and control section. Provide calibration as required in order for the system to work as intended.
- (g) Supply all cabling, wiring, starter and disconnect as required to complete modifications for ventilation fan as detailed on the Drawings and in accordance with the Specifications.
- (h) Provide testing and commissioning of the Soft Starts and power factor correction. Contractor to employ a factory trained technician to perform/assist contractor with final commissioning and verification of the operation of the systems.
- (i) Provide training to the owner's representatives on the operation systems including soft start operations, level control and alarms, fan control, etc.
- (j) Provide labour and materials for all other items as per the Drawings and the complete Specifications package.
- (k) Store all materials in an area designated and approved by the Contract Administrator.

E18.3.3 Contractor will record, on a set of Drawings, all as-built information as the Work progresses, including all conduit, cable routing and circuitry. The as-built drawings to record all field modifications.

E18.3.4 Standards and Codes

- (a) This section covers items common to Sections of Division 16 and supplements requirements of other divisions. Within the text of these Specifications, reference is made to the following standards:
 - (i) EEMAC – Electrical and Electronic Manufacturers Association of Canada,
 - (ii) CEMA – Canadian Electrical Manufacturer's Association,
 - (iii) NEMA – National Electrical Manufacturers Association,
 - (iv) IEEE – Institute of Electrical and Electronic Engineers,
 - (v) IPCEA – Insulated Power Cable Engineers Association,
 - (vi) CSA – Canadian Standards Association,
 - (vii) ULC – Underwriters Laboratory of Canada,
 - (viii) CEC – Canadian Electrical Code.
- (b) Materials to carry CSA approval and conform to CEMA, EEMAC and ULC standards.
- (c) Equipment wiring and wiring devices shall meet the requirements of the Canadian Electrical Code – CSA C22.1-06 and all current City of Winnipeg amendments and bylaws, and Manitoba Hydro amendments and bylaws.
- (d) Where an equipment manufacturer has been identified in the Contract or an equal product approved, substitutions will be subsequently permitted only where it can be shown that unusual or unforeseen circumstances will cause unacceptable delays in

completion of the work. The Contractor will be responsible to ensure that no delays are caused or additional costs incurred through the use of approved alternates or equals.

E18.3.5 Care Operation and Start-up

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

E18.3.6 Permits, Fees and Inspection

- (a) Submit to Local Authority having jurisdiction all the necessary number of Drawings and Specifications for examination and approval prior to commencement of Work.
- (b) Pay associated fees.
- (c) Notify the Contract Administrator of changes required by the Local Authority having jurisdiction prior to making changes.
- (d) Furnish Certificates of Acceptance from authorities having jurisdiction on completion of Work to the Contract Administrator.

E18.3.7 Finishes

- (a) Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and a minimum two coats of finish enamel.
 - (i) Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.
 - (ii) Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.
- (b) Clean and touch-up surfaces of shop painted equipment scratched or marred during shipment or installation to match original paint.
- (c) Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rust.

E18.3.8 Equipment Identification

- (a) Identify electrical equipment with labels as follows:
 - (i) Nameplates: Lamicoid 3 mm thick plastic engraving sheet, white face, black core, mechanically attached with self tapping screws.
 - (ii) Nameplate Sizes:
 - Size 1 10X50 mm 1 Line 3 mm High Letters
 - Size 2 12X70 mm 1 Line 5 mm High Letters
 - Size 3 12X70 mm 2 Lines 3 mm High Letters
 - Size 4 20X90 mm 1 Line 8 mm High Letters
 - Size 5 20X90 mm 2 Lines 5 mm High Letters
 - Size 6 25X100 mm 1 Line 12 mm High Letters
 - Size 7 25X100 mm 2 Lines 6 mm High Letters
 - (iii) Labels: Embossed plastic labels with 6 mm high letters, unless otherwise specified.
 - (iv) Wording on labels to be approved by the Contract Administrator prior to manufacture.
 - (v) Allow for average of twenty-five (25) letters per label.

- (vi) Identification to be in English.
- (vii) Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- (viii) Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- (ix) Terminal cabinets and pull boxes: indicate system and voltage.
- (x) Transformers: indicate capacity, primary and secondary voltages.

E18.3.9 Wiring Identification

- (a) Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- (b) Maintain phase sequence and colour coding throughout.
- (c) Colour code: to CSA C22.1.
- (d) Use colour coded wires in communication cables, matched throughout system.

E18.3.10 Conduit and Cable Identification

- (a) Colour code conduits, boxes and metallic sheathed cables.
- (b) Code with plastic tape or paint at points where conduit or cable enters wall, ceiling and/or floor at 15 m intervals.
- (c) Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	<u>Prime</u>	<u>Auxiliary</u>
• Up to 250 V	Yellow	---
• Up to 600 V	Yellow	Green
• Up to 5 kV	Yellow	Blue
• Up to 15 kV	Yellow	Red
• Telephone	Gold	---
• Other Communication Systems	Gold	Blue
• Fire Alarm	Red	---
• Other Security Systems	Red	Yellow

- (d) All conductors shall be identified by coloured insulation and permanent markers at every terminal and accessible points throughout the entire run.

