



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 476-2010

**2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS ON BISON DRIVE
FROM WAVERLEY STREET TO KENASTON BOULEVARD – CONTRACT NO. 17**

TABLE OF CONTENTS

PART A - BID SUBMISSION

Form A: Bid	1
Form B: Prices	4
Form G1: Bid Bond and Agreement to Bond	7
Form G2: Irrevocable Standby Letter of Credit and Undertaking	9

PART B - BIDDING PROCEDURES

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

PART C - GENERAL CONDITIONS

C0. General Conditions	1
------------------------	---

PART D - SUPPLEMENTAL CONDITIONS

General

D1. General Conditions	1
D2. Scope of Work	1
D3. Definitions	1
D4. Contract Administrator	1
D5. Contractor's Supervisor	1
D6. Notices	2
D7. Furnishing of Documents	2

Submissions

D8. Authority to Carry on Business	2
D9. Safe Work Plan	2
D10. Insurance	3
D11. Performance Security	3
D12. Subcontractor List	3
D13. Equipment List	4
D14. Detailed Work Schedule	4

Schedule of Work

D15. Commencement	4
D16. Substantial Performance	5
D17. Total Performance	5
D18. Liquidated Damages	5
D19. Scheduled Maintenance	5

Control of Work

D20. Job Meetings	6
D21. Traffic Control and Maintenance of Access	6
D22. Prime Contractor – The Workplace Safety and Health Act (Manitoba)	6

D23. Coordination With Others	7
Measurement and Payment	
D24. Payment	7
Warranty	
D25. Warranty	7
Form H1: Performance Bond	8
Form H2: Irrevocable Standby Letter of Credit	10
Form J: Subcontractor List	12
Form K: Equipment	13

PART E - SPECIFICATIONS

General

E1. Applicable Specifications and Drawings	1
E2. Soils Investigation Report	1

General Requirements

E3. Protection of Existing Trees	2
E4. Expedited Shop Drawings	2
E5. Shop Drawings	3
E6. Excavation, Bedding and Backfill	5
E7. Supply and Delivery of Prestressed Concrete Pipe and Appurtenances	5
E8. Supply and Delivery of Poly-Vinyl chloride Pipe	8
E9. Supply and Installation of Feeder mains	10
E10. Construction of Valve Chamber Structures	16
E11. Off-Take Valve Chamber Removeable concrete roof panels	19
E12. Off-Take Valve chamber Pre-Cast Concrete Manhole	23
E13. Off-Take Valve Chamber Foundation Waterproofing	23
E14. Offtake Valve Chamber Miscellaneous Metal Fabrications	26
E15. Offtake Valve Chamber Butterfly Valves	28
E16. Butterfly Valve Actuators	33
E17. Offtake Valve Chamber Gate Valves	35
E18. Installation of Butterfly valves, Miscellaneous Valves and Fittings	35
E19. Surface Restorations	38

APPENDICES

APPENDIX A

- **Geotechnical Soils Report**
- **Drawing D-1471**
- **Drawing D-6690**
- **Drawing D-6691**
- **Hyperscon Shop Drawing**

PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

- B1.1 2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS ON BISON DRIVE FROM WAVERLEY STREET TO KENASTON BOULEVARD – CONTRACT NO. 17

B2. SUBMISSION DEADLINE

- B2.1 The Submission Deadline is 12:00 noon Winnipeg time, June 29, 2010.
- B2.2 Bids determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.
- B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

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

B4. ENQUIRIES

- B4.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.
- B4.2 If the Bidder finds errors, discrepancies or omissions in the Bid Opportunity, or is unsure of the meaning or intent of any provision therein, the Bidder shall notify the Contract Administrator of the error, discrepancy or omission, or request a clarification as to the meaning or intent of the provision at least five (5) Business Days prior to the Submission Deadline.
- B4.3 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator to all Bidders by issuing an addendum.
- B4.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.
- B4.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B4 unless that response or interpretation is provided by the Contract Administrator in writing.

B5. ADDENDA

- B5.1 The Contract Administrator may, at any time prior to the Submission Deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.
- B5.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.
- B5.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/bidopp.asp>
- B5.2.2 The Bidder is responsible for ensuring that he 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.

B5.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B6. SUBSTITUTES

B6.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.

B6.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.

B6.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.

B6.4 The Bidder shall ensure that any and all requests for approval of a substitute:

- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;
- (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
- (c) identify any anticipated cost or time savings that may be associated with the substitute;
- (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;
- (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.

B6.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.

B6.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, only to the Bidder who requested approval of the substitute.

B6.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely responsible for disseminating information regarding the approval to any person or persons he wishes to inform.

B6.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B6.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B15.

B6.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B6.10 Notwithstanding B6.2 to B6.9, and in accordance with B7.6 deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B15.1(a).

B7. BID COMPONENTS

B7.1 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;

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

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

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

B7.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid.

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

B7.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B15.1(a).

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

B7.8 Bids shall be submitted to:

The City of Winnipeg
Corporate Finance Department
Materials Management Division
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B8. BID

B8.1 The Bidder shall complete Form A: Bid, making all required entries.

B8.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:

- (a) if the Bidder is a sole proprietor carrying on business in his own name, his name shall be inserted;
- (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
- (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
- (d) if the Bidder is carrying on business under a name other than his own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

B8.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B8.2.

