



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 604-2015

NORTH KILDONAN FEEDERMAIN – VALVE CHAMBERS AND CONNECTIONS

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 NORTH KILDONAN FEEDERMAIN – VALVE CHAMBERS AND CONNECTIONS

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, February 3, 2016.

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

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

B3. SITE INVESTIGATION

B3.1 Further to C3.1, the Bidder may view the Site without making an appointment.

B3.2 The Bidder is advised to view the site to account for site access constraints, material laydown and staging areas, and equipment staging areas.

B4. ENQUIRIES

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

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

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

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

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

B5. CONFIDENTIALITY

B5.1 Information provided to a Bidder by the City or acquired by a Bidder by way of further enquiries or through investigation is confidential. Such information shall not be used or disclosed in any way without the prior written authorization of the Contract Administrator. The use and disclosure of the confidential information shall not apply to information which:

- (a) was known to the Bidder before receipt hereof; or
- (b) becomes publicly known other than through the Bidder; or
- (c) is disclosed pursuant to the requirements of a governmental authority or judicial order.

B5.2 The Bidder shall not make any statement of fact or opinion regarding any aspect of the Bid Opportunity to the media or any member of the public without the prior written authorization of the Contract Administrator.

B6. ADDENDA

- B6.1 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.
- B6.2 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.
- B6.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/bidopp.asp>
- B6.2.2 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.
- B6.3 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.

B7. SUBSTITUTES

- B7.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.
- B7.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B7.3 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.
- B7.4 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.
- B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her 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.
- B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.

- B7.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.
- B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her 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 B16.
- B7.9 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.
- B7.10 Notwithstanding B7.2 to B7.9, and in accordance with B8.6 deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B16.1(a).

B8. BID COMPONENTS

- B8.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices;
 - (c) Bid Security
 - (i) Form G1: Bid Bond and Agreement to Bond, or
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or
a certified cheque or draft;
- B8.2 Further to B8.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B7.
- B8.3 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.
- B8.4 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.
- B8.4.1 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.
- B8.5 Bidders are advised not to include any information/literature except as requested in accordance with B8.1.
- B8.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B16.1(a).
- B8.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B8.8 Bids shall be submitted to:
- The City of Winnipeg
Corporate Finance Department
Materials Management Division
185 King Street, Main Floor

Winnipeg MB R3B 1J1

B9. BID

- B9.1 The Bidder shall complete Form A: Bid, making all required entries.
- B9.2 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/her own name, his/her 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/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.
- B9.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.
- B9.3 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.
- B9.4 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/her 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/her 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.
- B9.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.
- B9.5 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.

B10. PRICES

- B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.
- B10.2 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.
- B10.3 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.
- B10.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B11. QUALIFICATION

- B11.1 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.

B11.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/debar.stm>

B11.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

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

B11.4 Further to B11.3(c), the Bidder shall, within five (5) 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 copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
- (b) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
- (c) 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 Division website at <http://www.winnipeg.ca/matmgt/>).

B11.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B11.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B12. BID SECURITY

B12.1 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.

B12.1.1 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.

B12.1.2 All signatures on bid securities shall be original.

B12.1.3 The Bidder shall sign the Bid Bond.

B12.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B12.2 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.

B12.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B12.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B12.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B12.3 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.

B13. OPENING OF BIDS AND RELEASE OF INFORMATION

B13.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Division, or in such other office as may be designated by the Manager of Materials.

B13.1.1 Bidders or their representatives may attend.

B13.2 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 Division website at <http://www.winnipeg.ca/matmgt/default.stm>

B13.3 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 Division website at <http://www.winnipeg.ca/matmgt/default.stm>

B13.4 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.

B14. IRREVOCABLE BID

B14.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.

B14.2 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.

B15. WITHDRAWAL OF BIDS

B15.1 A Bidder may withdraw his/her Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

B15.1.1 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.

B15.1.2 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.

B15.1.3 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 B15.1.3(b)e, declare the Bid withdrawn.

B15.2 A Bidder who withdraws his/her Bid after the Submission Deadline but before his/her Bid has been released or has lapsed as provided for in B14.2 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.

B16. EVALUATION OF BIDS

B16.1 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, or acceptable deviation there from (pass/fail);
- (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B11 (pass/fail);
- (c) Total Bid Price;
- (d) economic analysis of any approved alternative pursuant to B7.

B16.2 Further to B16.1(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.

B16.3 Further to B16.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is responsible and qualified.

B16.4 Further to B16.1(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.

B16.4.1 Further to B16.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B17. AWARD OF CONTRACT

- B17.1 The City will give notice of the award of the Contract or will give notice that no award will be made.
- B17.2 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.
- B17.2.1 Without limiting the generality of B17.2, 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.
- B17.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B16.
- B17.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her 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 Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm
- 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 completing the new North Kildonan Feedermain crossing by tying in a section of previously installed HDPE pipe crossing the Red River to the existing water distribution system. This work will include the construction of two new valve chambers, installation of 600mm diameter PVC pipe and associated appurtenances, and two connections to the existing PCCP watermain

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

- (a) Supply and installation of approximately 70 m of 600 mm PVC pipe by open trench to connect the previously installed river crossing HDPE pipe to the existing water distribution system;
- (b) Construction of two cast-in-place valve chambers complete with butterfly valves and associated piping and connections;
- (c) Installation of a new standard hydrant assembly;
- (d) Abandonment of two (2) existing valve chambers and the salvaging of miscellaneous valves, piping, and hydrant;
- (e) Two (2) connections of PVC pipe to the existing PCCP feedermain;
- (f) Feedermain commissioning including hydrostatic pressure testing, flushing, disinfection and chlorination;
- (g) Installation of 65 m of a 3.5 m wide walking trail; and
- (h) Site surface restoration.

D3. DEFINITIONS

D3.1 When used in this Bid Opportunity:

- (a) "**HDPE**" means High Density Polyethylene;
- (b) "**HDD**" means Horizontal Directional Drilling;
- (c) "**NSF**" means National Sanitation Foundation
- (d) "**ASTM**" means American Society for Testing and Materials
- (e) "**PCCP**" means Pre-stressed Concrete Cylinder Pipe
- (f) "**CSA**" means Canadian Standards Association
- (g) "**NMS**" means National Master Specifications
- (h) "**DI**" means Ductile Iron

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is Associated Engineering , represented by:
Colin McKinnon, P.Eng.
Project Manager
Telephone No. 204-942-6391

Facsimile No. 204-942-6399

D4.2 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.

D4.3 Bids Submissions must be submitted to the address in B8.8.

D5. CONTRACTOR'S SUPERVISOR

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

D6. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

D6.1 The Contract, all deliverables produced or developed, and information provided to or acquired by the Contractor are the property of the City and shall not be appropriated for the Contractors own use, or for the use of any third party.

D6.2 The Contractor shall not make any public announcements or press releases regarding the Contract, without the prior written authorization of the Contract Administrator.

D6.3 The following shall be confidential and shall not be disclosed by the Contractor to the media or any member of the public without the prior written authorization of the Contract Administrator;

- (a) information provided to the Contractor by the City or acquired by the Contractor during the course of the Work;
- (b) the Contract, all deliverables produced or developed; and
- (c) any statement of fact or opinion regarding any aspect of the Contract.

D6.4 A Contractor who violates any provision of D6 may be determined to be in breach of Contract.

D7. NOTICES

D7.1 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.

D7.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D7.3, D7.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the facsimile number identified in D4.1.

D7.3 Notwithstanding C21, all notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following facsimile number:

The City of Winnipeg
Chief Financial Officer
Facsimile No. 204-949-1174

D7.4 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 facsimile number:

The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services
Facsimile No. 204-947-9155

D7.5 **Bids Submissions** must be submitted to the address in B8.8.

D8. FURNISHING OF DOCUMENTS

D8.1 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/her at cost.

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

D9.1 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.

D10. SAFE WORK PLAN

D10.1 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.

D10.2 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 Division website at <http://www.winnipeg.ca/matmgt/Safety/default.stm>

D10.3 Notwithstanding B11.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D11. INSURANCE

D11.1 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) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;
- (b) if applicable, Automobile Liability Insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than \$2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.
- (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.

D11.2 Deductibles shall be borne by the Contractor.

D11.3 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.

- D11.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D12. PERFORMANCE SECURITY

- D12.1 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.

- D12.1.1 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.

- D12.2 The Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of 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.

D13. SUBCONTRACTOR LIST

- D13.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D14. DETAILED WORK SCHEDULE

- D14.1 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.

- D14.2 The detailed work schedule shall consist of the following:
- (a) a critical path method (C.P.M.) schedule for the Work; acceptable to the Contract Administrator.

- D14.3 Further to D14.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path:

- (a) At a minimum, the following activities/tasks are to be included on the C.P.M. schedule:
 - (i) Project Start – Site Mobilization;
 - (ii) Feedermain Protection
 - (iii) Confirm Connection Details to PCCP;
 - (iv) East Open Trench Installation;
 - (v) West Open Trench Installation;

- (vi) Valve Chambers;
- (vii) PCCP Connections;
- (viii) Commissioning;
- (ix) Pathway Construction;
- (x) Site Restoration; and
- (xi) Demobilization.

(b) Schedule shall be computer generated and supplied to the Contract Administrator.

SCHEDULE OF WORK

D15. COMMENCEMENT

D15.1 The Contractor shall not commence any Work until he/she is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.

D15.2 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 D9;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the Safe Work Plan specified in D10;
 - (iv) evidence of the insurance specified in D11;
 - (v) the performance security specified in D12;
 - (vi) the Subcontractor list specified in D13;
 - (vii) the detailed work schedule specified in D14.
- (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.
- (c) Additionally, prior to the commencement of work, the Contractor shall submit for review and approval:
 - (i) Site Management Plan as outlined in E12.5.(g) Erosion and Sedimentation Control Measures; and

D15.3 Commencement of the Work shall be at the discretion of the Contractor provided the commencement date will allow the achievement of the Substantial Performance of the Work in accordance with D17, and Total Performance of the Work in accordance with D18.

D16. SUBSTANTIAL PERFORMANCE

D16.1 The Contractor shall achieve Substantial Performance by May 13, 2016.

D16.2 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.

D16.3 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.

D17. TOTAL PERFORMANCE

D17.1 The Contractor shall achieve Total Performance by June 30, 2016.

D17.2 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.

D17.3 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.

D18. LIQUIDATED DAMAGES

D18.1 If the Contractor fails to achieve Critical Stages, 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 Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:

- (a) Substantial Performance – Fifteen Hundred dollars (\$1,500)
- (b) Total Performance – Five Hundred dollars (\$500)

D18.2 The amounts specified for liquidated damages in D18.1 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.

D18.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D19. SCHEDULED MAINTENANCE

D19.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

- (a) Seeding as specified in CW3520; and
- (b) Sodding as specified in CW3510.

D19.2 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

D20. JOB MEETINGS

D20.1 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.

D20.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D21. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D21.1 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).

D22. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D22.1 Further to B11.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B11.4.

MEASUREMENT AND PAYMENT

D23. PAYMENT

D23.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

D24. WATER USED ON CITY OF WINNIPEG CONSTRUCTION PROJECTS

D24.1 Further to Section 3.7 of CW 1120, charges incurred for the permit and water meters shall be paid for by the Contractor when taken out. The Contractor shall forward the invoice to the Contract Administrator for reimbursement. The billing for water usage sent to the Contractor shall be forwarded to the Contract Administrator for payment. The Bid Opportunity number shall be noted on each permit.

WARRANTY

D25. WARRANTY

D25.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire one (1) year thereafter, except where longer warranty periods are specified in the respective Specification sections, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D25.1.1 For the purpose of Performance Security, the warranty period shall be one (1) year.

D25.2 Notwithstanding C13.2, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use.

D25.2.1 In such case, the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

FORM H1: PERFORMANCE BOND
(See D12)

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 for

BID OPPORTUNITY NO. 604-2015

NORTH KILDONAN FEEDERMAIN – VALVE CHAMBERS AND CONNECTIONS

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 as to Principal if no seal)

(Name of Principal)

Per: _____ (Seal)

Per: _____

(Name of Surety)

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

**FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)**
(See D12)

(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 604-2015

NORTH KILDONAN FEEDERMAIN – VALVE CHAMBERS AND CONNECTIONS

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 (2007 Revision), International Chamber of Commerce Publication Number 600.

(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/Spec/Default.stm> .
- 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
D-14033	Legend and Site Access
D-14034	Civil Site Works Plan
D-14035	Connections – Tie in to 600 Feedermain
D-14036	Connections Details
D-14037	Connections Details
D-14038	Valve Chamber Plans and Sections
D-14039	Valve Chamber Details
D-14040	Valve Chamber Details
D-14107	New Granular Pathway

<u>Appendix No.</u>	<u>Appendix Name/Title</u>
A	Soils Investigation Report – TREK North Kildonan Feedermain Detailed Design – Geotechnical Report
B	Waterway Permit
C	Historical Drawings

- E1.4 Reference drawings are provided in Appendix C. The historical drawings are provided herein as information only and the City makes no claim or liability to the accuracy of the information provided.

E2. SOILS INVESTIGATION REPORT

- E2.1 Further to C3.1, a geotechnical soils investigation has been done in the vicinity of the proposed Works to determine the character of the subsurface soil to facilitate the design of the Work. The information is considered accurate at the locations indicated and at the time of the investigation. A complete copy of the soils investigation report and addendum completed by TREK Geotechnical is included in Appendix A.
- E2.2 Bidders are responsible for any interpretation they place on the supplied information and are expected to make such additional investigation of the soil as they feel necessary to satisfy themselves with the conditions as it relates to the Work. No separate measurement or payment will be made for any additional soil investigation, and will be considered incidental to the Works of the project.

- E2.3 Any additional investigation by the Bidder shall be done in accordance with the requirement of the appropriate authority of the City of Winnipeg. Bidders shall notify the contract Administrator prior to starting any soil boring operation.
- E2.4 No separate measurement or payment will be made for any additional soil investigation, and will be considered incidental to the Works of the project.
- E2.5 Contractor is responsible to review the existing geotechnical information and make determinations according to the level of dewatering required for the installations of the works as described within the bid opportunity. This includes working within the previously excavated areas as well as working within proximity to the Red River. No additional measurement and payment will be made for dewatering in any part in the construction of the works and will be considered incidental to the project.