(e) Conductors:

- (i) Equipment Grounding – Green
- (ii) Neutral Conductor – White
- (iii)

	<u>347 / 600Volt System</u>	<u>120 / 208 Volt System</u>
– Phase A	Red	Red
– Phase B	Black	Black
– Phase C	Blue	Blue

E18.3.11 Wiring Terminations

- (a) Lugs, terminals and screws used for termination of wiring to be suitable for either copper or aluminium conductors.

E18.3.12 Manufacturers and CSA Labels

- (a) Visible and legible after equipment is installed.

E18.3.13 Warning Signs

- (a) As specified and to meet requirements Electrical Inspection Department and the Contract Administrator.
- (b) Decal sign minimum size to be 175 mm X 250 mm.

E18.3.14 Mounting Heights

- (a) Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- (b) If mounting height of equipment is not specified or indicated, verify with Contract Administrator before proceeding with installation.
- (c) Install electrical equipment at the following heights unless otherwise indicated;
 - (i) Local control stations: 1400 mm.

E18.3.15 Load Balance

- (a) Measure phase current to panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- (b) Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- (c) Submit, at completion of work, a report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured and voltage at time of test.

E18.3.16 Workmanship

- (a) Workmanship shall be in accordance with well established practice and standards accepted and recognized by the trade.
- (b) The Contractor shall have the right to reject any item of work that does not conform to the Contract Documents and accepted standards of performance.
- (c) Employ only tradesmen holding valid Provincial Trade Qualification certificates. Tradesmen shall perform only work that their certificate permits. Certificates shall be available for inspection by the Contract Administrator. Apprentices will be allowed, but will be limited to one apprentice for every journeyman, and not all the apprentices will be of the same year.

E18.3.17 Field Quality Control

- (a) Specify exact nature, duration and timing of tests.
- (b) Conduct and pay for tests to confirm phasing, voltage, grounding, load balance and continuity for the following:
 - (i) Distribution system, MCC.
 - (ii) Circuits originating from branch distribution panels.
 - (iii) Motors and associated control equipment including sequenced operation of systems where applicable.
- (c) Furnish manufacturer's certificate or letter confirming that entire installation, as it pertains to each system, has been installed to the manufacturer's instructions.
- (d) Insulation resistance testing:
 - (i) Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - (ii) Megger 350 – 600 V circuits, feeders and equipment with a 1000 V instrument.
 - (iii) Check resistance to ground before energizing.
 - (iv) Carry out tests in presence of Contract Administrator.
 - (v) Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

- (vi) Submit test results for Contract Administrator's review and include certified test result copies in the Operating and Maintenance manuals.

E18.3.18 Work of Other Trades

- (a) Cooperate and coordinate the work specified in this section with the requirements of other units of work specified in other sections.
- (b) Refer to Mechanical Drawings and Specifications for electrical work in connection therewith. Where such work is included in this section of the specification, install such equipment as specified and in accordance the manufacturer's approved shop drawings.
- (c) The Contractor shall rough in for and/or connect up all equipment requiring electrical service, as shown on the Drawings or indicated in the Specifications.
- (d) Supply other trades with all necessary details, roughing-in drawings, etc. as required.
- (e) Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation. Make no deviations, without prior approval of the Contract Administrator.

E18.3.19 Site Examination

- (a) Visit the site before commencing construction to examine all local and existing conditions on which the Work is dependant.
- (b) No consideration will be granted for any misunderstanding of work to be done resulting from failure to visit the site.
- (c) Provide for avoidance of damage and interference to existing work and rectify any damage due to work by this section.
- (d) Disconnect any existing equipment indicated to be re-used, rough-in new position and connect up ready for use. Removal and relocation of electrical equipment shall be completed by relevant section.

E18.3.20 Codes and Standards

- (a) All components of the Contractor's work shall comply with all applicable laws, regulations, codes, standards and with the regulations of the governing inspection authorities at the place of use, including but not limited to the following:
 - (i) American Society for Testing and Materials (ASTM),
 - (ii) D877 – Test for Dielectric Breakdown Voltage of Liquids using Disk Electrodes,
 - (iii) D923 – Method for Sampling Electrical Insulating Liquids,
 - (iv) Provincial Electrical Protection Branch Regulations,
 - (v) Canadian Electrical Codes (CEC) C22.1 and Manitoba Amendments,
 - (vi) Canadian Standards Association (CSA) Standards,
 - (vii) National Electrical Manufacturer's Association (NEMA) Standards,
 - (viii) Electrical Electronic Manufacturer's Association of Canada (EEMAC) Standards,
 - (ix) Instrument Society of America (ISA) Standards,
 - (x) Institute of Electrical and Electronic Engineers (IEEE),
 - (xi) International Electrical Testing Association (IETA),
 - (xii) Workers Compensation Board (WCB).