- B8.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.
- B8.4 Paragraph 12 of Form A: Bid shall be signed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his own name, it shall be signed by the Bidder;
 - (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
 - (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, should be affixed;
 - (d) if the Bidder is carrying on business under a name other than his own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.
- B8.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.
- B8.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B9. PRICES

- B9.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.
- B9.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.
- B9.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.
- B9.4 Prices from Non-Resident Bidders are subject to a Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B10. QUALIFICATION

- B10.1 The Bidder shall:
- (a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba; and
 - (b) be financially capable of carrying out the terms of the Contract; and
 - (c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.
- B10.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/debar.stm>
- B10.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) have successfully carried out work similar in nature, scope and value to the Work; and

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

B10.4 Further to B10.3(c), the Bidder shall, within 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 valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association or by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or
- (b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt>)

B10.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B10.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B11. BID SECURITY

B11.1 The Bidder shall provide bid security in the form of:

- (a) a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or
- (b) an irrevocable standby letter of credit, in the amount of at least ten percent (10%) of the Total Bid Price, and undertaking issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form included in the Bid Submission (Form G2: Irrevocable Standby Letter of Credit and Undertaking); or
- (c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.

B11.1.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.

B11.1.2 All signatures on bid securities shall be original.

B11.1.3 The Bidder shall sign the Bid Bond.

B11.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B11.2 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly executed by the successful Bidder and the performance security furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B11.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B11.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B11.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B11.3 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Bid Opportunity.

B12. OPENING OF BIDS AND RELEASE OF INFORMATION

B12.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Division, or in such other office as may be designated by the Manager of Materials.

B12.1.1 Bidders or their representatives may attend.

B12.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/default.stm>

B12.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract Amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/default.stm>

B12.4 The Bidder is advised that any information contained in any Bid may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

B13. IRREVOCABLE BID

B13.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.

B13.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly executed and the performance security furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid.

B14. WITHDRAWAL OF BIDS

B14.1 A Bidder may withdraw his Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

B14.1.1 Notwithstanding C23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.

B14.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid, and only such person, has authority to give notice of withdrawal.

B14.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:

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

B14.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B13.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law, including the right to retain the Bidder's bid security.

B15. EVALUATION OF BIDS

B15.1 Award of the Contract shall be based on the following bid evaluation criteria:

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

B15.2 Further to B15.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities, if the interests of the City so require.

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

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

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

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

B16. AWARD OF CONTRACT

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

B16.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.

B16.2.1 Without limiting the generality of B16.2, the City will have no obligation to award a Contract where:

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

B16.3 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 B15.

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

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

- C0.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management 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 the supply and installation of a 750 mm diameter feedermain along Bison Drive from Waverley Street to Kenaston Boulevard.

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

- (a) Supply and installation of approximately 1650 metres of 750 mm feedermain
- (b) Construction of off-take valve chamber
- (c) Installation of two 750 mm butterfly valves complete with actuators
- (d) Construction of pre-cast air release valve chambers
- (e) Connection to existing feedermain
- (f) Pressure testing and disinfection of feedermain
- (g) Supply and Installation of approximately 69 metres of 300 mm watermain
- (h) Surface restorations

D3. DEFINITIONS

D3.1 When used in this Bid Opportunity:

- (a) "**AWWA**" means American Waterworks Association;
- (b) "**CSA**" means Canadian Standards Association;
- (c) "**NSF**" means National Sanitation Foundation;
- (d) "**ASTM**" means American Society for Testing and Materials.
- (e) "**PCCP**" means Pre-stressed Concrete Cylinder Pipe.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is:

Doug Berg, C.E.T.
Project Coordinator
110-1199 Pacific Avenue, Winnipeg, Manitoba, R3E 3S8
Telephone No. (204) 986-4452
Facsimile No. (204) 986-5345

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.

D5. CONTRACTOR'S SUPERVISOR

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

D6. NOTICES

- D6.1 Except as provided for in C23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.
- D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3, D6.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D4.1.
- D6.3 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 address or facsimile number:
- The City of Winnipeg
Chief Financial Officer
Administration Building, 3rd Floor
510 Main Street
Winnipeg MB R3B 1B9
Facsimile No.: (204) 949-1174
- D6.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following address or facsimile number:
- The City of Winnipeg
Internal Services Department
Legal Services Division
Attn: City Solicitor
185 King Street, 3rd Floor
Winnipeg MB R3B 1J1
Facsimile No.: (204) 947-9155

D7. FURNISHING OF DOCUMENTS

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

SUBMISSIONS

D8. AUTHORITY TO CARRY ON BUSINESS

- D8.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D9. SAFE WORK PLAN

- D9.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.
- D9.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg,

Corporate Finance, Materials Management Division website at
<http://www.winnipeg.ca/matmgt/Safety/default.stm>

D10. INSURANCE

- D10.1 The Contractor shall provide and maintain the following insurance coverage:
- (a) commercial general liability insurance, in the amount of at least two million dollars (\$2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;
 - (b) automobile liability insurance for owned automobiles used for or in connection with the Work in the amount of at least two million dollars (\$2,000,000.00) at all times during the performance of the Work and until the date of Total Performance;
- D10.2 Deductibles shall be borne by the Contractor.
- D10.3 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract.
- D10.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D11. PERFORMANCE SECURITY