GENERAL REQUIREMENTS

E3. WATERWAY BY-LAW

- E3.1 The Contractor shall note that all Works within 107 metres (350 feet) of a riverbank are within the jurisdiction of the Waterway By-Law.
- E3.2 The Waterway Permit is in Appendix B for the project. The Contractor shall be governed by the Permit's requirements.
- E3.3 Under no circumstances will stockpiling of any material be permitted within 107 metres (350 feet) of a riverbank.
- E3.4 See Appendix B for a copy of the Waterway Permit.

E4. WATERWAYS PROTECTION

- E4.1 All work adjacent to or crossing waterways including creeks and ditches draining into a waterway is regulated by the Federal Department of Fisheries and Oceans (DFO). Contractor must implement Work in accordance to DFO guidelines and regulations.
- E4.2 Contractor to follow E10 Environmental Protection, E11 Erosion and Sedimentation Control Measures, and "The City of Winnipeg Best Management Practices Handbook for Work in and Around the City's Waterways and Watercourses".
- E4.3 No separate measurement or payment will be made for Waterways Protection, and will be considered incidental to the Works of the project.

E5. RED RIVER WATER LEVELS

- E5.1 Normal Red River water levels are as follows:
- (a) Regulated Summer Water Level (RSWL) – normally early June to late October – is approximately 223.44 m (geodetic).
 - (b) Normal Winter Water Level (WWL) – normally late November to late March – is approximately 221.44m (geodetic).
 - (c) Flood Protection Level (FPL) – 229.3m (geodetic).
- E5.2 Red River water levels rise considerably in the spring – typically in late March – due to ice breakup and snow melt. River crest elevations of more than 228 m have occurred (2009).
- E5.3 River elevations may also increase in the summer due to heavy rainfall in the areas south of Winnipeg. Summer crests are usually lower and of shorter duration than spring crests.

- E5.4 Contractor shall schedule work and layout the site so that Red River water levels will not impact the Works.
- E5.5 Occurrence of high river levels during construction of the Work will not be considered a basis for claim for extra work or extra time.
- E5.6 Contractor responsible to secure site in the event of any high river elevations that may impact work.

E6. PROTECTION OF EXISTING TREES AND REMOVAL

- E6.1 Required tree removal shall be the responsibility of the contractor and shall be done according to CW 3010 – Clearing and Grubbing.
- E6.2 Contractor shall identify trees required for removal as per their work plan and submit to it to the Contract Administrator for review and approval. No trees will be removed prior to the Contract Administrators approving the tree removal plan.
- E6.3 Construction activities near trees may result in injury to the trunk, limbs or roots of trees causing damage or death of the tree. In order to prevent such damage:
 - (a) Trees within or adjacent to a construction area must be protected during construction by means of a barrier surrounding a “Tree Protection Zone” (TPZ) as outlined in E6.2 and E6.3.
 - (b) Activities which are likely to injure or destroy the tree are not permitted within the TPZ.
 - (c) Tree pruning or root pruning of City of Winnipeg owned trees may only be done by a Contractor approved by the project’s Qualified Tree Consultant (Refer to E6.5) or Urban Forestry Branch.
 - (d) No objects may be attached to trees protected by City of Winnipeg by-laws without written authorization by the City of Winnipeg.
 - (e) No City of Winnipeg tree or tree protected by a City of Winnipeg by-law may be removed without the written permission of the City of Winnipeg.
 - (f) 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.
 - (g) 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.

E6.4 Tree Protection Zone

The following is a chart showing optimal distances for determining a tree protection zone. Some site conditions may dictate the need for a smaller TPZ. The City of Winnipeg Urban Forestry Branch must be notified in these instances. Forestry will determine if the smaller TPZ is acceptable in the specific circumstance and advise of any additional tree protection or removal requirements.

Trunk Diameter (DBH)*	Minimum Protection Distances Required
< 10 cm	2.0 m
11-40 cm	2.4 m
41-50 cm	3.0 m
51-60 cm	3.6 m
61-70 cm	4.2 m
71-80 cm	4.8 m

81-90 cm	5.4 m
>91 cm	6.0 m

* Diameter at breast height (DBH) measurement of tree trunk taken at 1.4 metres above ground.

E6.5 Tree Protection Barriers

Trees within tree protection zones shall be protected by means of a "tree protection barrier" meeting the following specifications:

- (a) The required barrier is a 1.2 metre (4 ft) high orange plastic web snow fencing on 2" x 4" frame or as directed by the City of Winnipeg Urban Forestry Branch in accordance with City of Winnipeg Protection of Existing Tree Specifications. The barrier can be lowered around branches lower than 1.2 metres (4 ft). The barrier location can be adjusted to align with curbs and edges at clear path of travel zones.
- (b) Tree strapping material will be installed on individual trees, in accordance with CW1140, where Work will be completed within the TPZ.
- (c) Tree protection barriers are to be erected prior to the commencement of any construction or grading activities on the site and are to remain in place throughout the entire duration of the project. The applicant shall notify the City of Winnipeg prior to commencing any construction activities to confirm that the tree protection barriers are in place.
- (d) All supports and bracing used to safely secure the barrier should be located outside the TPZ. All supports and bracing should minimize damage to roots.
- (e) No grade change, storage of materials or equipment is permitted within this area. The tree protection barrier must not be removed without the written authorization of the City of Winnipeg.

E6.6 Utility Construction and Engineering and Capital Construction Projects

- (a) It is recognized that there are cases where trees are growing overtop existing utilities or beside capital infrastructure. While the guidelines in this section still apply, in these cases some modification to the table in E6.4 in addition to root pruning may be permitted provided non-open trench methods of construction are employed (as defined in CW2110 and CW2130).
- (b) Root Pruning will be required to be done under the direction of - and along with - written sign-off by the Project's Qualified Tree Consultant (Refer to E6.7). The objective is to avoid severance of anchor roots, which provide upright support for trees and minimize damage to the tree.
- (c) Above ground clearance for overhanging branches in the work zone must be anticipated. The Contractor is required to have a Forestry approved tree service raise the crown of all branches to provide adequate clearance for construction equipment.

E6.7 Qualified Tree Consultants are defined as:

- (a) An arborist certified by the International Society of Arboriculture (ISA) who has a diploma (minimum) in arboriculture or urban forestry; and
- (b) A landscape architect who is a member in good standing of the Manitoba Association of Landscape Architects

E6.8 No separate measurement or payment will be made for the protection or removal of existing trees, any work will be considered incidental to the Works of the project.

E7. DANGEROUS WORK CONDITIONS

E7.1 Further to clause GC 6.26 of the General Conditions, the Contractor shall be aware that underground chambers, manholes, sewers and pumping stations are considered a confined

space and shall follow the "Guidelines for confined Entry Work" as published by the Manitoba Workplace Safety and Health Division.

- E7.2 The Contractor shall be aware of the potential hazards that can be encountered in manholes, sewers and pumping stations such as explosive gases, toxic gases and oxygen deficiency.
- E7.3 The air in a confined space shall be tested before entry and continuously during the time that personnel are inside the space. Equipment for continuous monitoring of gases shall 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 shall be calibrated in accordance with manufacturer's specifications.
- E7.4 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 shall wear a respirator or supplied air to enter the confined space.
- E7.5 Workers shall wear a respirator or supplied air at all times when entering a chamber, manhole or sewer where live sewage is present.
- E7.6 Provide appropriate equipment 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.
- E7.7 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 his 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.
- E7.8 The Contractor's attention is drawn to the Province of Manitoba Workplace Safety and Health Act ("the Act"), and the Regulations and Guidelines thereunder pertaining to confined entry work, and in particular the requirements for conducting hazard/risk assessments and providing personal protective equipment (PPE).
- E7.9 Provide supplied air breathing apparatus conforming to the requirements of the Act, Regulation and Guidelines for the use of the Contract Administrator where confined entry is required to allow for inspection of the Work.

E8. SHOP DRAWINGS

- E8.1 This specification shall revise, amend and supplement the requirements of CW 1100 of the City of Winnipeg's Standard Construction Specifications.
- (a) The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
 - (b) The Contractor shall submit specified shop drawings to the Contract Administrator to review. Detail all shop drawings using the metric system. Prepare to a drafting standard equivalent to Contract drawings.
- E8.2 Administrative
- (a) Provide to Contract Administrator for review the shop drawings specified. Submit with reasonable promptness and in an orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
 - (b) Do not proceed with Work affected by the submittal until review is complete.
 - (c) Review submittals prior to submission to Contract Administrator. This review represents that necessary requirements have been determined and verified, or will be, and that each

submittal has been checked and coordinated with the requirements of the Work and the Contract Documents. Submittals not stamped, signed, dated and identified as to the specific project will be returned without being examined and shall be considered rejected.

- (d) Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents and stating reasons for deviation.
- (e) Verify that field measurements and affected adjacent Work are coordinated.
- (f) Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator review of submittals.
- (g) Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator review.
- (h) Keep one reviewed copy of each submission on Site.

E8.3 Contractor shall make submissions far enough in advance as to allow adequate time for coordination, Contract Administrator's review, revisions and resubmittals, and for supply and delivery in time for the scheduled installation of the Work.

E8.4 Allow at least fourteen (14) calendar days for the Contract Administrator's review after receipt of shop drawings.

E8.5 Shop Drawings and Product Data

- (a) Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, wiring diagrams, panel layouts with bills of material, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the Section under which the adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- (b) Adjustments made on shop drawings by Contract Administrator are not intended to change the Contract Amount. If adjustments affect the value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- (c) Make such changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of any revisions other than those requested.
- (d) Shop drawings for the following components shall bear the seal of a Professional Engineer registered to practice in the Province of Manitoba:
 - (i) Shoring;

E8.6 Submittal Requirements

- (a) Submit shop drawings and other submittals to Contract Administrator for review with a Submittal Transmittal Form as provided by Contract Administrator or in a form acceptable to Contract Administrator.
- (b) One original hard copy or an electronic file of the Submittal Transmittal Form (at Contractor's choice) will be provided to Contractor by Contract Administrator. Make photocopies of the form as needed for use on the project.
- (c) For each submittal or submittal package, type or print the appropriate information on the form to fully describe the submittal(s) being sent for review.
- (d) Number each transmittal form in sequential order, for record and tracking purposes.
- (e) Sign the form in the space provided to acknowledge Contractor review of the submittal(s).
- (f) Retain one photocopy of the form for filing and record purposes.
- (g) Forward the form and the accompanying submittal(s) to Contract Administrator.
- (h) Submissions shall include:
 - (i) Date and revision dates.
 - (ii) Project title and number.

- (iii) Name and address of: Subcontractor, Supplier, Manufacturer.
- (iv) Submission shall be signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- (v) Details of appropriate portions of Work as applicable.
- (vi) Submit six prints of shop drawings for each requirement requested in specification Sections and as Contract Administrator may reasonably request.
- (vii) Where more than one type of shop drawing has been specified for one item, e.g., wiring diagrams, layout details, and dimensional drawings, the shop drawings shall be submitted together, to enable Contract Administrator to review the drawings as a package.
- (viii) Catalogue pages or drawings applicable to an entire family or range of equipment will not be accepted as shop drawings unless they are clearly marked to show the pertinent data for the particular materials.
- (ix) Manufacturers' catalogues, manuals, or price lists will not be accepted as shop drawings. Such materials may be used as supplemental information to the shop drawings.
- (x) Indicate the tag number of instruments and valves and clearly show the features and details applicable to the equipment being supplied.
- (xi) Determine which shop drawings have, in addition to those drawings specifically mentioned in the Contract, design elements requiring the seal of a Professional Engineer registered in the Province or Territory where the work is located, in accordance with the applicable provincial or federal engineering acts or other governing legislation. Seal such drawings before submitting them for review. Submit for review engineering calculations signed by the registered Professional Engineer responsible for the shop drawing design elements.

- E8.7 Submittals will be returned with one or more of the following notations. Take action as noted:
- (a) "REVIEWED" - Make and distribute additional copies as required for execution of Work.
 - (b) "REVISE & RESUBMIT" - Make the necessary revisions and resubmit revised drawings for review. Show the drawing number of the first such revised drawing and show the latest revision number applicable to the drawing by adding a suffix to the drawing number as - "REV. 1", "REV. 2", etc.
 - (c) "NOT REVIEWED" - This notation indicates when Contract Administrator has not reviewed the drawing. It may also be used in combination with the notation to revise and resubmit the drawing where Contract Administrator lacks sufficient information to complete the review and requires to resubmit the drawing for review after revision.
 - (d) Drawings will be marked "REVIEWED" together with the notation to "REVISE & RESUBMIT" when Contract Administrator requires Contractor to resubmit a revised drawing showing corrections made as a result of Contract Administrator's notations on the shop drawings. This procedure will not relieve Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of Contract.
- E8.8 Use only those shop drawings on the work that bear the "REVIEWED" notation.
- E8.9 Do not revise shop drawings marked "REVIEWED" unless resubmitted to Contract Administrator for further review.
- E8.10 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made, three copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through the same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

- E8.11 The City may deduct, from payments due to Contractor, costs of additional engineering work incurred if correct shop drawings are not submitted after one review by Contract Administrator.
- E8.12 Review by Contract Administrator is for the sole purpose of ascertaining conformance with the general design concept. This review does not mean that Contract Administrator approves the detail design inherent in the shop drawings, responsibility for which remains with Contractor, and such review does not relieve Contractor of the responsibility for errors or omissions in the shop drawings or of the responsibility for meeting all requirements of the Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at the job-site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all sub-trades.
- E8.13 Costs due to delays in making submittals shall be borne solely by the Contractor.
- E8.14 No separate measurement or payment will be made for Shop Drawings, and will be considered incidental to the Works of the project.