E18.3.21 Quality Assurance

- (a) Supplier – Installer Qualifications
 - (i) Pre-commissioning and testing of electrical/instrumentation equipment and systems shall be carried out by qualified and experienced personnel who are able to provide evidence that they meet the current recommended qualifications of the following:

- The Canadian Interprovincial Standards for Journeyman Electrician in the Electrical Trade or;
- The Provincial Standards for Journeyman Electrician or Apprentice Electrician in the Electrical Trade.

E18.3.22 Pre-Commissioning Check Lists and Submittals

- (a) Submit notification to begin Pre-commissioning Checks a minimum ten (10) working days prior to the start of Pre-commissioning.
- (b) City of Winnipeg personnel and the Contract Administrator shall be present to witness and the Pre-commissioning Checklists.
- (c) Submit two (2) type-written copies of the Pre-commissioning Checklists to the Contract Administrator.

E18.3.23 Testing and Commissioning Installation

- (a) Inspection: Do not allow or cause any work performed or installed to be covered up or enclosed by work of this section prior to the required inspections, tests and approvals.
- (b) General:
 - (i) Provide all necessary test equipment,
 - (ii) Verify that the nameplate and tag numbers correspond to the specified equipment,
 - (iii) Check for damage or deterioration,
 - (iv) Verify that the grounding connections are complete,
 - (v) Ensure warning signs, barriers and locks are in place prior to the start of testing,
 - (vi) Comply fully with the City's Pre-commissioning/testing and lockout procedures.
- (c) Wires and Cables
 - (i) Inspect all wires and cables to ensure all are numbered with approved markers and tags in accordance with the Drawings.
 - (ii) Inspect all connections to ensure connections have been torqued to the values specified.
 - (iii) Test each conductor for insulation resistance and circuit continuity.
 - (iv) Continuity tests shall be performed with both ends disconnected from the equipment and isolated from ground/earth.
 - (v) Measure continuity of each 600 V and 1000 V power/control conductor and instrumentation conductor with an ohmmeter capable of accurately measuring the expected resistance values.
 - (vi) D.C. resistance shall be less than the following values per 300 meters conductor length:

<u>AWG</u>	<u>Ohms</u>
22	17
20	11
18	7
16	4.5
14	3.0
12	2.5
10	1.5
8	1.0
6	0.7
4	0.5
2	0.4

1/0	0.3
1/0, 2/0, 3/0, 4/0 and larger than 4/00.1	0.2

- (vii) To ensure the shield of instrument cables are grounded at one point only, conduct the following:
 - Temporarily disconnect the shield from the specified ground point and measure the resistance to ground using a low voltage source ohmmeter;
 - If resistance is less than 100 mega-ohm, determine the location of all connections to ground and isolate/insulate the shield as specified.
- (viii) Re-test until all low resistance connections to ground have been eliminated.
- (ix) Upon completion of the test, reconnect the shield to the specified location.
- (x) Megger test the insulation of each 600 V / 1000 V cable conductor while the conductors are disconnected from the terminals or the terminal blocks (Note testing while connected to the terminal blocks may damage sensitive control circuits/relays within the equipment).
- (xi) Do not megger test instrumentation cable conductors.
- (xii) Megger test voltage for 600 V / 1000 V shall be 1000 V.
- (xiii) Minimum insulation resistance shall be 100 mega-ohm.
- (d) Inspect all grounding conductors, including equipment and building grounding accessories and connections.
- (e) Instrumentation testing and commissioning to be completed as per manufacturer's recommendations and process requirements.
- (f) Motor and Process Controllers
 - (i) Verify that the auxiliary transformers, fuses, overloads and current transformers have been properly installed and connected.
 - (ii) Perform operational testing per manufacturer's recommendations of motors, motor control, starters, instruments, interlocks, speed controls, I/O interlocks, auxiliary contacts, relays and motor rotation.
 - (iii) Contractor to program/commission soft starters.
 - (iv) Measure each phase current for all motors, both loaded and unloaded. Record and advise Contract Administrator where current unbalance exceeds manufacturer's recommendations.
- (g) Low Voltage Equipment Testing
 - (i) Measure the insulation resistance of 600 volt equipment using a 1000 volt megger.
 - (ii) Resistance phase to phase (A to B, B to C and C to A).
 - (iii) Resistance of each phase to ground.
 - (iv) Resistance of 120 V windings of control transformers to ground.
 - (v) Resistance of 120 V windings to 600 V winding.
 - (vi) Insulation resistance shall be a minimum of 100 mega-ohms.
 - (vii) Insulation resistance values recorded for transformers to be adjusted to 20° C.
- (h) Assume full responsibility for all construction means and coordinate with the Contract Administrator and other Trades.