- D11.1 The Contractor shall provide and maintain performance security until the expiration of the warranty period in the form of:
- (a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; or
 - (b) an irrevocable standby letter of credit issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form attached to these Supplemental Conditions (Form H2: Irrevocable Standby Letter of Credit), in the amount of fifty percent (50%) of the Contract Price; or
 - (c) a certified cheque or draft payable to "The City of Winnipeg", drawn on a bank or other financial institution registered to conduct business in Manitoba, in the amount of fifty percent (50%) of the Contract Price.
- D11.1.1 Where the performance security is in the form of a certified cheque or draft, it will be deposited by the City. The City will not pay any interest on certified cheques or drafts furnished as performance security.
- D11.2 The Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D12. SUBCONTRACTOR LIST

- D12.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D13. EQUIPMENT LIST

D13.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment 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;
 - (b) a Gantt chart for the Work based on the C.P.M. schedule;
- all 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) Installation of 750 millimetre feedermain
- (b) Testing and Disinfection of 750 millimetre feedermain
- (c) Construction of offtake valve chamber
- (d) Reconnection of 750 millimetre feedermain
- (e) Construction of air release chamber
- (f) Installation of 300 millimetre watermain
- (g) Substantial Performance
- (h) Total Performance

D14.4 Further to D14.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

SCHEDULE OF WORK

D15. COMMENCEMENT

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

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 D8;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the Safe Work Plan specified in D9;
 - (iv) evidence of the insurance specified in D10;
 - (v) the performance security specified in D11;
 - (vi) the Subcontractor list specified in D12;
 - (vii) the equipment list specified in D13;
 - (viii) the detailed work schedule specified in D14; and

- (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.

D15.3 The Contractor shall commence Work on the site at such a date that will allow for the achievement of Substantial Performance by the date specified in D16.1 and taking into account equipment delivery days and where work cannot be performed due to adverse weather conditions.

D16. SUBSTANTIAL PERFORMANCE

D16.1 The Contractor shall achieve Substantial Performance by November 15, 2010.

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 November 30, 2010.

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 Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:

- (a) Substantial Performance – fifteen hundred dollars (\$1500.00);
- (b) Total Performance – five hundred dollars (\$500.00).

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) Landscape Maintenance as specified in CW 3510 of the City of Winnipeg's Standard Construction Specifications;

- 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 deems it necessary.

D21. TRAFFIC CONTROL AND MAINTENANCE OF ACCESS

- D21.1 Traffic control shall be carried out in accordance with Section 3.7 of CW 1130 of the General Requirements.
- D21.2 Access to construction site shall be from Waverley Street, Bison Drive and Cadboro Road.
- D21.3 A minimum of one lane of traffic on Cadboro Road must be maintained at all times.
- D21.4 Access to all properties on Cadboro Road must be maintained during construction.
- D21.5 Installation of feedermain pipe across south bound Waverley Street must be done as weekend work only.
- D21.6 Provide flag persons to direct traffic around construction vehicles that are loading and unloading equipment and materials at the site if required.
- D21.7 Further to Section 3.6 of CW 1130 of the General Requirements, the Contractor shall maintain safe pedestrian crossing at intersections at all times. If possible, only one pedestrian crossing at an intersection is to be blocked by construction at any one time. If more than one pedestrian crossing is blocked by construction at an intersection at the same time the Contractor shall provide flag persons to safely escort pedestrians across the intersection. The Contractor shall leave pedestrian crossing locations safe and free of equipment that may hamper pedestrians when no construction activities are being performed at a particular crossing location.
- D21.8 The Contractor shall not park company or private vehicles inside the barricaded work zone in a manner that will block sightlines for vehicles and pedestrians approaching and crossing intersections or will obstruct the safe operation of motor vehicles past the site.
- D21.9 Traffic management and maintaining access to all properties affected by construction activities shall be considered incidental to the Work being done and no additional payment will be made for such work.

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

- D22.1 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).

D23. COORDINATION WITH OTHERS

D23.1 The Contractor shall not have exclusive use of the Site. Numerous other road and utility relocation works will be occurring in the area. The Contractor shall coordinate Site activities with others.

MEASUREMENT AND PAYMENT

D24. PAYMENT

D24.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D25. WARRANTY

D25.1 Warranty is as stated in C13.

FORM H1: PERFORMANCE BOND
(See D11)

KNOW ALL MEN BY THESE PRESENTS THAT

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

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

_____ dollars (\$_____)

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

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

BID OPPORTUNITY NO. 476-2010

2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS ON BISON DRIVE FROM WAVERLEY STREET TO KENASTON BOULEVARD – CONTRACT NO. 17

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 D11)

(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 476-2010

2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS ON BISON DRIVE FROM
WAVERLEY STREET TO KENASTON BOULEVARD – CONTRACT NO. 17

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

(Name of Contractor)

(Address of Contractor)

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

_____ Canadian dollars.

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

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

Partial drawings are permitted.