E9. SITE CONTAINMENT AND PROTECTION

- E9.1 The proposed work areas on both sides of the Red River are within designated park areas that are accessible by the public, and as such the Contractor shall implement measures to contain their work site and protect the general public.
- E9.2 Contractor shall develop a plan that outlines the measures they will implement to contain the site and protect the public. Plan shall be submitted to, discussed with, and approved by the Contract Administrator prior to mobilization. At a minimum plan shall include placement of fencing around the work sites, equipment staging areas, materials; and outline the staging, storage locations, and vehicle parking areas.
- E9.3 Provisions should be provided to allow pedestrian traffic around the work site, while still providing adequate protection and space for the work to be performed.
- E9.4 Contractor may need to reassess Site Containment and Protection as the Work progresses, and adjust fencing and protection measures based on actual flow of pedestrians and work progress.
- E9.5 Contractor shall maintain and up-keep measures throughout the duration of the project, and shall address concerns raised by the Contract Administrator immediately.
- E9.6 Contractor will provide periodic inspection and maintenance for Site Containment and Protection measures during non-work days.
- E9.7 No separate measurement or payment will be made for Site Containment and Protection, and will be considered incidental to the Works of the project.

E10. ENVIRONMENTAL PROTECTION

- E10.1 Fires and burning of rubbish on site is not permitted.
- E10.2 Do not bury rubbish and waste materials on site unless approved by Contract Administrator. Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
- E10.3 Provide temporary drainage and pumping as necessary to keep excavations and site free from water. Do not pump water containing suspended materials into waterways, sewer or drainage systems. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- E10.4 Operation of construction equipment in waterways is prohibited. Do not use waterway beds for borrow material. Do not dump excavated fill, waste material or debris in waterways.

- E10.5 Design and construct temporary crossings to minimize erosion to waterways. Do not skid logs or construction materials across waterways.
- E10.6 Pumping water containing suspended materials into watercourse is prohibited.
- E10.7 Control emissions from equipment and plant to local authorities emission requirements.
- E10.8 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- E10.9 Water removed from the existing feeder mains shall be discharged into the manholes identified on drawing D-14033.
- E10.10 No separate measurement or payment will be made for environmental protection, and will be considered incidental to the Works of the project.

E11. EROSION AND SEDIMENTATION CONTROL MEASURES

E11.1 Objectives

- (a) To minimize the disturbance of existing vegetation and soil within the extent of the construction site as indicated on the drawing.
- (b) Prevent the loss of soil from the site (including topsoil stockpiled for reuse) resulting from storm water runoff, wind erosion and construction activities.
- (c) Prevent sedimentation of storm water or receiving streams.
- (d) Prevent pollution of the air with dust and particulate matter.

E11.2 Description of Work

- (a) Temporary Erosion and Sediment Control (ESC): includes the installation and maintenance of temporary structural control measures as required or specified to reduce or eliminate the erosion of soil and transport of sediment off-site.
- (b) Minimize the amount of disturbed soil and preserve existing vegetation by establishing construction boundaries, using stakes to indicate the limits of construction including construction area, laydown area, and stockpile area.
- (c) Clearly mark the trees to be preserved and protect them from ground disturbances around the base of the tree.
- (d) Dust Control: includes the management of operations and the application of water or dust palliatives in order to reduce or eliminate the spread of dust from the Project limits.
- (e) Coordination of Work of this Section with all other ESC Measures in place or planned under other Designated Contract Areas including laydown, work staging areas such as parking, office trailers, etc.
- (f) Follow strategy based on the best management practices for stabilization and structural measures outlined in Chapter 3 of EPA 832-R-92-005 "Storm Water Management for Construction Activities", Standard Construction Specifications published by Manitoba Infrastructure and Transportations Department, or City of Winnipeg Best Management Practices Handbook for Activities in and Around the City's Waterways and Watercourses, November 2005, whichever is more stringent.
- (g) Accept formal responsibility for monitoring, managing, replacing, and maintaining the ESC measures throughout the construction period and during warranty period.
- (h) Monitor and inspect ESC measures on a daily basis.
- (i) Coordinate ESC requirements of the overall project, with the site specific Erosion and Sedimentation Control requirements by other Contractors, which are specific to their Contracts.
- (j) During cessation of construction activity due to winter shutdown (if any), continue to provide erosion and sedimentation control measures.

- (k) Review the existing ESC measures implemented and other preventative measures with all contractor employees and employees of sub-contractors on site. If additional measures are required, review with the Contract Administrator. Where there is a conflict with the requirements, the most stringent requirements will govern.

E11.3 Products

- (a) As indicated in the drawings or in the subsequent sections.
- (b) As required based on construction operations and staging of work.

E11.4 Regulatory Requirements

- (a) Comply with all Federal, Provincial and Municipal legal and regulatory requirements and determine all applicable and relevant environmental legislation for this project.

E11.5 General Requirements

- (a) Incorporate the Manitoba Infrastructure and Transportations Department, USEPA standards as indicate above, or City of Winnipeg Handbook as indicated above; where they conflict, the more stringent requirements govern.
- (b) Minimize the amount of disturbed land that is susceptible to erosion. Ensure that areas outside the limits of construction are clearly defined and protected for all construction activities.
- (c) Provide immediate permanent or temporary pollution, sedimentation and erosion control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, designated site holding pond or other areas of water impoundment, or the delivery and deposition of sediment onto adjacent roads or properties. Use the designated site holding pond for collecting storm water, settling sediments, and/or dewatering and the like.
- (d) Install the appropriate erosion and sediment structural controls measures in accordance with approved sequence of construction. Schedule and perform clearing, grubbing and stripping operations so that grading operations and permanent erosion control features can follow immediately thereafter.
- (e) If sediment is deposited outside the Project limits, remove the sediment from the location(s) in which it is deposited within twenty-four (24) hours of the occurrence.
- (f) Any mud-tracking shall be avoided and clean haul routes to and from Site. Clean off mud from vehicles prior to leaving site.
- (g) Contractor shall provide a Site Management Plan that employs the Best Management Practices with proper house-keeping that would prevent pollution or releasing deleterious material to the adjacent water bodies or storm water infrastructure systems. The Site Management Plan shall address, at a minimum the following items:
 - (i) Site layout and boundaries indicating proposed Contract boundary.
 - (ii) Site setup for construction staging.
 - (iii) Temporary site utilities, potable water, and sewage requirements during the course of construction activities with proper and regular cleaning and off-site disposal procedure.
 - (iv) Parking requirements.
 - (v) Fuelling and Maintenance Areas with spill prevention and emergency response clean up kit.
 - (vi) Designated equipment storage area.
 - (vii) Security and access requirements.
 - (viii) All materials and waste handling requirements.
 - (ix) Location for general recycling materials and storage, if used.
 - (x) Dust control measures and application.
 - (xi) Water management during earthworks construction, outfall installation and pipe installation.

- (xii) On site management of top soil and subsoil stockpiles with sedimentation control measures.

E11.6 Suspension of Work

- (a) The City of Winnipeg or Contract Administration may suspend work in cases where, in their opinion, the Contractor fails to comply with procedures. If the Contractor fails to maintain or implement proper ESC to protect the adjacent water bodies and storm water systems, the Contract Administrator may make other arrangements to have the work completed, and deduct the cost thereof from any money owing to the Contractor.

E11.7 Emergency Procedure and Response

- (a) Provide a description and tabulation of potential environmental emergency procedures and responses.
- (b) Provide a breakdown of these emergency procedures and responses that include at minimum:
 - (i) Operational Requirements
 - (ii) Release Reporting.
 - (iii) Comply with all Municipal, Provincial and Federal environmental emergency procedures and requirements in this regard.

E11.8 Slurry and Silt Control Measures

- (a) Construct, regularly inspect, maintain and repair as necessary, such facilities until such time that the risk of silt and/or deleterious materials entering the storm sewer drainage system for the construction phase has passed.
- (b) When using vegetation control, consult with the Contract Administrator on which species are to be used. Do not use non-native/invasive species.
- (c) Saw cutting slurry may contain substances such as sediment, hydrocarbons from asphalt cutting or high pH water from concrete cutting that may be harmful to the aquatic environment. All saw cutting slurry must be contained in a manner that will ensure that none of the materials enter the storm water system or the adjacent creek, in accordance with Government of Manitoba, Department of Fisheries and Oceans requirements (where they conflict, the most stringent requirements apply).
- (d) Use a sway with a built-in slurry containment system. Dispose of solid and liquid clean-up material as per provincial and federal regulation.

E11.9 Stability Measures

- (a) Preservation of Natural Vegetation:
 - (i) Establish construction boundaries to limit site disturbance so that no vegetation damage is done beyond this boundary.
 - (ii) Use stakes to indicate limits of construction, grading and disturbance. Clearly mark
 - (iii) The trees to be preserved and protect them from ground disturbances around the base of the tree.
 - (iv) Rehabilitate natural vegetation to pre-construction condition if damaged during construction activity.
- (b) Dust Control:
 - (i) Use vegetative cover, mulch, spray-on non-toxic adhesives, clean water sprinkling, stone, or barriers when open dry areas of soils are anticipated on site.

E11.10 Silt Barrier Fences

- (a) Placement of Silt Barrier Fence:
 - (i) Place silt barrier in a manner that will intercept run-off at or close to right angles to flow. In areas where problem is severe, erect two or more silt barriers parallel to each other, until required degree of control is achieved.

- (ii) Position posts at maximum 2 metres o.c., in such a manner that the fence structure remains naturally taut and placed or driven a minimum of 300 mm into the ground.
- (iii) Position posts so that they are downstream.
- (iv) Where a 300 mm depth is impractical or impossible, adequately secure or brace posts to prevent overturning of fence due to sediment loading.
- (v) Bury excess geotextile at bottom of silt fence minimum of 150 mm in trench located upstream such that no flow can pass under fence.
- (vi) Splice subsequent lengths of barrier only at support post locations. Splice by wrapping geotextile fabric completely around each of two abutting support posts, such that gap between abutting posts is completely covered by other sections of fabric.
- (vii) Do not use where site slope is steeper than 3:1.
- (viii) Silt barrier to have a >75% efficiency. Employ successive, parallel fences to achieve required degree of control.

E11.11 Other Structural Measures

- (a) Use one or more of the following structural measures, as required and/or where applicable.
- (b) Earth Dike:
 - (i) Construct a mound of stabilized soil to divert surface run-off volumes from the disturbed areas or into sedimentation basins or sedimentation traps.
- (c) Storm Drain Inlet Protection:
 - (i) Place a filtering measure around any inlet or drain to trap sediment and prevent it from entering the inlet structures.
 - (ii) Structure may be composed of gravel and stone with a wire mesh filter, block and gravel, filter fabric or sod.
- (d) Temporary Earth Check Dams:
 - (i) Install earth check dams during stripping process to ensure protection from run-off into natural drainage areas surrounding the site.
 - (ii) Build temporary earth check dams to suit field conditions. Verify site conditions prior to placement.
 - (iii) Review locations with Contract Administrator prior to placement of material.
 - (iv) Remove temporary earth check dams, except as determined by the Contract Administrator, when permanent seeding has been established and is exhibiting rigorous growth.
- (e) Surface Roughening:
 - (i) Create horizontal grooves, depressions, or steps that run parallel to the contour of the land.
 - (ii) Use surface roughening on all slopes, as soon as possible after the vegetation has been removed.
 - (iii) Methods of surface roughening are stair-step grading, grooving (using disks, spring harrows, or teeth on a front-end loader), and tracking (driving a crawler tractor up and down a slope, leaving the cleat imprints parallel to the slope contour).

E11.12 Monitoring and Maintenance Requirements

- (a) Coordinate with all maintenance, monitoring, and reporting procedures.
- (b) Conduct daily monitoring and bi-weekly maintenance reports and submission to the Contract Administrator.
- (c) Maintain integrity of silt fences, and all other erosion and sedimentation control measures as long as necessary to contain sediment run-off. Inspect all temporary silt fences and all other erosion and sedimentation control measures immediately after each storm, rainfall, snow melt and the like, with twenty-four (24) hours of such event, weather permitting and at least daily during prolonged rainfall or storm. Immediately correct any deficiencies.

- (d) Maintain and monitor silt fences, erosion and sedimentation control measures during holidays, and other times when construction is not in progress, at least on a weekly basis or more often as required by the Contract Administrator.
- (e) In addition, make daily review of location of silt fences and other sedimentation control measures in areas where construction activities have changed natural contours and drainage run-off to ensure that silt fences and other sedimentation and control measures are properly located for effectiveness. Where deficiencies exist, install additional silt fences and other sedimentation and control measures. Should silt fences or other sedimentation and control measures become damaged or otherwise ineffective while barrier is still necessary, repair or replace within twenty-four (24) hours.
- (f) Remove sediment deposits when deposit reaches approximately one-third ($\frac{1}{3}$) of height of silt fence or install second silt fence up slope.
- (g) Do not remove silt fences or other sedimentation and control measures until permanent erosion protection is established or the Contract Administrator directs that it be removed.
- (h) Remove and dispose of sediment in a location where such sediment will not erode into construction areas, offsite properties or watercourses.
- (i) Should the silt barrier fabric cease to function due to clogging, damage, or deterioration, replace with a new fabric, when and as required.
- (j) Monitor erosion control blanket to ensure that all anchoring is stable and staples securely installed. Replace damaged erosion control blankets if erosion control measures and performance is compromised. Reseed as required prior to replacement. Repair installation and anchoring as required.
- (k) Reapply tackifier when erosion and disturbance has occurred on stockpiles, berms and embankments, as required and where applicable.
- (l) Reseed and repair seeded areas that have become bare or damaged by construction activity.
- (m) During the construction dewatering process, when sedimentation builds up beyond 30 mm in depth, in the storm water management pond or swales, remove the sedimentation and place in a designated area on site. Do not remove sedimentation from site.

E11.13 Clean-Up and Removal

- (a) Upon completion of the Work, when erosion and sedimentation controls are no longer required, as determined by the Contract Administrator, remove all such temporary erosion and sedimentation controls and clean-up and restore areas. These include the construction laydown, and work staging area within the construction boundary.

E11.14 No separate measurement or payment will be made for erosion and sedimentation control measures, and will be considered incidental to the Works of the project.