E18.3.24 Conduits, Fastenings and Fittings Installation

- (a) All conduits to be surfaced mounted unless otherwise required due to specific equipment location or site conditions.
- (b) Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- (c) Cut all conduits square and ream to remove sharp edges and burrs.

- (d) Use rigid aluminium threaded conduit for all areas inside the pumping station.
- (e) Use liquid tight flexible aluminium conduit for connection to motors
- (f) Minimum conduit size to be 21 mm.
- (g) Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- (h) Mechanically bend conduit over 21 mm diameter.
- (i) Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- (j) Install fish cord in empty conduits.
- (k) Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.
- (l) Dry conduits out before installing wire.
- (m) Site determine location of fire rated walls and penetrations of those walls shall be sealed using an approved fire stop material rated to suit wall fire rating. Common penetration space with other services where possible. Minimize number of penetrations.
- (n) All conduits crossing building expansion joints shall have conduit expansion fittings to suit type of conduit used and shall be Crouse Hinds, Sceptor or an approved equal.
- (o) Seal conduits with duct seal where conduits are run between heated and unheated areas.
- (p) Provide necessary flashing and pitch pockets making water-tight joints where conduit passes through roof, walls or water-tight membranes.
- (q) Provide conduit fittings, pullboxes and junction boxes where necessary.
- (r) Swab out conduit and thoroughly clean before wires and cables are pulled.
- (s) Ensure electrical continuity in all metallic conduit systems.
- (t) Run parallel or perpendicular to building lines.
- (u) Surface Conduits:
 - (i) Group conduits wherever possible.
 - (ii) Do not pass conduits through structural members except with permission of the Contract Administrator.
 - (iii) Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum 25 mm spacing at crossovers.

E18.3.25 Wire and Cable Installation

- (a) Install wiring in conduit systems in accordance with E18.3.24.
- (b) Install all underground cables trenches in accordance with the Drawings and Specifications.
- (c) Conductor length for parallel feeders to be identical. Parallel feeders shall be of the identical wire type, voltage rating, insulation type, armour type, shielded type, etc. It is the responsibility of the Contractor to ensure that parallel feeders will work as intended and meet all aspects of the electrical code, bylaws and to the satisfaction of the Contact Administrator.

E18.3.26 Colour Coding and Numbering

- (a) Colour code all power distribution conductors at both ends throughout the facility.
- (b) Use same colour for same phase throughout, by insulation colour or permanently applied colour banding at all distribution centres, panels and outlet boxes.
- (c) Colour coding to be in accordance with the C.E.C, as indicated in the Specifications and as follows:
 - (i) Equipment Grounding Conductor – green or green with yellow tracer.

- (ii) Neutral Conductor – white.
- (iii) 1 Phase, 3 Wire – red, or black and white.
- (iv) 3 Phase – red (A), black (B) and blue (C).

E18.3.27 Motor Starter Installation

- (a) Install starters, connect power and control as indicated.
- (b) Install overload relay thermal units and ensure that they are of recommended sizes for full load motor currents as shown on the motor nameplates. Report discrepancies to the Contract Administrator.
- (c) Ensure correct fuses and circuit breakers supplied with starters are of rating as shown on the Drawings and indicated in the Specifications. Report discrepancies to the Contract Administrator.
- (d) Ensure soft start overloads and over-current settings are of recommended sizes for full load motor currents as shown on the motor nameplates. Report discrepancies to the Contract Administrator.
- (e) Field Quality Control
 - (i) Perform tests in with assistance from the manufacturer's factory technician in accordance with E18.3.2(h).
 - (ii) Operate switches and contactors to verify correct functioning.
 - (iii) Perform starting and stopping sequences of contactors and relays.
 - (iv) Check that sequence controls, interlocking with other separate related starters, equipment and control devices operate as indicated.

E18.3.28 Transformer Installation

- (a) Transformers shall be factory installed and pre-wired inside the MCC section.
- (b) Energize transformers and check secondary no-load voltage.
- (c) Adjust primary taps as necessary to produce rated secondary voltage at no-load.
- (d) Perform tests in accordance with the manufacturer's recommendations.