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

(Address)

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

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

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

(Date)

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

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

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

(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM K: EQUIPMENT
(See D13)

2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS ON BISON DRIVE FROM WAVERLEY STREET TO KENASTON BOULEVARD – CONTRACT NO. 17

<p>1. Category/type:</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p>2. Category/type:</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p>3. Category/type:</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>

FORM K: EQUIPMENT
(See D13)

2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS ON BISON DRIVE FROM WAVERLEY STREET TO KENASTON BOULEVARD – CONTRACT NO. 17

<p>4. Category/type:</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p>5. Category/type:</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p>6. Category/type:</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>

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-12112	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, 241 M W. OF WAVERLEY STREET TO WAVERLEY STREET
D-12113	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, 566 M W. OF WAVERLEY STREET TO 241 M W. OF WAVERLEY STREET
D-12114	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, 891 M W. OF WAVERLEY STREET TO 566 M W. OF WAVERLEY STREET
D-12115	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, 1191 M W. OF WAVERLEY STREET TO 891 M W. OF WAVERLEY STREET
D-12116	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, 1491 M W. OF WAVERLEY STREET TO 1191 M W. OF WAVERLEY STREET
D-12117	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, 1691 M W. OF WAVERLEY STREET TO 1491 M W. OF WAVERLEY STREET
D-12118	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, MISCELLANEOUS DETAILS, WAVERLEY STREET TO KENASTON BOULEVARD
D-12119	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, OFFTAKE VALVE CHAMBER, CONCRETE DETAILS 1 OF 2
D-12120	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, OFFTAKE VALVE CHAMBER, CONCRETE DETAILS 2 OF 2
D-12121	2010 FEEDERMAIN INSTALLATION AND ASSOCIATED WORKS, BISON DRIVE, REINFORCING DETAILS

- E1.4 The following historic drawings are provided in Appendix A for information purposes only.
- (a) Geotechnical Soils Report
 - (b) Drawing No. D-1471: South Fort Garry Feedermain Details of Offtake Chamber at Bison Drive and Waverley Street
 - (c) Drawing No. D-6690: Waverley Street Watermain Extension, Contract No. 16, Sta 36+00 to 39+00
 - (d) Drawing No. D-6691: Waverley Watermain Extension, Contract 16, Various Details
 - (e) Hyperscon Shop Drawing (Project No. 9052-00) for Waverley Watermain Extension, Contract No. 16

E2. SOILS INVESTIGATION REPORT

- E2.1 A geotechnical soils investigation has been carried out by Dyregrov Consultants (refer to geotechnical report [File #293178 City of Winnipeg Valve Chamber Bison Drive West at Kenaston Boulevard](#), dated May 19, 2010) 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, however fluctuations in the ground water level can be expected seasonally. A copy of the geotechnical report is included in Appendix A at the end of these specifications for the convenience of Bidders.

- 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.
- E2.3 Any test borings made by the bidder shall be done in accordance with the requirements of the appropriate authority of the City of Winnipeg. Bidders shall notify the contract Administrator prior to starting any soil boring operation.

GENERAL REQUIREMENTS

E3. PROTECTION OF EXISTING TREES

- E3.1 Do not remove existing trees and take the following precautionary steps to avoid damage from construction activities to existing boulevard trees within the limits of the construction area.
- E3.1.1 Do not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.
- E3.1.2 Strap mature tree trunks with 25 x 150 x 2400 wood planks. Smaller trees shall be similarly protected using appropriately sized wood planks.
- E3.1.3 Excavations shall be carried out in a manner to minimize damage to existing root systems. Where roots must be cut to facilitate an excavation they shall be neatly pruned at the face of the excavation.
- E3.1.4 Work on site shall be carried out in a manner to minimize damage to existing tree branches. Where damage to tree branches does occur, the Contractor shall neatly prune the damaged branch.
- E3.1.5 American elm trees shall not be pruned between April 1st and August 1st and Siberian elm trees between April 1st and July 1st of any year under provisions of The Dutch Elm Disease Act.
- E3.2 All damage to existing trees due to construction activities shall be repaired to the requirements and satisfaction of the City of Winnipeg, Parks and Recreation Department, Forestry Branch at the Contractor's expense.
- E3.3 Costs for protection of trees shall be considered incidental to the Contract Work and shall be done at the Contractor's expense.

E4. EXPEDITED SHOP DRAWINGS

- E4.1 Further to E5, in order to expedite Shop Drawings with critical timeliness, the Lowest Responsive Bidder, as outlined in B15, will be permitted, after receiving written approval from the Contract Administrator, to arrange for the preparation of Shop Drawings for the following items with critical timelines:
- (a) Butterfly Valves with Manual Actuators as indicated in E15 and E16.
- (b) 750X750X300X300 Offtake Chamber Cross (flanged) as indicated on the drawings.
- E4.2 If Award is made to the Lowest Responsive, then as indicated in E5.1(a)(iii), no payment for the preparation of Shop Drawings will be made.
- E4.3 If no contract is awarded, then the City of Winnipeg will pay the requested Bidder up to a maximum of five hundred dollars (\$500.00) for each of the requested submissions noted above,

for the preparation and delivery of Shop Drawings. Delivery of the Shop Drawings to the City and payment of the above amounts will constitute full and final consideration of each party to the other, and neither party will have any further liability to the other with respect to this Bid Opportunity.