E12. SITE ACCESS

E12.1 Access to the construction area on the east side of the river will be as follows:

- (a) access the east side off of Westbound Chief Peguis Trail through locked gate and maintenance path shown in Drawing D-14033;
- (b) follow the same route in and out of the park and to not disturb any more of the grounds than necessary;
- (c) gate should be shut at all times to prevent inadvertent access by the public;
- (d) ensure gate is shut and locked when leaving the Site for the day.

E12.2 Access to the construction area on the west side of the river will be as follows:

- (a) access work area from the end of John Black Avenue at location shown on Drawing D-14033;

- (b) maintain driveway access along road and do not park construction vehicles on John Black Avenue during the construction period;
- (c) Contractor shall maintain access for all residents and the cemetery at all times.

E12.3 Contractor shall provide proper protection for any crossings or structures while accessing the site.

E12.4 Any damage caused as a result of the Contractor accessing the site shall be repaired by Contractor immediately upon discovery. Contractor is responsible for repair costs.

E13. VERIFY CONNECTIONS TO EXISTING PCCP

E13.1 The Works include connecting the new Kildonan Feedermain to the existing 600 mm diameter PCCP on the East and West side of the Red River.

E13.2 Contractor shall expose PCCP at both proposed connection locations to verify the actual horizontal/vertical alignment of the existing pipe, location of nearest existing joint to the proposed tie in location, and determine the configuration and requirements of the tie-in.

E13.3 Contractor is responsible to procure the appropriate transition coupling necessary to make the connection as outlined on the Drawings.

E13.4 Contractor shall submit Shop Drawings to the Contract Administrator for review prior to ordering any couplings or restraints.

E13.5 Adequate procurement time shall be allowed for manufacture and delivery of any transition couplings and restraints so as not to delay the project.

E13.6 Once the PCCP connection locations and required materials are confirmed, Contractor shall reinstate and/or repair the examined joints to the satisfaction of the City, and backfill any excavations made to expose the pipe.

E13.7 Contractor is responsible to ensure that site is safe and secure between the time that the connections are verified, and the time that construction commences on the connections.

E13.8 No separate measurement or payment will be made for Verify Connections to Existing PCCP, and will be considered incidental to the Works of the project.

E14. NOISE MANAGEMENT

E14.1 All work shall be conducted in accordance to the City of Winnipeg Neighbourhood Liveability By-Law, Part 5 – Noise Control.

E14.2 Contractor shall obtain approval from Contract Administrator and City of Winnipeg for operations outside of normal working hours: 7:00 am – 9:00 pm weekdays and 9:00 am – 9:00 pm weekends.

E14.3 Take special precautions and supply noise abatement measures to reduce public exposure to noise to a minimum. Such measures include, but are not limited to:

- (a) Shields, blankets, or other physical barriers to restrict the transmission of noise.
- (b) Soundproof housings or enclosures for noise producing machinery such as compressors, pumps, motors, generators, etc.
- (c) Efficient intake and exhaust silencers on air equipment.
- (d) Efficient intake and exhaust mufflers on internal combustion engines.
- (e) Placement of stationary noise producing equipment at a maximum distance from public areas.

E14.4 No separate measurement or payment will be made for Noise Management, and will be considered incidental to the Works of the project.

E15. WATER SUPPLY FOR CONSTRUCTION WORK

E15.1 Water supply shall be from the existing watermain in accordance with CW1120 and SD-019. The supply will be provided from existing valve chambers and hydrants. All permits are to be obtained through the City of Winnipeg.

E15.2 Water Services Division of Water and Waste Department will provide and install metering equipment once permit has been obtained. The contractor shall have access to water from the following locations:

- (a) Scotia Street Hydrant;
- (b) The contractor shall arrange with the City to access the valve chambers at Main Street and Henderson Highway.

E15.3 There will be no separate measurement or payment for permits or equipment related to obtaining and supplying water. The cost of supplying water will be borne by the City. The cost of connecting to the water supply will be borne by the contractor.

E16. FEEDERMAIN PROTECTION

E16.1 The Work involves construction activity in close proximity to the active 600 mm diameter North Kildonan Feedermain. The feedermain is constructed of prestressed concrete cylinder pipe (PCCP) for the overland sections.

E16.2 The first phase of the project is near completion. The trenchless contractor currently has rig mats onsite. It is anticipated that once the work is completed they will be removed. Any overlap of use will require coordination between the two contractors. Feedermain protection must be maintained at all times through work.

E16.3 The Contractor shall review Appendix C – Historical Drawings in conjunction with the outlined site access to assess the extent at which their methodology will impact the existing feedermain.

E16.4 The North Kildonan Feedermain is a critical component of the City of Winnipeg water supply system, and work in close proximity to the pipeline shall be undertaken with an abundance of caution, inadvertent damage to the pipe would likely result in catastrophic consequences.

E16.5 Work around the feedermain shall be planned and implemented to minimize the time period that Work is carried out in close proximity to the pipe and to ensure that the pipeline is not subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement;

E16.6 Large diameter pressure pipe generally has limited ability to withstand increased earth and live loading, therefore, every precaution shall be undertaken to ensure that applied loading during all phases of construction is within accepted loading parameters, prestressed pipe typically fails in a non-ductile mode and has the potential to cause extensive consequential damage to infrastructure if failure should occur.

E16.7 Contractor will submit a Construction Method Statement with proposed construction plan including haul routes, excavation and equipment locations, and material staging to the Contract Administrator for review seven (7) days prior to the start of construction. Contractor may not start construction until the Construction Method Statement has been reviewed and accepted by the Contract Administrator.

- (a) Rig mats shall be used to distribute vehicular loadings at any location where within 6m traveling along or crossing of the feedermain is required.

- (b) Work practices and procedures should be structured so as not to impart excessive vibration loads on the feedermain or that would cause settlement of the subgrade below the feedermain.
- (c) Construction operations should be staged in such a manner as to limit multiple construction loads at one time.
- (d) Alignment of the feedermain shall be delineated/identified by survey lath or flagging.
- (e) Materials, stockpiles, equipment, and vehicles shall not be stored within 6 m of the feedermain alignment at any time.
- (f) Contractor shall ensure that all crew members and subcontractors understand and observe the requirements of this specification prior to commencement of the Work.

E16.8 Contractor shall notify the City and Contract Administrator prior to feedermain being exposed, or any excavation within 6 m of the feedermain.

E16.9 No separate measurement or payment will be made for feedermain protection, and will be considered incidental to the Works of the project.

E17. BUTTERFLY VALVES

E17.1 Description

E17.1.1 This Specification shall cover the design, manufacture and installation of butterfly valves, this Specification is supplementary to and shall be read together with the latest revision of AWWA Standard C504, "Rubber Seated Butterfly Valves".

E17.2 Design Requirements

(a) General

- (i) design, materials and construction of all valves shall conform to the latest version of AWWA Standard C504.
- (ii) further to AWWA C504, products and coatings in contact with potable water shall be certified as suitable for contact with drinking water by an accredited certification organization in accordance with ANSI/NSF 61 "Drinking Water System Components – Health Effects"
- (iii) design torques shall be calculated using procedures outlined in AWWA Manual of Water Supply Practices – Butterfly Valves: Torque, Headloss and Cavitation Analysis – M49.
- (iv) all butterfly valves to be supplied under this Contract shall be designed and manufactured by a company having at least five (5) years prior experience in manufacturing these types of products in the sizes and to the pressure ratings as those specified herein.
- (v) direction of opening to be counter clockwise (left hand open).

(b) Design Parameters

- | | |
|--|----------------------------|
| (i) Service | Potable Drinking Water |
| (ii) Chemical Resistance | 1 % Hypochlorite |
| (iii) Installation | Submerged Service |
| (iv) Operating service | -40°C to +70°C |
| (v) Water Temperature Service | 0°C to 20°C |
| (vi) Normal System Operating Pressure | 552 kPa (80 psi) |
| (vii) Valve Test Pressure (2 times Operating) | 2000 KPa (300 psi) |
| (viii) Type of Body (All) | Flanged Short Body |
| (ix) Maximum Non-Shock Shut-Off Pressure (All) | 1000 Kilopascals (150 psi) |
| (x) Body (All) | Cast Iron |
| (xi) Headloss | Maximum K value 0.5 |

- (xii) Valve torques and safety factors shall be based upon the design pressure of 700 Kilopascals (100 psi).
- (xiii) Maximum Velocity 4.88 metres per second (m/s)

NOMINAL PIPE SIZE (MM)	QUANTITY	ACTUATOR TYPE	VALVE CLASS	PRIMARY SERVICE FUNCTION
600	2	Manual	150B	Isolation (Open/Close)

E17.3 Materials

(a) General

- (i) materials for butterfly valves shall meet or exceed the latest revision requirements of AWWA Standard C504 and shall meet or exceed the requirements of this Specification.
- (ii) materials throughout shall be the best of their respective kinds, the equipment shall be designed for the very highest class of service, shall include the highest degree of strength, durability and reliability for continuous operation and for most convenient maintenance.
- (iii) liberal factors of safety (minimum of fifty percent (50%)) shall be used throughout especially for all parts subject to alternating stresses or shock.
- (iv) all joints shall be machined and all castings shall be spot-faced for nuts, all rods shall be finished, all mating faces shall be drilled and tapped, peened, or finished as subsequently specified.
- (v) the mechanical features of the equipment covered by these Specifications shall conform to the appropriate standards of the ASME.
- (vi) threads on all screws, bolts, studs, and nuts shall be American Standard., tapped holes in flanges shall be standard unified national threads of the coarse-thread series.

(b) Stainless steel components

- (i) all components specified in the latest revision of AWWA Standard C504 as stainless steel and the valve shaft, pins, clamps and retaining rings for the rubber seats shall be Type 304 stainless steel, no alternative materials will be accepted in this regard.

(c) Workmanship

- (i) all foundry and machine work shall be in accordance with the best modern practice for the class of work involved;
- (ii) all parts shall conform accurately to the required dimensions and shall be free from injurious defects. All machine parts shall be made to template or gauge;
- (iii) no repairs to metal such as welding, plugging, peening or stitching will be permitted, any valve or actuator exhibiting such repairs will be rejected;
- (iv) all joints shall be faced true and shall be watertight where subject to water pressure.
- (v) the bolt holes of all cast iron flanges and flanged fittings shall be spot faced to the specified thickness of flange with a plus tolerance of 3 millimetres (1/8 inch);
- (vi) all iron parts receiving bronze mounting shall be finished to fit, such hand work shall be done in finishing as is required to produce a neat, workmanlike, well fitting, and smooth operating job throughout.
- (vii) all parts of the same size and same make shall be interchangeable.

(d) Ferrous castings

- (i) all castings shall be true to pattern, of workmanlike finish and of uniform fine grain quality and condition, free from blowholes, porosity, hard spots, shrinkage defects,

cracks, or other injurious defects and shall be smooth and well cleaned before inspection, castings shall be readily machinable, castings shall not be repaired, plugged, or welded.

- (e) Valve bodies
 - (i) valve bodies shall be as indicated in E17.2(b) and constructed of either cast iron conforming to ASTM Standard A126, Class B or ASTM A48, Class 40; of ductile iron conforming to ASTM A536, Grade 65-45-12; or of alloy cast iron conforming to ASTM A436, Type 1 and 2, or ASTM A439, Type D-2 with a maximum lead content of 0.003 percent.
- (f) Valve ends
 - (i) the ends of all valves shall be flanged and drilled to ANSI B16.1 standard for cast iron flanges, Class 125.
- (g) Valve discs
 - (i) the design and materials of valve discs shall conform to the requirements of Section 4.5 of the latest revision of AWWA Standard C504;
 - (ii) discs shall be offset to provide an uninterrupted 360 degree seating edge and shall be cast iron per ASTM A48, Class 40 or ductile iron per ASTM A536 (65-45-12);
 - (iii) the disc seating edge, if applicable, shall be solid type 316 stainless steel;
 - (iv) the disc shall be securely attached to the valve shaft using type 304 stainless steel taper fasteners;
 - (v) disc structures containing hollow cavities are not acceptable.
- (h) Valve shaft
 - (i) valve shaft shall be constructed of type 304 stainless steel.
- (i) Valve seats
 - (i) valve seats shall be reinforced natural or synthetic rubber reinforced with high resiliency fabric inserts, the mating seat shall be of type 304 stainless steel, seats shall be of a design that permits adjustment, removal or replacement of the seat at the site of the installation without removal of the valve from the line, seats that are clamped or mechanically secured are preferred over epoxy retained seats;
 - (ii) valve seats shall be manufactured from a solid mass rather than layers of rubber bonded together;
 - (iii) valves with a rubber seat mounted on the valve disc shall meet the following conditions:
 - a) the disc seats shall be offset from the centre line of the shafts so that the rubber seat forms a continuous uninterrupted ring;
 - b) an insert of stainless steel shall be provided in the body to provide a smooth seating surface for the rubber disc seat.
 - (iv) mechanically retained rubber seats shall be held in position on the disc or body by a segmented retaining ring secured by type 316 stainless steel nuts and bolts which by tightening will slightly deform the rubber seat to maintain proper contact with the seat face throughout the entire circumference.
- (j) Bearings
 - (i) bearings in the valve body for shaft ends shall be of the sleeve type made of self-lubricating material such as Teflon filled acetal or approved equal;
 - (ii) each valve shall be equipped with one or two thrust bearings of corrosion resistant material on the shaft, outboard of the shaft seal or in the actuator housing.
- (k) Shaft seals
 - (i) shaft seals shall be designed for the use of standard split-V type packing, standard O-ring seals or pull down packing as described in Section 4.5.7 of the latest revision of AWWA Standard C504.
- (l) Nuts, bolts and fasteners

- (i) flange nuts, bolts and washers to ASTM A276, Type 316 stainless steel sized to requirements of flange, thread on bolts to extend past nut a minimum of 6 millimetres.
- (m) Flange gaskets
 - (i) 3mm, full faced, SBR rubber gaskets or neoprene in accordance with AWWA C207.
- (n) Painting and coating
 - (i) interior surfaces shall be coated with a protective system in accordance to AWWA Standard C550 – Protective Interior Coatings of Valves and Hydrants, which can be used in a potable water system;
 - (ii) interior coatings shall comply with ANSI/NSF 61 “Drinking Water System Components – Health Effects”;
 - (iii) coating shall be two (2) or more layers (5 mils minimum each coat) Polyamide Epoxy, Amerlock 400, Tnemec Series 140F Pota-Pox Plus or approved equal. Application as per manufacturer’s recommendations;
 - (iv) coatings shall be holiday free as defined in Section 5.2.3 of AWWA Standard C550;
 - (v) exterior surfaces shall be painted consistent with interior surfaces;
 - (vi) surfaces shall be prepared to NACE SSPC-SP10- Near-White Metal Blast Cleaning;
 - (vii) all machined surfaces shall be protected with an approved coating, prior to assembly to prevent rusting, machined surfaces for valve seats shall have particular attention paid to, as this area if untreated, has proven to support "barnacle growth" which can prevent watertight closure of the valve.
- (o) Acceptable Products
 - (i) DeZurik;
 - (ii) K-Flo 47 Series;
 - (iii) Mueller;
 - (iv) Pratt;
 - (v) Rodney Hunt;
 - (vi) Val-Matic;
 - (vii) Or Approved Equal.