E18.3.29 Motor Control Centre Installation

- (a) Provide wiring identification in accordance with the Specifications.
- (b) Paint motor control centre exterior light grey and interior shall be white.
- (c) Set and secure motor control centre in place on channel bases, rigid, plumb and square to building floor and wall.
- (d) Make field power and control connections as indicated on the drawings or as required by the equipment manufacturer.
- (e) Ensure correct overload heater elements are installed, and solid state (soft starters only) overload settings are programmed as per the motor nameplate, into the soft starters.
- (f) Program and commission all soft starters.
- (g) Field Quality Control
 - (i) Perform tests in accordance with the Specifications for Electrical Testing.
 - (ii) Ensure moving and working parts are lubricated where required.
 - (iii) Operate all starters to prove satisfactory performance of motor control centre.

E18.3.30 Electrical Controls Installation

- (a) Install electrical controls in accordance with the Drawings, Engineering Standards and the following:
- (b) Local Control Stations – install and connect control stations.
- (c) Relays – install and connect relays in panels.

- (d) Control and Relay Panels
 - (i) Install, all devices, level and secure inside the control panel.
 - (ii) Drill all top plates to suit cable and conduit entries as required.
 - (iii) Supply and install all terminal blocks, where indicated on the Drawings. Ensure that such terminal blocks are of the manufacturer as indicated in the bill of material.
 - (iv) Ensure that all control wiring is within wiring troughs and is carefully laced and supported to provide neat and orderly installations.
- (e) Commission all instrumentation and controls in accordance with the Specifications.
- (f) Connect miscellaneous control devices as required in accordance with the manufacturer's instructions.
- (g) Inspection and Testing
 - (i) After completion of the installation, test all cables for continuity and grounds. Perform potential test on all cables and equipment. Ensure that all ground connections are properly made. Perform functional test to ensure satisfactory operation of precision digital controller, model 441 alternator, level transmitter and all other pumping level controls.

E18.4 Measurement and Payment

- E18.4.1 Electrical material, equipment and accessories will be measured on a unit basis and paid for at the Contract Unit Price for "Electrical Work" as supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

E19. VENTILATION

E19.1 Description

- E19.1.1 This Specification covers the supply, fabrication, transportation, handling, delivery and installation of ventilation equipment including the fan, blower motor, ductwork piping and related components.

E19.2 Materials

E19.2.1 Fan and Blower Motor

- (a) Supply and install a two-speed ventilation fan and blower, in accordance with the Specifications and as detailed on the drawings, inside the pumping station.
 - (i) High-speed setting to be rated at a minimum 1120 l/s (2375 cfm) and to provide 15 air changes per hour,
 - (ii) Low-speed setting to be rated at a minimum 448 l/s (950 cfm) and to provide 6 air changes per hour.
- (b) Internal and external fan surfaces to be epoxy coated.
- (c) Acceptable products: Northern Blower, Cook CP series or an approved equal.
- (d) Submit shop drawings of fan blower in accordance with E8 of this specification

E19.2.2 Ductwork Piping

- (a) All ductwork piping shall be zinc coated steel strip, spiral 0.60 millimetre (24 ga.) with ribs spaced 150 millimetres apart. Size as indicated on the Drawings. Duct sizes are inside dimensions.
- (b) Duct sealer: Duro Dyne S-2 duct sealer or approved equal.

E19.2.3 Inside Vent Outlets and Louvres

- (a) Titus supply grille model 300FS or approved equal.

E19.2.4 Miscellaneous Metal Fabrications

- (a) See section E20.

E19.2.5 Shop Drawings

- (a) Submit shop drawings for all ventilation materials in accordance with E8 of this specification.

E19.3 Construction Methods

E19.3.1 Fan and Blower Motor

- (a) Remove the existing ventilation fan and blower motor from the existing support stand.
- (b) Install the new ventilation fan and blower motor on the existing support stand in accordance with the manufacturer's instructions. The Contractor shall be responsible to fabricate and install a new support stand, if required and at no additional cost.

E19.3.2 Fresh Air Inlet Duct

- (a) Remove the existing fresh air inlet duct and prepare the existing opening in the wall as required to accommodate the new fresh air inlet duct.
- (b) Seal around wall opening and fresh air duct to make it watertight.
- (c) Connect fresh air inlet duct to new ventilation fan and blower motor using adapters and fittings as required. Install flexible adapter between inlet duct and fan inlet to reduce noise vibration.