E5. SHOP DRAWINGS

E5.1 Description

- (a) This Specification shall revise, amend and supplement the requirements of CW 1100 of the City of Winnipeg's Standard Construction Specifications.
 - (i) The term 'shop drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, which are to be provided by the Contractor to illustrate details of a portion of the Work.
 - (ii) The Contractor shall submit specified shop drawings to the Contract Administrator for review. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be shown on all submissions for Engineering review.
 - (iii) Provision of Shop Drawings will be considered incidental to the price for supply and delivery of equipment and materials.
- (b) Shop Drawings
 - (i) Original drawings are to be prepared by the Contractor, Subcontractor, Supplier, Distributor, or Manufacturer, which illustrate appropriate portion of Work; showing fabrication, layout, setting or erection details as specified in appropriate sections.
 - (ii) Shop drawings for the following structural components shall bear the seal of a Professional Engineer registered to practice in the Province of Manitoba.
 - (a) Shoring;
 - (b) Reinforcing steel;
 - (c) Miscellaneous metal.
- (c) Contractor's Responsibilities
 - (i) Review shop drawings, product data and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.
 - (ii) Verify:
 - (a) Field measurements
 - (b) Field construction criteria
 - (c) Catalogue numbers and similar data
 - (iii) Coordinate each submission with requirements of Work and Contract Documents. Shop drawings of separate components of a larger system will not be reviewed until all related drawings are available.
 - (iv) Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.
 - (v) Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review of submission, unless Contract Administrator gives written acceptance of specified deviations.
 - (vi) Responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.
 - (vii) The Contractor shall make any corrections required by the Contract Administrator and shall resubmit the required number of corrected copies of Shop Drawings. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.
 - (viii) After Contract Administrator's review and return of copies, distribute copies to sub-trades as appropriate.

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

E5.2 Measurement and Payment

- E5.2.1 Preparation and submittal of Shop Drawings will be included in the Contract Work and no additional payment will be made for such work.

E6. EXCAVATION, BEDDING AND BACKFILL

E6.1 Shoring Design

E6.1.1 Excavation shoring shall be designed to accommodate installation of all structures, pipe and fittings.

E6.2 Excavation

E6.2.1 Excess excavation from trenching operations shall be disposed of off-site, unless otherwise determined and approved by the Contract Administrator.

E6.2.2 Granular bedding in the vicinity of existing pipelines shall be dewatered and stabilized prior to undermining pipes to prevent loss of granular pipe foundation.

E6.2.3 Pipelines under pavements excluding walkways, shall be installed by trenchless methods.

E6.3 Backfill

E6.3.1 Backfill under existing and proposed pavements shall be completed to CW 2030, Class 2 standards. Granular backfill shall extend to the underside of the proposed pavement structure, as indicated on the drawings. The remaining trench backfill shall be completed to existing grade to CW 2030, Class 4 standards.

E6.3.2 Backfill under proposed paths and walkways shall be completed to CW 2030, Class 4 standards.

E6.3.3 Backfill within 1 metre of existing and new concrete structures shall be completed with free draining pit run granular material to CW 2030, Class 3 standards. The top 600 millimetres of the backfill adjacent to concrete structures shall be insitu clay material completed to CW 2030, Class 4 standards.

E6.3.4 Pipe bedding and backfill of parallel trenches in the vicinity of thrust blocks shall be carefully backfilled to the levels shown on the drawings with crushed granular backfill conforming to CW 2030 Type 2 material, and thoroughly compacted to CW 2030 Class 2 standards.

E6.4 Measurement and Payment

E6.4.1 Excavation and shoring for pipe installation and valve chambers will not be measured for payment. Costs for excavation and shoring shall be included in the price for installation of feeder mains, water mains and valve chambers.

E7. SUPPLY AND DELIVERY OF PRESTRESSED CONCRETE PIPE AND APPURTENANCES

E7.1 Description

(a) This Specification supplements and amends AWWA Specification C301-99, AWWA Manual M9 Concrete Pressure Pipe, and AWWA C304-99 Design of Prestressed Concrete Cylinder Pipe.

E7.2 Materials

(a) Cement

(i) Portland Cement shall be Type 50 Sulphate resistant Cement.

(ii) External mortar coating shall contain 10 percent silica fume by weight of cement.

(iii) Approval in writing is required if the Contractor proposed to use fly ash or pozzolan as a supplementary cementing material in conformance with AWWA Standard C301, Section 4.4.1.

(iv) Approval requests should be accompanied by a submission from an independent testing laboratory complete with sampling and testing results of the material conforming to ASTM Standard C311.

(b) Bell and Spigot Joint Rings

- (i) Where indicated on the drawings, restrained joints shall be harnessed clamp joints.
- (c) Fittings
 - (i) Fittings shall be manufactured using minimum steel thicknesses specified in Table 1, Section 4.7 of AWWA C301-99.
 - (ii) Flanges for fittings shall be AWWA C207-01 minimum Class D Flanges.
 - (iii) Pipe sections passing through valve chamber walls shall be manufactured with a minimum 12 mm thick by 150 mm wide steel thrust ring, located at the midpoint of the chamber walls, of adequate design to resist specified design forces.
- (d) Pipe Marking
 - (i) Each section of pipe and each fitting shall be plainly marked with a waterproof marking material both inside, on the bell or spigot end, and outside, at the pipe's midspan, the classification, the date of manufacture and marks of identification sufficient to show its proper location in the line by the reference to the laying schedule specified. The point of maximum bevel shall be marked on the end of the spigot on each piece of bevelled pipe. All bends shall be marked on the ends with the angle of deflection. The manufacturer's proposed marking system shall be included with the "Data to be Supplied by Contractor" in E7.4. Colour coded markings shall be required when there is more than one pipe classification.
- (e) Closures
 - (i) Buried pipe closures shall be welded split steel sleeve closures.
 - (ii) The plain steel end of each closure piece shall extend 150mm longer than the required length of the piece to provide an overlap in order to compensate for any correction required when installed.
 - (iii) The Contractor shall be responsible for any interior or exterior mortar coating damage.
 - (iv) Each pipe run shall be designed with a minimum of one (1) closure section. The closure section location will be left to the Contractor, subject to approval of the Contract Administrator, to best suit proposed installation sequencing.