E17.4 Submittals

- (a) Shop Drawings
 - (i) submit shop drawings in accordance to E8;
 - (ii) shop drawings shall state all performance and design criteria;
 - (iii) allow two (2) calendar weeks in delivery schedule for review of shop drawings, commencing at the date of receipt by the Contract Administrator;
 - (iv) at the time of submission, the Contractor shall inform the Contract Administrator in writing of any deviation in the shop drawings from the requirements of the contract documents, the shop drawings shall include a copy of the Specifications attached in Part E and marked by the Contractor as either in “compliance” or “deviation” with comment;
 - (v) provide valve torque calculations for operating conditions listed.
- (b) Affidavit of compliance
 - (i) provide Affidavit of Compliance stating that valves meet requirements of the latest revision of ANSI/AWWA Standard C504 and terms of this specification.
- (c) Testing
 - (i) provide all factory pressure test reports;
 - (ii) provide protective coating thickness measurements as specified in ANSI/AWWA Standard C550;

- (iii) provide recent coating qualification testing results as specified in ANSI/AWWA Standard C550 Section 5.2.1.

E17.5 Valve Testing and Acceptance

E17.5.1 Factory Tests

(a) General

- (i) all acceptance testing shall be completed in the presence of the Contract Administrator or his appointed representative, unless the Contract Administrator waives this requirement, provide a minimum of two (2) weeks notice of testing schedule to the Contract Administrator;
- (ii) testing of valves and actuators, including pressure tests, paint and coatings and electrical tests shall be coordinated to minimize number of plant visits;
- (iii) if the Contract Administrator waives witnessing of testing as indicated in E17.5.1(a)(i), provide all testing results to the Contract Administrator for review prior to shipping valves.

(b) Butterfly Valves

- (i) all valves shall be tested with mated actuators mounted and adjusted;
- (ii) all valves shall be tested with valves mounted in the vertical operating orientation;
- (iii) each valve shall be subjected to hydrostatic tests under a pressure (1000 kPa for class 150B valves and 1724 kPa for Class 250B valves) by the manufacturer at their facilities prior to shipping, the tests shall be conducted in the following manner, in accordance with the latest revision of AWWA Standard C504.
 - ◆ a hydrostatic pressure of (1000 kPa for class 150B valves) shall be applied through bulkheads, alternately to the two sides of the closed disc with the opposite side open to inspection, under this pressure, the valve seat shall be perfectly watertight;
 - ◆ a hydrostatic pressure of (2000 kPa for class 150B valves) shall be applied to the body of the valve with bulkheads closing both flanges and the disc open, under this pressure there shall be no leakage through the metal or joints, no permanent deformation of the castings, and no other defects.
- (iv) the following information shall be supplied by the Contractor to the Contract Administrator prior to delivery of the valves:
 - ◆ a certified copy of the chemical and physical analysis on all materials used in the manufacturer of the valve(s) or certification that the materials used are in strict accordance with this specification;
 - ◆ copies of the test reports for Performance, Leakage and Hydrostatic Tests performed in accordance with AWWA Standard C504, included in the report shall be the signature of the official who is responsible for the valve assembly and testing.

(c) Protective coatings

- (i) conduct non-destructive film thickness testing, in accordance to NACE SSPC PA 2, on both interior and exterior surfaces and provide comparison to qualification standard, as per AWWA Standard C550;
- (ii) conduct low voltage holiday testing as specified in AWWA Standard C550 section 5.2.3. Completed coating shall be holiday-free;
- (iii) the Contract Administrator will conduct holiday testing to NACE RP01188-88;
- (iv) the Contract Administrator will conduct disbondment testing in accordance to ASTM D 4541, tensile adhesion shall be acceptable if a minimum tensile adhesion rating of 3447 kPa (500 psi) is achieved.

E17.5.2 Field Tests

- (a) Butterfly valves
- (i) the Contractor shall perform a hydrostatic leak test, in the presence of the Contract Administrator, on all valves once they arrive at the City warehouse;
 - (ii) the Contractor will provide a suitable 600 mm diameter blind flange for testing the these valves, blind flanges will become property of the City upon successful completion of testing;
 - (iii) the Contractor shall provide 3 millimetre SBR gasket, bolts, and testing equipment, suitable to conduct tests;
 - (iv) the test shall be performed as follows:
 - ◆ the valve shall be orientated in the vertical position;
 - ◆ a gasketed, steel blind flange with a tapped fitting suitable for introduction of compressed water, shall be bolted in place;
 - ◆ the space between the blind flange and valve disc shall be filled through the center port, and air bled off through the top port, once all air has been expelled, the top test port shall be closed;
 - ◆ a pressure of 1000 kPa for class 150B valves shall be applied through the fitting and maintained for 10 minutes, under this pressure the valve seat shall be perfectly watertight;
 - ◆ the test shall be repeated for the opposite side.

E17.5.3 The Contractor shall ensure a qualified representative of the valve manufacturer is present for the testing of the valves to correct any deficiencies found.

E17.6 Installation

E17.6.1 Installation of Butterfly Valve

- (a) install butterfly valves as shown on the Drawings, valves shall be installed with the valve shaft in the horizontal position;
- (b) core 125 mm opening in roof slabs directly above actuator operation nut, valve box and valve stem extensions shall be installed plumb and aligned directly above the valve actuator operation nut.

E17.6.2 Commissioning of Butterfly Valve

- (a) the Contractor shall assist in operation of the butterfly valve for the purpose of commissioning.

E17.7 No separate measurement or payment will be made for butterfly valves, and will be considered incidental to the Works of the project.

E18. MANUAL VALVE ACTUATORS

E18.1 Description

E18.1.1 This Specification shall cover the design and manufacture of manual actuators for butterfly valves to be supplied under this Contract, this Specification is supplementary to and shall be read together with the latest revision of AWWA Standard C504, "Rubber-Seated Butterfly Valves".

E18.2 General Design Requirements

- (a) quarter turn, manual geared actuators shall be of worm gear drive type designed for one person operation and for a maximum pull on the handwheel rim, at maximum torque conditions of not more than 356 Newtons (80 ft pounds);
- (b) all manual actuators to be supplied under this Contract shall be designed and manufactured by a company having at least five (5) years prior experience in manufacturing these types of products in the size and to the pressure ratings as those specified herein.

E18.3 Gearing and Enclosure

- (a) actuators shall be manual geared with a ball bearing mounted worm gear drive, machine cut gear teeth, and be totally enclosed in a sealed housing sufficient to permit normal operation even when totally submerged in water, travelling nut type of mechanisms will not be accepted, gear lubricant shall be of the bulk grease type; synthetic lubricants will not be accepted;
- (b) number of actuator turns to open or close the valve shall be kept to as few as possible to avoid overtorquing and damage to the actuator;
- (c) submersible rating shall be adequate for 7.5 metres water submergence for forty-eight hours;
- (d) accessible parts of the actuator requiring lubrication shall be provided with button-head alemite grease fittings.

E18.4 Input Limit Stops

- (a) adjustable, external stop-limiting devices shall be provided on the actuators to prevent over-travel of the valve disc in the open and closed position;
- (b) under circumstances where spur gear attachments are installed on the input side of the actuator to facilitate the maximum input operating torque of 356 Newtons (80 ft. pounds), input limit stops shall be installed on the input side of the spur gear attachment;
- (c) a shear pin or other torque regulating device shall be provided on the actuator or handwheel/operating nut as an extra precaution against actuators being over-torqued.

E18.5 Handwheel

- (a) each actuator shall be equipped with a 450 millimetre (min.) to 600 millimetre (max.) diameter handwheel fitted with an operating nut secured in position by a lock nut, pin or key, the operating nut shall be 49 millimetres square at the top, 51 millimetres square at the base and 45 millimetres high, the handwheel shall be made of cast iron or aluminum of the rimmed type with finger grips, an arrow, the word "OPEN" cast in relief on the rim and have an easy slide fit onto the mating shaft, direction of opening shall be counter clockwise, spinners shall be provided on all handwheels;
- (b) the handwheel shall be located sufficiently away from the valve flanges, housings, etc. such that personnel will not hit their knuckles on any of these obstructions when using the handwheel.

E18.6 Valve Position Indicator

- (a) a mechanical, valve position indicator shall be provided and mounted on the outside of each valve actuator, the dial or scale plate shall be 316 stainless steel and shall be clearly graduated and marked, A 316 stainless steel pointer shall be aligned to show the exact position of the valve disc in the valve body, the fastener for the indicator dial shall be made of 316SS stainless steel.
- (b) there shall also be a visible indication on the valve shaft end showing the position of the valve disc in relation to the shaft to ensure proper relation of the disc and indicating mechanism in the event an actuator has to be removed and replaced on a valve.

E18.7 Stainless Steel Extension Shaft

- (a) a 50 mm diameter stainless steel extension shaft shall be supplied with the butterfly valves for surface operation as shown on the Drawings;
- (b) the extension shaft shall be configured for a 50 mm AWWA operating nut;
- (c) the extension shaft shall be located a minimum of 150 mm and maximum of 450 mm from the proposed final grade.

E18.8 Protective Coatings

- (a) all external ferrous components including adaptor and mounting plates, shall be painted and tested in accordance to Clause E19.3(n) Painting and Coating and Clause E19.5.1(c) of this Specification;
- (b) any touch-up paintwork required during installation shall be undertaken by the installation contractor, the touch-up paint shall be of the same colour and specifications used in the above clauses and shall be supplied by the Contractor, the Contractor shall provide a minimum of one (1) litre of paint product for this purpose.

E18.9 Acceptable Manufacturers

- (a) Rotork;
- (b) Limitorque;
- (c) or approved equal in accordance with B7.

E18.10 No separate measurement or payment will be made for manual valve actuators, and will be considered incidental to the Works of the project.

E19. AIR VACUUM AND RELEASE VALVES

E19.1 Combination air valve assembly requires a 200mm combination air valve with 1/8 inch relief orifice and shall be installed in the west valve chamber on the 200 flange port on the 600x600x600 tee.

E19.2 Conform to AWWA C512 - 13 mm through 150 mm air-release valves and 13 mm through 500 mm air/vacuum and combination air valves having gray cast iron or ductile iron bodies and covering with maximum working pressure of 2,070 kPa.

E19.3 Body and cover shall be of gray cast iron (ASTM A126, Class B or ASTM A48, Class 35) or ductile iron (ASTM A536, Grade 65-45-12) and shall have threaded or flanged connections as required.

E19.4 Flanged ends dimensions and drilling shall conform to ANSI/ASME B16.1, Class 250 except all flanges shall be flat faced unless otherwise specified.

E19.5 Threaded end connections shall conform to the specifications for tapered pipe threads for general use, National Pipe Threads (NPT) per ANSI/ASME B1.20.1.

E19.6 Floats for valves with inlet sizes less than 100 mm shall be capable of withstanding a collapse pressure of 6,900 kPa. For 100 mm and larger, shall be capable of withstanding collapse pressure of 5,180 kPa.

E19.7 Gaskets shall be made of rubber composition of paper that is free of asbestos or corrosive ingredients. O-rings or the suitable elastomeric seals may be used for gaskets. O-rings shall be compounded to meet ASTM D200 and has physical properties suitable for the application.

E19.8 An air release valve and an air/vacuum valve assembled with inter-connecting pipes shall have pipe fittings of sufficient size to prevent clogging and entrapment of foreign materials. The piping between the air/vacuum valve and the air-release valve be installed to allow air to rise to the air-release inlet. A shutoff valve isolating the two valves shall be installed.

E19.9 Elastomers shall:

- (a) Be resistant to microbial attack, copper poisoning, and ozone attack.
- (b) Contain no more than 8 ppm of copper ion and shall include copper inhibitors to prevent copper degradation of the rubber material.
- (c) Be capable of withstanding an ozone-resistance where tested in accordance with ASTM D1149.
- (d) Have a maximum compression set value of 18 percent when tested in accordance with ASTM D395, Method B, for 22 h at 71degrees C.

- (e) Be free of vegetable oils, vegetable soil derivatives, animal fats and animal oils.
- (f) Contain no more than 1.5 parts wax per 100 parts of rubber hydrocarbon and shall have less than a 2 percent volume increase when tested in accordance with ANSI/ASTM D471 after being immersed in distilled water at 23 degrees C +/- 1 degree C. Reclaimed rubber shall not be used.

E19.10 No separate measurement or payment will be made for air vacuum and release valves, and will be considered incidental to the Works of the project.