E19.3.3 Low Pressure Ductwork

- (a) Location of ductwork shown on drawings is based on existing conditions. Contractor to finalize all measurements and locations of new ductwork before installing.
- (b) Clean and degrease ductwork prior to application.
- (c) Assemble and install ductwork in accordance with recognized industry practices to achieve a virtually airtight and noiseless system.
- (d) Connect ductwork to new ventilation fan and outside exhaust stack using adapters and fittings as required. Install flexible adapter between duct and fan outlet to reduce noise and vibration.
- (e) Install each duct run with a minimum number of joints.
- (f) Keep duct runs level and plumb following building lines. Minimize the use of elbows and other fittings accept as required.
- (g) Align ductwork accurately at connections.
- (h) Locate ductwork so as not to interfere with headroom and present a hazard to personnel.
- (i) Support ducts rigidly with suitable ties, braces, hangers and anchors of a type that will hold ducts true-to-shape and prevent buckling. All material should be suitable for use in a highly corrosive environment.
- (j) Support vertical ducts at every floor.
- (k) Connect lengths of duct pipe with laps in airflow direction.
- (l) Seal joints with a continuous 6.4 millimetre bead of sealer.
- (m) Clean duct system to remove accumulated dust and debris after complete installation.

E19.3.4 Openings in Concrete Floors

- (a) If required, core holes of required size in concrete floors where the new duct will pass through. Existing holes for duct work shall be patched and sealed in accordance with this specification.
- (b) No additional payment will be made for coring and/or patching of holes in concrete.

E19.4 Measurement and Payment

E19.4.1 Ventilation material, equipment and accessories will be measured on a unit basis and paid for at the Contract Unit Price for "Ventilation Work" as supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

E20. MISCELLANEOUS METAL FABRICATIONS

E20.1 Description

E20.1.1 General

(a) This Specification covers the supply, fabrication, transportation, handling, delivery and installation of miscellaneous metal fabrications.

E20.2 Materials

E20.2.1 General

(a) All materials shall be of a type acceptable to the Contract Administrator, and shall be subject to inspection and testing by the Contractor Administrator.

(b) Material intended for use in the various assemblies shall be new, straight and clean, with well defined profiles.

E20.2.2 Steel Sections and Plates

(a) To CAN/CSA G40.20/G40.21, Grade 300 W, except W, HP and HSS sections, which shall be Grade 350 W.

E20.2.3 Steel Pipe

(a) To ASTM A53/A53M, seamless, galvanized, as specified by item.

E20.2.4 Welding Materials

(a) To CSA W59.

E20.2.5 Hot Dipped Galvanized Steel Repair Material

(a) Galvalloy and Gal-Viz

E20.2.6 Stud Anchors

(a) To ASTM A108, Grade 1020.

E20.2.7 Aluminium

(a) To CAN/CSA S157 and the Aluminium Association 'Specifications for Aluminium Structures'. Aluminium for plates shall be Type 6061-T651. Aluminium plate shall have an approved raised oval or multi-grip pattern.

E20.2.8 Isolating Sleeves

(a) "Nylite" – headed sleeve as manufactured by SPAE-Nauru of Kitchener, Ontario, or approved equal.

E20.2.9 Anchor Bolts and Fasteners

(a) ASTM A276, Type 316 stainless steel, of ample section to safely withstand the forces created by operation of the equipment or the load to which they will be subjected.

E20.3 Construction Methods

E20.3.1 Submittals

(a) Submit the qualifications of the fabricator and welders to the Contractor Administrator for acceptance.

(b) Submit shop drawings in accordance with E8 clearly indicating materials, core thickness, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and, accessories. Indicate field measurements on shop drawings.

E20.3.2 Fabrication

- (a) Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured. Assemble work in such a way that no disfigurements will show in the finished work, or impair the strength.
- (b) Confirm measurements for all fabrications before fabricating.
- (c) Cut aluminium plate with edges straight and true, and as far as practical, maintain continuity of the pattern at abutting edges.
- (d) Pieces shall be of the sizes indicated on the Drawings and shall not be built up from scrap pieces. Confirm sizes with field measurements.
- (e) Fit work and shop assemble, ready for erection where possible.
- (f) Use same material for angle frames as for cover plates.
- (g) Supply cover plates with hinges and lifting handles as shown on the Drawings. Provide hasp suitable for a padlock for exterior covers.
- (h) Remove and grind smooth burrs, filings, sharp protrusions, and projections from metal fabrications to prevent possible injury. Correct dangerous or potentially harmful installations as directed by Contract Administrator.
- (i) Steel welding to conform to CSA Standard W.59. Fabricator to be fully approved by the Canadian Welding Bureau, in conformance with CSA Standard W.47.1. Welding to be done by currently licensed welders only.
- (j) Aluminium welding to conform to Welding and be in accordance with the requirements of CSA W59.2. Fabricator to be fully certified in conformance with CSA Standard W47.2. All welding to be done in a licensed welding shop. Obtain Contract Administrator's approval to do field welding.
- (k) Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- (l) Hot-dip galvanize steel after fabrication, in accordance with CAN/CSA-G164, to a minimum net retention of 600 gm/m².
- (m) Seal exterior steel fabrications to provide corrosion protection in accordance with CAN3-S16.1.
- (n) Use self-tapping, shake-proof, flat-headed screws on items requiring assembly by screws.