E7.3 Design Requirements

- (a) Pipe Design
 - (i) The Contractor shall submit details of the pipe design for approval of the Contract Administrator prior to manufacture. Where pipe runs contains more than one pipe class, pipe marking system shall clearly indicate different pipe classes.
 - (ii) All pipe and fittings shall be design and constructed to withstand maximum design working pressure of 700 kilopascals, a test pressure of 1000 kilopascals, and all external pressures caused by overburden, traffic or other loads to which the pipe might be subjected, all in accordance with the applicable requirements of AWWA Standard C301 and C304.
 - (iii) Trench loadings shall be calculated and based on a trench width equal to pipe outside diameter (O.D.) width plus 600 millimetres, a soil weight of 1925 kilograms per cubic metre, a trench bedding factor of 1.5, earth cover as indicated on the drawings (minimum earth cover of 2500 millimetres or as indicated on the Drawings) and a $KU = 0.110$ in Marston's formula. Depth of cover requirements shall use the maximum of proposed final grades or original ground grades. Live loading under proposed roadways shall allow for HSS-25 highway loading.
 - (iv) The steel cylinder shall be a minimum of 1.6 millimetre thickness (No. 16 gauge) and the minimum thickness of the high tensile reinforcing wire shall be 4.2 millimetres thick (No. 8 gauge). Mortar coating shall be a minimum of 24 millimetres thick measured from the outside of the high tensile wire.
 - (v) Pipe under existing and future pavement crossings to be designed for a minimum HS-20 loading factor.
- (b) Laying Schedule

- (i) Pipe laying schedule shall incorporate a short pipe length of approximately 1.5 times the diameter, immediately outside of valve chamber piping.
 - (ii) Minor adjustments to pipe design plans to suit standard pipe lengths, may be allowed on approval of the Contract Administrator.
 - (iii) Pipe closures shall be field measured prior to fabrication.
 - (iv) Laying schedule shall incorporate sufficient person access points to safely facilitate pipe access for joint grouting and inspection.
- (c) Fitting Design
- (i) Fittings shall be designed to accommodate the horizontal and vertical deflections shown on the Drawings. Where combination horizontal and vertical bends are used, fitting orientation shall be clearly marked on the fitting to aide in installed alignment.

E7.4 Data to be Supplied by Contractor

- (a) Sufficient numbers of copies of all drawings and laying schedules as specified in Specification CW1110, Clause 1.5, shall show full details of reinforcement, concrete and joint dimensions for the straight pipe, specials and connections and shall be furnished by the Contractor for the review by the Contract Administrator. No pipe shall be manufactured until the drawings have been entirely approved.
- (b) The data submitted by the Contractor shall include a tabulated laying schedule with reference to the stationing and grade lines shown on the Drawings. This schedule shall show the locations and length of each class of pipe which the Contractor proposes to furnish, and the point of change from one class to the next shall be clearly indicated by station number. The area of steel per linear metre and such other details as are required shall be listed for each of the pipe classes proposed by the Contractor.
- (c) The Contractor shall be responsible for the accurate details, fabrication and fit of the pipe and specials.
- (d) The Contractor shall submit to the Contract Administrator for review, design calculations for the determination of the details of the pipe reinforcement prior to the manufacture of any pipe. The manufacturer of the pipe shall have sufficient data to verify all design strengths.
- (e) The Contractor shall provide complete Record Drawings for the pipe, including revised laying schedules, closure lengths for field trimmed pieces or other modifications required for the pipe installation.

E7.5 Delivery of Pipe

- (a) Contractor is required to coordinate manufacture and delivery of the pipe with his sub-contractor (the manufacturer) and to meet project scheduling requirements.
- (b) Delivery of the pipe shall be in accordance with AWWA M9 Manual – Concrete Pressure Pipe.

E7.6 Construction Methods

- (a) Pipe Length
 - (i) Standard pipe lengths shall be used, except where special lengths are required by an approved laying schedule.
- (b) Tolerances
 - (i) In addition to the requirements noted in Section 4.5 of AWWA C301-01, the overall length of pipe measured from the end of the spigot to the seat of the bell at any point around the circumference shall not vary more than 3 millimetres +/-.
 - (ii) The Contractor shall accurately measure and confirm pipe bell and spigot tolerances, and ensure pipe mating, prior to shipping pipe. The Contractor shall provide a written report of pipe bell and spigot measurements.

E7.7 Quality Control

(a) Inspection

- (i) The Contractor shall afford the Contract Administrator every facility to access and inspect all plant to be provided, work to be performed, materials to be supplied and equipment or machinery to be installed in accordance with the provisions of GC 5.03.