E20. PIPE, JOINTS, FITTINGS, FLANGES, AND COUPLINGS

E20.1 Polyvinyl chloride (PVC) pressure pipe:

- (a) Pressure class/rating as shown in the Bid Form and on the drawings.
- (b) AWWA C900, pressure class, gasket bell end, cast iron outside diameter (CIOD); AWWA C905, pressure rating, gasket bell end, cast iron and iron pipe outside diameter (CIOD and IPS); CAN/CSA-B137.3
- (c) Pipe marking: to CAN/CSA B137.0-M86.
- (d) Joint lubricants must be certified for potable water use in accordance with National Sanitation Foundation (NSF) Standard 61.
- (e) Supply an affidavit of Compliance to the AWWA C900 or C905 standard to Contract Administrator.
- (f) Fabricated fittings: conform to CSA B137.3, fabricated from AWWA C900 PVC bonded and overwrapped with fibreglass reinforced polyester.
- (g) PVC fitting (moulded): conform to AWWA C907 and certified to CSA B137.2.
- (h) Pipe to be NSF 61 certified.

E20.2 Cast/Ductile Iron Pipe:

- (a) Pressure class/rating of pipe to be minimum Class 200 for 600mm.
- (b) Pipe, Coatings, Linings, Encasement.
 - (i) Ductile iron pipe: to AWWA C151/A21.51.
 - (ii) Cast iron pipe: to AWWA C110.
 - (iii) Interior cement mortar lined: to AWWA C104/A21.4.
 - (iv) Exterior polyethylene encased: to AWWA C105/A21.5.
 - (v) Protective fusion-bonded epoxy coatings for the interior and exterior surfaces of ductile iron and gray-iron fittings: to AWWA C116/A21.16.
 - (vi) All interior linings to be NSF 61 certified.
- (c) Joints:
 - (i) Rubber gasket for mechanical and push on pipe joints: to AWWA C111/A21.11.
 - (ii) Rubber gasket for flange pipe joints 1.6 mm thick: to AWWA C111/A21.11.
 - (iii) Bolts, nuts, hex head with washers: to ASTM A307.
 - (iv) Electrical conductivity across joints where specified.

E20.3 High Density Polyethylene (HDPE) pressure pipe:

- (a) Pressure Class (DR rating) as shown in Bid Form and on drawings.
- (b) HDPE pipes: to AWWA C906, CAN/CSA B137.1, PE 3408 based on IPS outside diameter (100 mm through 1600 mm); to AWWA C901 for pipe 13 mm through 76 mm.
- (c) Polyethylene to polyethylene joints: to be thermal butt fusion joined, to ASTM D 2657.
- (d) Ductile iron fittings with flanged ends: to AWWA C110/A21.10 for pipe size above 100 mm.

- (e) Polyethylene fittings: to CAN/CSA B137.1 or AWWA C901. Ductile iron backup flange to Class 150, ANSI B16.1/16.5 with stainless steel bolts and nuts, with neoprene or red rubber gasket.
- (f) Pipe to be NSF 61 certified.

E20.4 Steel Pipe

- (a) Pipe: to AWWA C200
- (b) Pipe marking (each pipe): to CSA Z245.1.
- (c) Field welding: Butt weld to AWWA C206
- (d) Exterior finish:
 - (i) AWWA C203, hot applied coal tar enamel and tape polyethylene jacket.
 - (ii) AWWA C214 tape coating system.
 - (iii) AWWA C210 liquid Epoxy coating.
 - (iv) AWWA C213 Fusion Bonded Epoxy.
 - (v) CSA Z245.21-98 yellow jacket.
- (e) Interior finish:
 - (i) AWWA C205, cement mortar lined.
 - (ii) AWWA C210 liquid Epoxy coating.
 - (iii) AWWA C213 Fusion Bonded Epoxy Coating.
 - (iv) All linings to be NSF 61 certified.
- (f) Pipe joints: to be butt welded joints. Prepare in accordance to AWWA C206.
- (g) Grade of pipe to be 290 MPa and to be 9.50mm thick.

E20.5 Ensure that cutting procedures are complementary with the type of interior lining materials being used. Generally, flame cutters are considered acceptable for use on unlined, epoxy lined or enamel lined pipe.

E20.6 Fittings: to AWWA M11, AWWA 208, CSA Z662 and CSA Z245.1.

E20.7 Manufacture fittings and flanges in accordance with CSA Z245.12-M85, Category 1 classification and the following supplementary data:

- (a) Diameter equal to that of pipe being used.
- (b) Grade 290 steel or greater.
- (c) Pressure rating: ANSI Class 150.
- (d) Design pressure: 1380 kPa.
- (e) Surge pressure: 40% greater than design pressure.

E20.8 Fittings:

- (a) Unless specifically called for, use threaded connection for piping 65 mm and smaller.
- (b) Unless specifically noted otherwise, use butt-weld connection for piping 75 mm and larger.
- (c) Threaded Fittings up to 150 mm: 300 lb banded malleable iron to ANSI B16.3, galvanized.
- (d) Welded Fittings 75 mm to 750 mm Inclusive: Seamless carbon steel, butt-weld type, Grade NPB. Standard weight or extra strength as required to achieve at least the same working pressure rating as the pipe to which fittings are attached. Do not use fabricated fittings.
- (e) Welded Fittings 800 mm to 1200 mm Inclusive: Carbon steel, butt-weld type, Grade WPB and conforming to ASTM A234. Fittings to be standard weight or extra strength as required to achieve at least the same working pressure rating as the pipe to which the fittings are attached.

- (f) Fabricated Welded Fittings 800 mm to 1200 mm Inclusive: Fabricated welded fittings may be used where specifically indicated. Fabricated fittings to be produced from the same pipe as specified for steel pipe, 650 mm to 1200 mm inclusive, and to the dimensions of AWWA C208, latest edition. Reinforce fabricated fittings per the requirements of AWWA M11 to achieve a working pressure rating at least equal to the pressure rating of the pipe itself.

E20.9 Flanges:

- (a) 75 mm to 600 mm Inclusive: Forged carbon steel, weld neck type, conforming to ANSI A181, Grade I for Class 150 lb and Class 300 lb. Use Class 300 lb flat-faced flange only when mating to a Class 250 cast iron valve.
- (b) 650 mm to 1200 mm Inclusive: Forged carbon steel, weld neck and slip-on type, Class 250 lb to ANSI B16b, material to ASTM A105. Use slip-on flanges only where specifically indicated. Use a flat-faced flange when mating to a 250 lb cast iron valve. Confirm that flange bores and bolting patterns match the valve and pipe to which it is mated.

E20.10 Flanged / Compression Sleeve Couplings - F/C Couplings:

- (a) 600 mm to 1200 mm Inclusive: 250 lb ANSI forged steel flange with a steel sleeve and follower ring. Sleeve length not to exceed 140 mm. Working pressure rating of at least 1750 kPa (250 psi) for the entire assembly. The design of the couplings is to be such that they allow for direct flange to pipe harnessing as detailed on the drawings. Line couplings internally with an epoxy coating as per AWWA C210. If possible, design adaptors to allow follower bolt removal toward the flange of the adaptor.

E20.11 Nuts and Bolts

- (a) Direct buried, in manholes or submerged service - stainless steel bolts and nuts on direct buried or submerged applications conforming to ASTM A193 Grade B8 or B8M.
- (b) Exposed service - galvanized carbon steel bolts conforming to ASTM A307 Grade B7 with galvanized carbon steel nuts conforming to ASTM A307 Grade 2H, semi-finished hex head.
- (c) MJ T-Head nuts and bolts for ductile iron pipe to be high strength, low alloy steel to AWWA C10/A21.10.

E20.12 Joint Restraints

- (a) PVC fitting joint restraints shall be constructed of ductile iron to ASTM A536 Grade 65-45-12, Uniflange Series 1300 and 1400 or Approved Equal in accordance with B7, c/w 316 stainless steel hardware. Restraints to be tested in accordance with ASTM F1674.
- (b) Number of lugs to match the restraint retainer ring.

E20.13 Dismantling Joint

- (a) Flange Spool: AWWA Class D Ring Flange, compatible with ANSI Class 125 and 150 bolt circles. For 3" - 12" sizes, pipe is Sch 40 ASTM A53. For 14" - 72" sizes, ASTM A36 Carbon Steel.
- (b) End Ring & Body: For 3" - 12" sizes, body and end ring are ASTM A536 ductile (nodular) iron meeting or exceeding Grade 65-45-12. For 14" - 72" ASTM A36 Carbon Steel with AWWA C207 Class D flanges. 3" - 72" meet the dimensional requirements of ANSI Class 125 and 150 bolt circles.
- (c) Gaskets: Compounded for water and sewer service in accordance with ASTM D 2000 (ductile iron flange bodies, 3" - 12" have flange o-ring gaskets), NSF61 certified.
- (d) Bolts & Nuts: High strength low alloy steel bolts and nuts. Steel meets ASTM A588.
- (e) Coating : Fusion bonded epoxy, NFS 61 certified.
- (f) Tie-Rods : High strength steel per ASTM A193 B7.

E20.14 Pipe Couplers

- (a) Pipe couplers for pipe connections to chambers shall be to the latest revision of AWWA C-219 for bolted, Sleeve Type Couplers for Plain End Pipe. Minimum requirements are:
 - (i) Minimum sleeve length 250 mm.
 - (ii) Minimum centre sleeve thickness 12.7 mm.
 - (iii) Couplings capable of accommodating up to 2 degrees deflection.
 - (iv) Bolts and nuts to be 316 Stainless Steel.
 - (v) Design pressure 150 psi.
- (b) Buried pipe couplers shall be protected against corrosion by wrapping with Denso Tape system, consisting of Denso Profiling Mastic, Denso Paste and Denso Tape, or approved equal.
- (c) Couplings to be supplied with two di-electric insulating boots.
- (d) Couplings to be fusion bonded epoxy coated to AWWA C213, and meeting the requirements of ANSI/NSF 61 "Standard for Drinking Water System Components – Health Effects"

E20.15 Rubber gasket for flange pipe joints 1.6 mm thick: to AWWA C111/A21.11.

E20.16 In addition to anode protection, all buried nuts, bolts, transition couplings, restrainers and metal fittings to be coated with Denso Mastic and Denso Tape.

E20.17 Other corrosion protection method to be approved by the Contract Administrator.

E21. INSTALLATION OF FEEDERMAINS

E21.1 Clean pipes, fittings, valves, and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects to approval of Contract Administrator. Remove defective materials from site.

E21.2 Trenching

- (a) Do trenching work in accordance with Section CW2030 - Excavation Bedding and Backfill.
- (b) Trench depth to provide cover over pipe of not less than 2.8 m from finished grade to top of pipe unless otherwise specified on design drawings.
- (c) Trench alignment and depth require Contract Administrator's approval prior to placing bedding material and pipe.
- (d) Do not backfill trenches until installed, work has been checked and accepted by Contract Administrator.
- (e) Allowable tolerances in alignment and grade as follows:
 - Grade: ± 20 mm
 - Alignment: ± 50 mm

E21.3 Concrete Bedding and Encasement

- (a) Do concrete work in accordance with CW2030 – Excavation Bedding and Backfill. Place concrete to details as indicated or as directed by Contract Administrator.
- (b) Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- (c) Do not backfill over concrete within 24 h after placing.

E21.4 PVC Pipe Installation

- (a) Pipe installation: to AWWA C604 for PVC pipe.
- (b) Bevel or taper ends of PVC pipe to match fittings.
- (c) Handle pipe by approved methods. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

- (d) Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Remove and replace defective pipe. Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation.
- (e) Face socket ends of pipe in direction of laying. For mains on a grade of 2% or greater, face socket ends up-grade.
- (f) Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- (g) Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- (h) Position and join pipes with equipment and methods approved by Contract Administrator. Do not use excavating equipment to force pipe sections together.
- (i) Cut pipes in an approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- (j) Align pipes carefully before jointing.
- (k) Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- (l) Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.
- (m) Complete each joint before laying next length of pipe.
- (n) Minimize deflection after joint has been made.
- (o) Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- (p) Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Contract Administrator.
- (q) When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- (r) Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- (s) Do not lay pipe on frozen bedding.
- (t) Areas to be backfilled are to be free from debris, snow, ice, water and frozen ground.
- (u) Do not use backfill material, which is frozen or contains ice, snow or debris.
- (v) Protect valves and appurtenances from freezing.
- (w) Upon completion of pipe laying and after Contract Administrator has inspected work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated or directed by Contract Administrator.
- (x) Hand place pipe zone material in uniform layers not exceeding 150 mm thick to minimum 300 mm over top of pipe. Do not dump material directly on top of pipe.
- (y) Place layers of pipe zone uniformly and simultaneously on each side of pipe to prevent lateral displacement of pipe.
- (z) Compact each layer to Section CW2030 - Excavation Bedding and Backfill.
- (aa) Backfill remainder of trench.

E21.5 Polyethylene Pipe (HDPE) Installation

- (a) Pipe installation: to AWWA M55.