E20.3.3 Erection

- (a) Steel welding work to be done in accordance with CSA W59.
- (b) Aluminium welding work to be in accordance with CSA W59.2
- (c) Provide components for building in accordance with Shop Drawings and schedule.
- (d) Erect metalwork in accordance with reviewed shop drawings, square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- (e) Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles where not specifically indicated on the Drawings.
- (f) Make field connections with bolts to CAN/CSA-S16, or weld.
- (g) Touch-up rivets, bolts and burnt or scratched surfaces that are to receive paint finish, with zinc primer after completion of erection.
- (h) Repair damaged galvanized surfaces and field welds with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780, Repair of Damaged Hot Dip Galvanizing Coatings. The general procedure shall be to allow a small amount of the repair alloy to flow then spread by brushing briskly with a wire brush. Brushing shall be sufficient to obtain a bright finish. Repeat process three times to ensure a proper thickness is achieved. Temperatures shall be kept below

177°C (350°F) at all times. All heating of structural steelwork shall be done in the presence of the Contract Administrator.

- (i) Install access hatch frames square and level at the locations show on the Drawings. Embed anchors in concrete as shown on the Drawings. Install covers and adjust hardware to proper function.
- (j) Isolate aluminium surfaces in contact with concrete using alkali-resistant bituminous paint meeting the requirements of CGSB 31-GP-3M.
- (k) Install electrochemical isolation gaskets and sleeves to electrically isolate dissimilar metals.

E20.4 Measurement and Payment

E20.4.1 Supply, fabrication, transportation, handling, delivery and installation of miscellaneous metal fabrications will be measured on a unit basis and paid for at the Contract Unit Price for "Pumping Station Modifications and Mechanical Work" as supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

E21. PAINT

E21.1 Description

E21.1.1 General

- (a) This specification shall cover supply and application of paint and associated work for the items included.
- (b) All interior piping shall be painted in accordance with this specification.
- (c) Any new metal surfaces, not already factory finished, shall be painted in accordance with this specification.
- (d) All concrete repairs, patching and new concrete shall be painted in accordance with this specification

E21.2 Materials

E21.2.1 Paint

- (a) Paint materials are to be products of a single manufacturer.
- (b) Colour schedule will be determined by the Contract Administrator from a selection of the manufacturer's full range of colours.

E21.2.2 Paint Finishes

- (a) Formula 1 (Alkyd): for shop primed and unprimed ferrous metal surfaces:
 - (i) Touch-up shop primer (if used) with primer provided by the manufacturer.
 - (ii) One coat marine alkyd metal primer CGSB-1-GP-48M.
 - (iii) Two coats semi-gloss enamel CAN/CGSB-1.57.
 - (iv) Acceptable products: Pratt and Lambert, Benjamin Moore, Glidden, Cloverdale or Northern Paint.
 - (v) Provide color samples to the Contract Administrator for approval before application.
 - (vi) Paint and primer shall be from the same manufacturer.
- (b) Formula 2: for concrete, walls and ceilings:
 - (i) One coat latex primer-sealer CAN/CGSB-1.119.
 - (ii) Two coats semi-gloss enamel CAN/CGSB-1.57.
 - (iii) Acceptable products: Pratt and Lambert, Benjamin Moore, Glidden, Cloverdale or Northern Paint.
 - (iv) Paint and primer to be white.

- (v) Paint and primer shall be from the same manufacturer.

E21.3 Construction Methods

E21.3.1 Standard of Acceptance

- (a) Walls: No defects visible from a distance of 1000 millimetres at 90 degrees to surface when viewed using final lighting source.
- (b) Ceilings: No defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- (c) Piping, valves and pumping equipment: No visible defects from a distance of 1000 millimetres at 90 degrees to surface when viewed using final lighting source.
- (d) Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

E21.3.2 Delivery, Storage and Handling

- (a) Deliver and store materials in original containers, sealed with labels intact.
- (b) Indicate on containers or wrappings:
 - (i) Manufacturer's name and address.
 - (ii) Type of coating.
 - (iii) Compliance with applicable standard.
 - (iv) Colour number in accordance with colour schedule provided by Contract Administrator.
- (c) Observe manufacturer's recommendations for storage and handling.

E21.3.3 Safety Requirements

- (a) Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

E21.3.4 Extra Materials

- (a) Submit one 4-litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish formula.
- (b) Deliver to Owner and store as directed.

E21.3.5 Protection

- (a) Cover or mask floors, walls, and equipment adjacent to areas being coated to prevent damage and to protect from drops and splatters. Use non-staining coverings.
- (b) Protect items that are permanently attached such as Fire Labels on hatch doors, frames, and name plates on equipment.
- (c) Protect factory finished products and equipment.