(b) Testing of Pipe and Materials

- (i) The Contractor shall provide access to the Contract Administrator or his appointed representative to conduct plant inspections, in accordance to Section 5.1 of AWWA C301-99. The Contractor shall provide a minimum of 7 calendar days notice of commencement of pipe manufacture, for the purposes of scheduling plant inspections.
- (ii) The Contract Administrator reserves the right to conduct third party quality control testing.
- (iii) The Contractor shall make, conduct, arrange, make available, obtain and provide for all testing as described in Section 5.2 AWWA Standard C301-99. The following reports shall be made available to the Contract Administrator on request:
- (iv) Absorption tests shall be carried out by the Contractor on specimens of the exterior coating of the pipe. These tests shall be carried out in accordance with ASTM Standard C497 Method of Testing Concrete Pipe, Sections or Tile, method A.
 - ◆ Notwithstanding AWWA C301-99 4.6.8.3, no individual absorption test may exceed 10%.
 - ◆ Notwithstanding AWWA C301-99 4.6.8.3, mortar tests shall be conducted on a daily basis for the entire production run.
 - ◆ Every effort shall be taken to limit this absorption to 8% as measured in accordance with the ASTM Standard C497. The City will not accept pipe with an absorption rate in excess of 10%. No pipe shall be shipped until the absorption results related to the particular shipment have been provided to the Contract Administrator, and are satisfactory.

(c) Testing of Fittings and Special Pipe

- (i) Fittings and special pipe shall be tested in the same manner as pipe except that fittings and special pipe shall be tested for tightness by the dye penetrant method as specified in Section 4.7.2.22 of AWWA Standard C301-99.

(d) Affidavit of Compliance

- (i) An affidavit of compliance signed by an officer of the pipe manufacturing company shall be provided stating that the pipe and fittings comply with this Specification, in accordance with Section 6.3 of AWWA C301-99.

E7.8 Method Measurement and Basis of Payment

(a) Prestressed Concrete Pressure Pipe

- (i) The supply and delivery of prestressed concrete pressure pipe shall not be measured for payment. It shall be included in the price bid for Supply and Installation Main Line Pipe.

(b) Fittings and Specials

- (i) The supply and delivery of fittings and specials shall not be measured for payment. They shall be included in the price bid for Supply and Installation Fittings and Specials.

E8. SUPPLY AND DELIVERY OF POLY-VINYL CHLORIDE PIPE

E8.1 Materials

E8.1.1 Poly-Vinyl Chloride (PVC) Pipe

- (a) Dimension Ratio (DR)
 - (i) PVC pipe shall conform to the latest revision of AWWA C905 and CSA B137.3-M86, with the following dimension ratios (DR)
 - ◆ 750 millimetre DR 18
- (b) Pipe under existing and future pavement crossings to be designed for a minimum HS-20 loading factor.
- (c) Fabricated Fittings
 - (i) Fabricated fittings shall be thermally butt welded segments, with overwrapped reinforcement, conforming with AWWA C905 and CSA B137.3-M86. Where non-standard fittings and bend angles are required, fittings shall be constructed in every way to conform to the nearest CSA certified standard fitting.
- (d) Closures
 - (i) Main line closures shall be fabricated PVC slide collars conforming to AWWA C905 and CSA B137.3-M86. Pipe class to be the same as for mainline piping.

E8.1.2 Submittals

- (a) Laying Schedule
 - (i) Submit laying schedule for review by the Contract Administrator. Laying schedule shall show general pipe layout, location of fittings and specials, proposed direction of lay and connection points.
 - (ii) Minor adjustments to pipe design plans to suit standard pipe lengths, may be allowed on approval of the Contract Administrator.
- (b) Fittings
 - (i) Submit details of all fabricated fittings and specials, including details of proposed connections to existing pipelines.
- (c) Affidavit of Compliance
 - (i) An affidavit of compliance signed by an officer of the pipe manufacturing company shall be provided stating that the pipe and fittings comply with this Specification, in accordance with Section 6.3 of AWWA C905-97.

E8.1.3 Quality Control

- (a) Inspection
 - (i) The Contractor shall afford the Contract Administrator every facility to access and inspect all plant to be provided, work to be performed, materials to be supplied and equipment or machinery to be installed in accordance with the provisions of GC 5.03.
- (b) Testing of Pipe and Materials
 - (i) The Contractor shall provide access to the Contract Administrator or his appointed representative to conduct plant inspections, in accordance to Section 5.3 of AWWA C905-97. The Contractor shall provide a minimum of 7 calendar days notice of commencement of pipe manufacture, for the purposes of scheduling plant inspections.
 - (ii) The Contract Administrator reserves the right to conduct third party quality control testing.
- (c) Dimensional Checks
 - (i) Notwithstanding AWWA C905, Section 5.1.1, dimensional checks shall be carried out for each and every pipe in the production run.

E8.2 Method Measurement and Basis of Payment

(a) AWWA C905 Pressure Pipe

- (i) The supply and delivery of AWWA C905 PVC pipe shall not be measured for payment. It shall be included in the price bid for Supply and Installation Main Line Pipe.

(b) Fittings and Specials

- (i) The supply and delivery of fittings and specials shall not be measured for payment. They shall be included in the price bid for Supply and Installation Fittings and Specials.

E9. SUPPLY AND INSTALLATION OF FEEDERMAINS

E9.1 Description

- E9.1.1 This Specification shall cover the preparation of the pipe bed, including the supply of bedding materials and the placement of all pipe and accessories including fittings, as specified or shown on the Drawings.