- (b) Polyethylene Pipe shall be jointed by the thermal butt-fusion method in accordance with ASTM D2657 and in accordance with the pipe manufacturer's recommended procedure for jointing the pipe. Pipe or fittings, jointed by any form of fusion method can only be performed by technicians certified by the pipe manufacturer. Deflections at joints shall not be accepted unless they form part of a deflection fitting made on site.
- (c) Remove all cuttings from the interior of the pipe before fusing.
- (d) The tensile strength at yield of the butt-fusion joints shall not be less than the pipe. All joints shall be logged. The log on each joint shall include the name of the certified operator, time, date, diameter, wall thickness, heating plate, temperature, fusing time and cool down time. The operator shall immediately report to the Contract Administrator any joint that fails.
- (e) Whenever practicable the jointing shall be carried out at ground elevation and the jointed pipe subsequently lowered into the trench.
- (f) The open end of the pipe in the trench shall be suitably covered to prevent entrance of trench water and other material during periods when pipe is not being installed.
- (g) Precaution shall be taken to ensure that displacement of the pipe in the trench does not occur through soil displacement or flotation due to the presence of trench water. Pipe that has been displaced shall be removed from the trench and relaid.
- (h) No pipe shall be lowered into a ditch until all rocks, clods and debris have been removed.
- (i) Whenever sheeting is used to control unstable trench conditions, it shall be left in place and before backfilling, the sheeting shall be cut off 1.5 metres below ground level. The sheeting may be removed after laying the pipe only if the sheeting is installed such that the bottom of the sheeting extends no lower than the top of the pipe. If a trench box or case is used, the rear half of the box shall have sides that do not extend below the "in place" top of the pipe.
- (j) Pipes shall be stored as to prevent damage by crushing or piercing. If pipe is to be stored outside for periods longer than 60 days, the pipe shall be covered with an opaque material to protect it from prolonged exposure to sunlight. The Contractor must also provide for air circulation under the protective material.
- (k) Pipe shall be checked before being lowered into the trench to ensure that no foreign material or manufacturer's defects exist that might prevent the proper jointing of the pipe or its operation. Throughout the Contract and including the operations of off-loading on delivery, handling, storing and transporting pipes and fittings on or about the site, the Contractor shall use such methods and equipment as will prevent damage to the pipes and injury of workmen. Such methods shall include the use in appropriate cases of pipe hooks, lifting beams, reinforced canvas slings, struts, cradles and pipe trailers. Pipe shall not be dropped or allowed to come into contact with any sharp object. Any pipe that has been scratched, gouged, damaged or otherwise deemed by the Contract Administrator to be unsuitable for use, shall be replaced at the Contractor's expense.
- (l) Any section of pipe containing gouges or scratches exceeding 50% of the manufacturer's recommended limits will be rejected.
- (m) Temporary packing, coverings or crates provided by the suppliers for the protection of pipes and fittings in transit shall not be removed (except for purposes of inspection after which they shall be replaced) until immediately before the pipe is installed.
- (n) Dispose of all cuttings from the fusion operation at a sanitary landfill.

E21.6 Steel Pipe Installation

- (a) Check pipe before being lowered into the trench to ensure that no foreign material, manufacturer's defects, or cracks exist that might prevent the proper jointing of the pipe or its operation.
- (b) Repair jeeps and holidays and all skid blisters or other injuries to the protective coating, from whatever cause, before lowering the pipe into the trench.

- (c) If the protective covering is damaged during the lowering-in process, remove pipe from the ditch and repair the covering to the satisfaction of Contract Administrator.
- (d) Lay pipes to AWWA Manual of Practice and manufacturer's standard instructions and specifications.
- (e) Join pipes in accordance with AWWA Manual of Practice and manufacturer's recommendations.
- (f) Cover the open end of the pipe in the trench to prevent entrance of trench water and other material during periods when pipe is not being installed.
- (g) Take precaution to ensure that displacement of the pipe in the trench does not occur through soil displacement or flotation due to the presence of trench water. Remove pipe that has been displaced from the trench and re-install it to meet the specification requirements.
- (h) Install fittings in accordance with the requirements of CSA Z662.
- (i) Jointing to be either flanged or butt welded in accordance with these specifications.
- (j) Adequately support fittings to reduce the transmission of any undesirable load or stress on the adjoining pipe.
- (k) Fabricate mitred bends and transitions to AWWA M11.
- (l) Submit detailed shop drawings of mitred bends and transition pieces to Contract Administrator for review prior to fabrication.
- (m) After fabrication, apply, or repair if already applied, internal lining and external coating as specified elsewhere in these specifications.
- (n) Install mitred bends and transitions to line and grade, and with bedding and backfill as for steel pipe.

E21.7 Connections to Existing Pipes

- (a) Connections to existing pipes shall be made at the locations shown on the Drawings.
- (b) Connections between existing prestressed concrete cylinder pipe and AWWA C905 PVC pipe shall be made by means of a bell or spigot plain end adaptor and bolted sleeve coupling as indicated on the drawings. Alternate connection methods for connection of PVC pipe to existing PCCP may be permitted upon review of the Contract Administrator. Design and fabrication of alternate connections will be the responsibility of the Contractor.
- (c) All pipe joints included in connection sections shall be exposed after recommissioning to inspect for leakage.

E22. VALVE CHAMBERS

E22.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

E22.2 Complete units as pipe laying progresses.

E22.3 Excavation

- (a) Perform excavation in accordance to the drawings and CW 2030.
- (b) Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter. Protect bottoms of excavations from softening. Should softening occur, remove softened soil and replace with Type 2 material.
- (c) Notify Contract Administrator when bottom of excavation is reached to obtain approval of completed excavation.
- (d) Remove unsuitable material from trench bottom to extent and depth as directed by Contract Administrator.
- (e) Where required due to unauthorized over-excavation, correct as follows: Fill under areas with Type 2 fill compacted to minimum of 95% Standard Proctor Density.

E22.4 Backfill

- (a) Place and compact as Class 2 and Class 4 backfill in accordance to the drawings and CW 2030.
- (b) Cast concrete base on 150 mm minimum of granular bedding compacted to 95% maximum density to ASTM D698.
- (c) Exterior side of perimeter walls: Use Type 2 fill within the first 1000 mm from wall, Class 2 for the remainder, to subgrade level; compacted to 95%.
- (d) Do not proceed with backfilling operations until Contract Administrator has inspected and approved installations.
- (e) Areas to be backfilled are to be free from debris, snow, ice, water and frozen ground.
- (f) Do not use backfill material, which is frozen or contains ice, snow or debris.
- (g) Place backfill material in uniform layers not exceeding 300 mm compacted-thickness up to grades indicated. Compact each layer before placing succeeding layer.
- (h) Heavy compaction equipment is not allowed to operate within 1.5m above the placed pipe.
- (i) Do not backfill around or over cast-in-place concrete until 80% of concrete design strength is achieved.
- (j) Place layers simultaneously on all sides of installed work to equalize loading. Difference not to exceed 0.3 m.
- (k) Use only hand operated compaction equipment within 1.5 m of foundation walls.

E22.5 Reinforcing Steel

- (a) Lap lengths and bar development lengths to conform to CSA A23.3. Provide Class B tension lap splices in accordance with Clause 12.15.1 and Table 12-1, "Other Cases", unless otherwise indicated.

E22.6 Cast-In-Place Concrete and Pre-Cast Concrete

- (a) Concrete to conform to CW 2160.
- (b) All reinforced precast and cast in place concrete shall conform to Table 2160.1 Design Requirements for Concrete Used for Underground Structures Type A Monolithic Sewers and Reinforced Structures.
- (c) High range water reducing add mixtures may be used to increase workability of concrete for placement.
- (d) Mudslab is to be constructed using grout supplied in accordance with CW2160.

E22.7 Crack Repairs

- (a) Utilize the best possible care and construction techniques to minimize cracking of concrete walls and slabs.
- (b) Cracks which do appear shall be routed out on each face and repaired with Cementitious waterproof grout in accordance with manufacturer's recommendations, except that cracks which are in excess of 0.50 mm width, or deemed by the Contract Administrator to be structurally detrimental, or subject to movement shall be grouted with pressure injected epoxy resin.
- (c) Obtain approval from Contract Administrator of pressure grouting techniques and epoxy materials to be utilized prior to proceeding with the Work.
- (d) Depth of epoxy grouting shall be sufficient to restore structural integrity and/or water-tightness, as required, but shall not be less than 100 mm.
- (e) Cure crack repairs to manufacturer's instructions.

E22.8 Place frame and cover on top section to elevation as indicated. If adjustment required use concrete ring.

- E22.9 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.
- E22.10 Install valves to manufacturer's recommendations at locations as indicated.
- E22.11 Support valves located in valve boxes or valve chambers by means of adjustable stanchions located as indicated in drawing D-14036, located between valve and solid ground. Bedding same as adjacent pipe. Maximum length of pipe on each end of valve shall be 1 m. Valves not to be supported by pipe.
- E22.12 Piping which is to be built into mass concrete or reinforced concrete walls and floors is to cast in at the time of concreting the walls and floors, unless otherwise required by Contract Administrator. Box-outs will not be permitted.
- E22.13 Accurately locate piping to be built into walls and floors, with due care taken to position the bolting holes in flanged piping to the correct orientation to receive valves or other fittings mating to them.
- E22.14 Where pipe or sleeves are to be grouted in place:
- (a) Use an approved non-shrink, non-metallic grout mixture.
 - (b) Leave exposed non-metallic, non-shrink grout faces recessed 25 mm from final surface.
 - (c) Fit and finish with Portland cement grout.
 - (d) Do not disturb such sleeves or pipes until the grout is properly cured.
- E22.15 Abandonment of existing valve chambers to be completed as per section 3.20 of CW2130.

E23. STRUCTURAL STEEL FABRICATIONS

E23.1 Quality Assurance

- (a) Qualifications of Welders:
- (i) Welding of load supporting components shall be performed by companies certified by Canadian Welding Bureau in accordance with CSA W47.1.
 - (ii) Welders shall be qualified by Canadian Welding Bureau for classification of Work being performed.
- (b) Workmanship Standards:
- (i) Resistance Welding: to CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - (ii) Fusion welding: to CSA W59, Welded Steel Construction (Metal Arc Welding).

E23.2 Submittals

- (a) Submit shop drawings clearly indicating:
- (i) Components
 - (ii) Core metal thicknesses
 - (iii) Finishes
 - (iv) Dimensions
 - (v) Fabrication details
 - (vi) Installation details
- (b) Submit paint manufacturer's product data.

E23.3 Product Delivery and Storage

- (a) Schedule delivery of components to site to coincide with installation of this work.
- (b) Store components to prevent damage and distortion.
- (c) Protect finishes from scratches and soiling.

E23.4 Materials

- (a) Steel sections and plates: to CSA-G40.20/G40.21, Grade 300W.
- (b) Deformed steel bars: of billet steel to CSA G30.18, grade 300.
- (c) Anchor bolts and nuts: to ASTM A307, hot dip galvanized where noted.

E23.5 Fabrication

- (a) Shop fabricate components where possible.
- (b) Fabricate components square, straight, true, free from warpage and other defects. Accurately cut, machine, file and fit joints, corners, copes and mitres.
- (c) Exposed joints and connections shall be tight, flush and smooth unless otherwise indicated.
- (d) Where work of other Sections is to be attached to work of this Section, prepare work by drilling and tapping holes as required to facilitate installation of such work.
- (e) Work of this Section, supplied for installation under other Sections, shall be prepared as required ready for installation.

E23.6 Finishes

- (a) Galvanizing: hot dipped galvanizing with zinc coating to ASTM A123/A123M.

E23.7 Access Ladders

- (a) Stringers: 65 x 13mm thick, steel.
- (b) Steel Rungs: 20 mm diameter, welded to stringers at 300 mm o.c.
- (c) Brackets: sizes and shapes as indicated, weld to stringers at 1200 mm o.c., complete with fixing anchors.
- (d) Finish: Galvanized.

E23.8 Erection

- (a) Perform welding work in accordance with CSA W59 unless specified otherwise.
- (b) Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- (c) Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- (d) Exposed fastening devices to match finish and be compatible with material through which they pass.
- (e) Provide components for building by other sections in accordance with shop drawings and schedule.
- (f) Make field connections with bolts to CAN/CSA S16.1, or weld.
- (g) Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- (h) Touch up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- (i) Touch up galvanized surfaces with zinc rich primer where burned by field welding.
- (j) Install access ladders in locations as indicated.

E23.9 Trench Covers

- (a) Install trench covers in locations as indicated.

E23.10 Channel Frames

- (a) Install steel channel frames to openings as indicated.

E24. ELASTOMERIC SHEET MEMBRANE WATERPROOFING

E24.1 Description

- (a) This section specifies elastomeric waterproofing required over the exterior of the valve chamber, as shown in the drawings.

E24.2 Quality Assurance

- (a) Membrane: applied by applicator trained and approved by manufacturer for application of its products. To be compatible with other materials used in the installation.
- (b) Applicators: minimum 5 years proven experience.
- (c) Manufacturer's representative:
 - (i) Inspect subgrade prior to commencement of work, during application of membrane and upon completion of work.
 - (ii) Provide technical assistance to applicator and assist where required in correct installation of membrane.

E24.3 Warranty

- (a) Provide warranty for the elastomeric membrane waterproofing against leakage for a period of ten years from date of notice of acceptance.

E24.4 Shipment, Protection and Storage

- (a) Deliver, store and handle materials in accordance with manufacturer's recommendations.

E24.5 Acceptable Products

- (a) Membrane:
 - (i) Bituthene 3000 by Grace Construction Products
 - (ii) Jiffy Seal 140/60 by Protecto Wrap Company.
- (b) Protection Layer: Concrete Faced Polystyrene: Type 4: to CAN/ULC S701-01, tongue and groove, 50 mm thick with 10 mm thick laytex modified concrete factory applied complete with securement clips and fasteners. Acceptable material: Styrofoam Brand CT Insulation as manufactured by Dow Chemical Company or equivalent installed to thickness indicated on the drawings.

E24.6 Materials

- (a) A self-adhering rubberized asphalt integrally bonded in a layer of cross laminated velron polyethylene.
- (b) Primers and lap sealants as recommended by membrane manufacturer.
- (c) Dampproofing material: to one (1) or more of the following:
 - (i) CAN/CGSB-37.1-M89, Chemical Emulsified Type, Emulsified Asphalt for Dampproofing.
 - (ii) CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coating.
 - (iii) CGSB 37-GP-6Ma, Asphalt, Cutback, Unfilled, for Dampproofing.
 - (iv) CAN/CGSB-37.16-M89, Filled, Cutback Asphalt for Dampproofing and Waterproofing.
- (d) Water: potable.
- (e) Joint Sealing Compound: rubber-asphalt, to CAN/CGSB-37.29-M89.

E24.7 Application

- (a) Apply and install all required materials as per manufactures specifications.

E24.8 Protection of Completed Work

- (a) Ensure membrane is undamaged before application of protective layer.
- (b) Apply insulation layer to cover membrane below grade as shown.