E21.3.6 Cleaning and Surface Preparation

- (a) Clean and prepare surfaces in accordance with the Manufacturer's instructions and the MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - (i) Remove dust, dirt, and other surface debris by scrubbing, vacuuming and wiping with dry, clean cloths or compressed air.
 - (ii) Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - (iii) Rinse prepared surfaces with clean water until foreign matter is flushed from surface.
 - (iv) Allow surfaces to drain and dry sufficiently as per manufacturer's instruction to allow for painting application.

- (b) Apply primer coat or paint to prepared surfaces if required by the manufacturer.
- (c) Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before protective coating is applied. Apply primer and paint as soon as possible after cleaning before any surface deterioration occurs.
- (d) Clean metal surfaces to be coated by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with section this specification. Remove traces of blast products from surfaces, pockets and corners to be coated.
- (e) Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.
- (f) Do not apply primer or paint to pumps.

E21.3.7 Application

- (a) Apply primer and paint using spray, roller or brush methods in accordance with the paint manufacturer's instructions. Surfaces to be painted shall be thoroughly cleaned of dirt, concrete, grease, weld slag and foreign matter before application. Sufficient drop clothes, shields or other protection shall be provided to protect adjacent piping, equipment, walls and floors from drips or splatters.
- (b) Do not paint over galvanized metal, aluminium, stainless steel, brass or bronze, rubber, plated surfaces, machined surfaces, hangers and nameplates.
- (c) Ventilate area of work by use of approved portable supply and exhaust fans.
- (d) Provide temporary heating where permanent facilities are not available to maintain minimum recommended temperatures.
- (e) Apply paint finish only in areas where dust is no longer being generated by related construction operations such that airborne particles will not affect the quality of the finished surface.
- (f) Apply paint only when surface to be painted is dry, properly cured, and adequately prepared.
- (g) Apply each coat of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- (h) Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- (i) Sand and dust between each coat to remove visible defects.
- (j) Finish top, bottom, edges and cut-outs of doors after fitting as specified for door surfaces.
- (k) Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- (l) Paint both sides and edges of backboards for electrical equipment before installation. Leave equipment in original finish except for touch-up as required.

E21.3.8 Cleanup

- (a) Clean and reinstall all hardware items that were removed before undertaken coating operations.
- (b) Remove over-spray, paint splatter and spills from exposed surfaces that were not intended for painting. Remove smears and spatter immediately as operations progress, using appropriate methods as per manufacturer's instructions.

E21.4 Measurement and Payment

E21.4.1 Protective coating application will be measured on a unit basis and paid for at the Contract Unit Price for "Painting Work" as supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

E22. PUMP START UP

E22.1 New pumps supplied by the City and installed by the Contractor shall not be started up by the Contractor without approval from the Contract Administrator. The Contractor shall provide the Contract Administrator his proposed schedule for each pump start up at least one week in advance in order to allow time for the Contract Administrator to make arrangements with the pump supplier to be present for the start up.

E22.2 If any new pumping equipment (pump, pump controller, motor or drive shaft) fails to operate or perform properly and has to be removed for service as determined by the Contract Administrator, the Contractor shall remove the equipment that fails at no cost to the City and make arrangements with the pump supplier to have the equipment taken to the supplier's shop.

E22.3 The City shall be responsible for the re-installation of the pumping equipment once it has been repaired or replaced.

E22.4 The pumping equipment supplier and contact for this Contract is:

Power and Mine Supply Company Ltd.
4 – 75 Meridian Drive
Winnipeg, Manitoba
Attention: Dan Shamlock, P. Eng.
Telephone (204) 694-9300

E23. SURFACE RESTORATION

E23.1 Description

E23.1.1 This specification shall cover surface restoration and associated items of Work for existing surfaces disturbed by construction activities.

E23.2 Construction Methods

E23.2.1 Restoration of all existing surface areas disturbed by construction activities including but not limited to; excavation for new station, operation of construction equipment, placement of field office or equipment trailer, snow clearing and where construction materials were stockpiled, shall be restored as follows.

- (a) Grassed areas: sodding using imported topsoil in accordance with CW 3510.
- (b) Gravel surfaces: in accordance with CW 3150.
- (c) Asphalt surfaces: match existing base course and asphalt thickness or provide a minimum of 150 millimetres of base course and 75 millimetres of Type 1A Asphaltic concrete whichever is greater, in accordance with CW 3410.
- (d) Pavement slabs in accordance with CW 3310.
- (e) Miscellaneous concrete slabs (median slab, sidewalk, bullnose: in accordance with CW3235
- (f) Concrete curb and gutter: in accordance with CW 3240.
- (g) Interlocking pavement stones: CW 3330.

E23.3 Measurement and Payment

E23.3.1 Costs for surface restoration will be included in the contract unit price for "Pumping Station Modifications and Mechanical Work".