E25. HYDROSTATIC AND LEAKAGE TESTING

- E25.1 The contractor is responsible for a successful pressure test.
- E25.2 Based on the design of the feedermain two separate test sections exist:
- (a) East Side, and
 - (b) West Side.
- E25.3 Hydrostatic pressure test of the PVC and Ductile Iron sections are to be performed at the pressure rating based on the elevation of the lowest point on the main. This pressure is to be corrected to the elevation of the test gauge and shall be occur for a duration of 2 hours. Pressure tests shall be completed by using bulkheads and thrust blocks.
- E25.4 Both a hydrostatic pressure test and a leakage test to be performed. Do tests in accordance with:
- (a) AWWA C605 for PVC pipe,
 - (b) AWWA C600 for ductile iron pipe,
 - (c) AWWA C604 for steel pipe.
- E25.5 Notify Contract Administrator at least 24 h in advance of all proposed tests. Contractor to confirm that test sections will maintain pressure prior to Contract Administrator being on-site. Perform all subsequent tests in presence of Contract Administrator.
- E25.6 No testing is allowed during freezing weather, unless approved by the Contract Administrator. In such case, the Contractor shall protect valves, joints and fittings, ditch, road surface and including the test area free from ice.
- E25.7 The Contractor shall:
- (a) Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described,
 - (b) Arrange and coordinate supply of potable water for hydrostatic and leakage testing. City will supply potable water required for hydrostatic testing,
 - (c) Where any section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete,
 - (d) Expel air from the pipe by slowly filling the pipe with potable water. Install corporation stops at any high points in the pipe where no air-vacuum release valves are installed. Remove stops after satisfactory completion of test and seal holes with plugs,
 - (e) Remove any pipe, fittings and appurtenances found defective and replace with new sound material and make watertight,
 - (f) Repeat hydrostatic test until all defects have been corrected. Contractor is responsible for all costs on repeat tests.
- E25.8 Pipe will be tested only after complete backfilling of trench.
- E25.9 Leave valves, joints and fittings exposed.
- E25.10 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- E25.11 Fill pipe with cement mortar lining at least 24 h before testing to allow water absorption by pipe material. Fill and pressurize PVC and steel pipes before test to allow for any expansion and stretching.

E25.12 The leakage test for PVC pipe is to be performed. To pass the leakage test, the volume of makeup water must not exceed the calculated volume of allowable makeup water as per the following table.

Allowable Makeup for PVC Plastic Pipe with Elastomeric Joints (Litres per Hour)

Nominal Pipe Size *mm)	345 kPa (50 psi)	690 kPa Average Test (100 psi)	1035 kPa Pressure (150 psi)	1380 kPa (200 psi)
	Allowable Makeup Per 50 Joints (305m)			
500	3.63	5.11	6.28	7.23
600	4.35	6.13	7.53	8.67
750	5.41	7.68	9.39	10.86

E25.13 For Steel and Ductile Iron Pipe:

- (a) The pipe shall hold the test pressure for 2 hours.
- (b) There should be no leakage in all-welded pipeline.

E26. FLUSHING AND DISINFECTION OF FEEDERMAINS

E26.1 Flushing and Disinfection shall be done according to CW2125.

E26.2 Flushing shall be completed on three sections:

- (a) West Valve Chamber to East Valve Chamber flushing from west to east. Contractor shall discharge flow used for flushing and disinfection to the east sanitary manhole identified in the Site Access Plan on drawing D-14033.
- (b) Main Street Chamber to West Valve Chamber flushing from west to east. Contractor shall discharge flow used for flushing and disinfection to the west sanitary manhole identified in the Site Access Plan on drawing D-14033.
- (c) Henderson Street Chamber to East Valve Chamber flushing from east to west. Contractor shall discharge flow used for flushing and disinfection to the east sanitary manhole identified in the Site Access Plan on drawing D-14033.

E26.3 Contractor shall be responsible for collection and delivery of the water sample for the bacteriological samples of all three sections according to the latest AWWA standards.

E27. BOLLARDS

E27.1 This specification shall cover the supply and installation of bollards where the path meets John Black Ave.

E27.2 Materials

- (a) Wood posts shall be 1800mm in length and 190mm to 230mm diameter pressure treated (ACQ) rough post.
- (b) Wood posts are to include a 50mm chamfer.
- (c) Granular backfill shall be 6mm diameter crushed limestone.

E27.3 Installation

E27.3.1 A 300mm diameter hole shall be augured into the ground to a 1000mm depth. Backfill post hole with approximately a 100mm depth of granular base material. Position the post and hold accurately in place in the hole, place granular base course backfill materials and compact around the post to within 75mm of the finished grade. After the granular material has been satisfactorily compacted, 75mm of compacted limestone base course is to be placed on top measuring 1.0m wide by the entire length of the bollards. The grade of the

post must be averaged over the irregularities in the grade at the site in order to ensure smooth and uniform grade. The post shall be set to that they are 900mm above finished grade.

E28. SURFACE RESTORATION

- E28.1 Prior to construction, Contractor shall inspect the grassed, asphalt pavement and gravel surfaces within and adjacent to the Site with the Contract Administrator to record the current condition. After construction and Site cleanup is complete, re-inspect the condition with the Contract Administrator.
- E28.2 Restoration of areas that were cleared and grubbed as result of construction activities will be restored in accordance with CW 3520. Restoration of treed areas will be restored as per E28.3.
- E28.3 Restoration of grassed areas damaged as result of construction activities will be restored in accordance with CW 3520.
- E28.4 Pavement damaged as a result of construction activities will be restored to existing structure in accordance with CW 3230 and CW 3410. Restoration of the pavement will not be measured for payment and will be included as part of the Work.
- E28.5 Gravel surfacing damaged as a result of construction activities will be restored in accordance with CW 3150. Restoration of the gravel surfacing will not be measured for payment and will be included as part of the Work.

E29. MEASUREMENT AND PAYMENT

- E29.1 Mobilization and Demobilization should cover all costs involved in preparing and maintaining the site for the execution of the work including bonding and insurance; submittals; temporary signs and marking; traffic control or diversion work; environmental and site protection; maintenance site during the project; moving personnel, materials and equipment to and from the site; setting up temporary facilities; survey and construction layout; erosion control; and preparation and performing of the Work.
- (a) The bid price for Mobilization and Demobilization for this work shall be relative to the costs involved but shall not exceed 10% of the Tender Price.
- (b) Payment shall be made as follows, as approved by the City:
- (i) 50% of the lump sum will be included in the first progress payment certificate;
 - (ii) 50% of the lump sum will be included in the final progress payment certificate.
- (c) The Contract Administrator, at their own discretion, may provide only partial payment if mobilization or demobilization is not complete.
- E29.2 Supply and Install 600 mm dia. PVC DR18 by Open Trench will be measured and paid on a linear metre basis along the centerline of the pipe through fittings after the pipe has been installed.
- (a) This price shall include all work incidental to installation of the watermain including all clearing and grubbing, stripping, trenching and backfilling; dewatering, if required; supply and installation of pipe; compaction; pipe zone material; fittings; couplings; restraints; insulation; thrust blocks; cathodic protection; and all other associated works to construct the Works as outlined in the drawings.
- (b) The supply and installation of fittings to be included in the cost of the installation of the watermain unless otherwise specified.
- (c) There will be no separate payment for the supply and installation of anodes for fittings and valves. Include costs in related work.
- (d) There will be no separate payment for the supply and installation of the pipe zone material. There will be no separate payment for the removal and disposal of excess excavated material from site. Include costs in related work.

- (e) There will be no separate payment for pipeline or cable crossings. Include costs in related sections.
 - (f) Price to include supply and installation of non-frozen pipe zone insulation as required.
 - (g) Price to include supply and installation of non-frozen backfill material.
- E29.3 Supply and install 600mm dia. steel pipe section with thrust anchor, thrust block, with a flanged and plain connection end treatment will be paid on a unit cost basis per steel section and thrust block installed.
- (a) This price shall include all materials, labour, and equipment to excavate and install the steel pipe section, concrete thrust block as per drawings.
 - (b) Price includes excavation, removal and disposal of the existing blind flange assembly, bolting on of the new steel section as well as the installation of the required thrust block. Bedding of the excavated section of HDPE pipe shall be completed and paid under this item as well.
 - (c) There will be no separate payment for the removal of any excess excavated material from site. Include costs in related work.
 - (d) Price to include supply and installation of non-frozen backfill material.
- E29.4 Valve Chamber c/w Butterfly Valves and Required Appurtenances will be measured and paid on a unit cost basis for each valve chamber constructed.
- (a) The price shall include all materials, labour, and equipment to construct the valve chambers as outlined on the design drawings and as per the specifications.
 - (b) The price shall include the connection from the ductile iron pipes to the PVC pipe installed by open trench, and associated fittings, couplings, restraints, labour, equipment, and other materials required to complete the connections.
 - (c) The price will include the supply and installation of the butterfly valves, air valves, valve boxes, valve stems; flange thrust restraints; dismantling joints; valve ports; drain assemblies; access ports and caps; cathodic protection; and required pipe, fittings and valve supports listed and/or required to facilitate the installation and operation of the valve as outlined and intended by the drawings and specifications.
 - (d) The price shall include the supply and installation of a combination air release valve as noted in the design drawings for the west valve chamber only.
 - (e) The price shall include excavation, backfill with required material, dewatering, clearing, and site restoration required to facilitate the installation and return the area to pre-existing conditions.
 - (f) The price shall include all measures required for winter construction that includes heating and hoarding of all sensitive works.
 - (g) There will be no separate payment for the removal of any excess excavated material from site. Include costs in related work.
 - (h) Price to include supply and installation of non-frozen backfill material.
- E29.5 Supply and Install Standard Fire Hydrant Assembly with 600x150x600 Tee shall be paid on a unit cost basis on completion.
- (a) This price shall include all work incidental to installation of the hydrant assembly including all clearing and grubbing, stripping, trenching and backfilling; dewatering, if required; supply and installation of assembly; compaction; pipe zone material; fittings; couplings; restraints; insulation; thrust blocks; cathodic protection; and all other associated works to construct the Works as outlined in the drawings and specifications.
 - (b) The supply and installation of fittings, valves, pipe, and hydrant to be included in the cost of the installation of the hydrant assembly unless otherwise specified.
 - (c) There will be no separate payment for the supply and installation of anodes for fittings and valves. Include costs in related work.

- (d) There will be no separate payment for the supply and installation of the pipe zone material. Include costs in related work.
- (e) Price to include supply and installation of pipe zone insulation as required

E29.6 Abandonment of Existing Valve Chambers and Salvage of Materials shall be measured and paid on a lump sum basis on completion.

- (a) The price shall include all labour, materials, and equipment necessary to abandon the two existing valve chambers as outlined in the specifications. The price should include all work incidental to the abandonment of the valve chambers including but not limited to excavation; demolition; disposal of concrete, piping, fittings, and recovered materials; backfill; backfill material; and surface restoration.
- (b) The price shall include all labour, materials, and equipment necessary to cut and plug the existing 600 mm PCCP pipe at the locations identified on the drawings in the vicinity of the abandoned valve chambers.
- (c) The price shall include all labour, materials, and equipment necessary to salvage the existing 600 mm valves, fire hydrant, and identified section of PCCP one full joint back from identified salvage article; and deliver these salvaged materials to a City of Winnipeg yard or storage facility identified by the Contract Administrator at the time the salvage is undertaken.

E29.7 Connection to Existing 600 mm dia. PCCP Feedermain shall be measured and paid on a lump sum basis on completion.

- (a) The price shall include all labour, materials, and equipment necessary to excavate, locate and connect the PVC pipe to the existing PCCP feedermain.
- (b) Price shall include the supply and installation of the required couplings, restraints, and transition adaptors; excavation; pipe zone material; excavation; dewatering; backfill; corrosion protection; cathodic protection; joint testing; welding and fabrication necessary to construct the connection.
- (c) The price shall include all labour, materials, and equipment necessary to cut and plug the existing 600 mm PCCP pipe at the locations identified on the drawings in the vicinity of the connections.
- (d) The price shall include all labour, materials, and equipment necessary to expose, repair, and protect the PCCP to determine the configuration and confirm the tie-in locations.

E29.8 Pressure Testing

- (a) Pressure testing shall be paid for on a lump sum basis per section completed, to the standards specified in E25.
- (b) Pressure testing shall be completed on both newly installed sections by the use of bulkheads and thrust blocks, one on each side of the river.
- (c) The price shall include all labour, materials, and equipment necessary for the Pressure Tests of the new feedermain sections including the installation and removal of the test bulkheads and thrust blocks.
- (d) City will supply water for pressure test. Contractor to coordinate water supply with the Contract Administrator and City of Winnipeg for testing.

E29.9 Flushing, Disinfection, and Commissioning shall be measured and paid on a lump sum basis on completion.

- (a) Payment for disinfection including dechlorination will be paid under this pay item, to the standards specified in E25 and CW2125.
- (b) Payment for flushing will be paid under this pay item, to the standards specified in E26 and CW2125.
- (c) The price shall include all labour, materials, and equipment necessary for Disinfection and Commissioning of the new feedermain.

- (d) City will supply water for the flushing, disinfection and commissioning. Contractor to coordinate water supply with the Contract Administrator and City of Winnipeg flushing, disinfection and commissioning.

E29.10 Supply and Install New Granular Pathway and Bollards shall be measured and paid on a linear metre basis along the centerline of the path from the existing trail north of Chief Peguis Trail to John Black Ave.

- (a) The price shall include all labour, materials, and equipment necessary to install a path and the removal and replacement of the six (6) required bollards as per the design drawings.
- (b) It shall include all work incidental to the installation of the path which could include but not limited to stripping, tree clearing, excavation, subgrade preparation, hauling of materials on and off site, laying of geotextile fabric, compaction of materials, laying of sod and any required watering, and augering.
- (c) Grassed areas disturbed for the construction of the path shall be placed with sod.
- (d) There will be no separate payment for the removal of any excess excavated material from site. Include costs in related work.

E29.11 Restoration of Construction Area shall be measured and paid on a square meter basis measured onsite.

- (a) The price shall include all labour, materials, and equipment necessary to restore areas impacted by construction with topsoil, mulch, and hydroseeding.
- (b) It shall include all work incidental including, hauling, placing, grading, leveling, harrowing, seeding
- (c) There shall be no separate payment for the removal of any excess material excavated when completing the blending of the subgrade base to existing ground.
- (d) Cost shall include all watering and maintenance as required by City of Winnipeg standards.