E9.2 Materials

E9.2.1 Acceptable Feedermain Products

- (a) Prestressed Concrete Pressure Pipe conforming to AWWA C301 and as described in E7.
- (b) Poly Vinyl Chloride (PVC) conforming to AWWA C905 and CSA B137.3-M86 and as described in E8.

E9.2.2 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:
 - ◆ Minimum sleeve length 250 mm
 - ◆ Minimum centre sleeve thickness 12.7 mm
 - ◆ Couplings capable of accommodating up to 2 degrees deflection
 - ◆ Bolts and nuts to be 316 Stainless Steel.
 - ◆ 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 Densyl 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"

E9.2.3 Paint

- (a) Paint for exposed metal surfaces shall be in accordance to AWWA C213.
- (b) Interior coatings shall comply with ANSI/NSF 61 "Drinking Water System Components – Health Effects"
- (c) 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.

E9.3 Construction Methods

E9.3.1 Excavation

- (a) Excavation shall be in accordance with Specification CW2030, "Excavation, Bedding and Backfill". Over-excavated material shall be replaced with compacted, well-graded crushed limestone having a maximum aggregate size of 20mm, conforming to CW 2030 Type 2 granular material.

E9.3.2 Pipe Installation – AWWA C301 Pipe

(a) Installation of Pipe

- (i) The pipe shall be laid and fitted together so that when complete, the pipe will have a smooth and uniform invert. The trench shall be free of water while the pipe is being installed. The excavation of the trench shall be fully completed a sufficient distance in advance so as not to interfere with the laying of the pipe.
- (ii) All pipe shall be installed on a 150 millimetre thick bed of sand placed in the bottom of the trench prior to the installation of the pipe in accordance with AWWA M9 Manual, Type R5 Bedding. The sand bedding shall be levelled such that it forms a continuous solid bedding for the full length of the pipe except at the midpoint of each pipe and at the joints. A small groove shall be left at the midpoint to facilitate the removal of the sling after the pipe has been laid. Another groove shall be provided at each joint to facilitate placing of a "diaper" band around the joint. Both grooves shall be filled with compacted sand after the removal of the sling and after placing of the diaper band.
- (iii) Compacted sand backfill shall be placed above the pipe to a depth of 200 millimetres above the top of the pipe, for the full trench width. Backfill shall be compacted to 90% SPMDD. The Contractor shall ensure that disturbance of the pipe or damage to the pipe coating does not occur during sand bedding and backfilling operations.
- (iv) Pipe shall be installed utilizing trench methods. Coring, augering or jacking methods shall not be undertaken without approval of the Contract Administrator.
- (v) The exposed end of the pipe shall be fully protected with an approved stopper to prevent foreign matter from entering the pipe. The interior of the pipe shall be kept free of all dirt, concrete or superfluous material as the Work proceeds.

(b) Jointing

- (i) Immediately prior to connecting two lengths of pipe, the spigot end of the pipe shall be thoroughly cleaned. Prior to insertion of the rubber gasket in the spigot groove, the spigot groove shall be lubricated with vegetable soap. The gasket shall then be thoroughly cleaned and then lubricated with a vegetable soap approved by the pipe manufacturer, the consistency of which shall be approximately that of soft No. 2 cup grease. In stretching the gasket, care shall be exercised to maintain a uniform tension or volume of rubber around the whole circumference of the spigot. The bell of the pipe already in place shall be carefully cleaned and lubricated with vegetable soap.
- (ii) The spigot shall then be pushed into the bell and against steel inserts placed between the top of the spigot and the shoulder of the bell to provide a space for inserting the feeler gauge. The entire circumference of the joint shall be gauged to determine that the rubber gasket is in its proper position. If the gasket cannot be felt all around the pipe, the pipe shall be withdrawn and the gasket examined for cuts. If the gasket is undamaged it may be reused, but only after the bell ring and gasket have been lubricated with soap again, as previously specified, before the pipe is re-laid. When it has been determined that the gasket is in its proper position, the steel inserts shall be removed and the pipe pushed completely "home".
- (iii) Diaper bands to hold grout in place shall be used according to the manufacturer's instructions. Immediately before pouring cement grout, the entire joint shall be thoroughly wetted. A cement grout of one part Sulphate-

Resistant cement to two parts sand shall be poured between the diaper and the pipe, to ensure a thorough sealing of the joint around the portion of the pipe covered by the band. Silt, slush, water or polluted mortar grout shall be carefully forced out by the pouring and removed. The upper portion of the joint shall then be filled with mortar and a bead made around the outside of the top half of the pipe joint with a sufficient amount of additional mortar. The completed joints shall immediately be protected from the air, sun or cold with proper coverings and shall be kept protected for such a period as necessary to secure satisfactory curing of the mortar. No backfilling around joints shall be done until the joints have been fully inspected and approved.

- (iv) The inside joint recess of the concrete pipe, sizes 600 millimetres and larger, shall be completely filled with mortar made from one part cement and one part sand so as to provide a smooth continuous flush surface across the joint. The Contractor shall comply with all requirements and regulations of the Workplace, Safety and Health Division concerning air supply for workers performing operations inside the pipe and any associated costs shall be considered incidental to the installation.
- (v) Delay grouting and diapering of short pipe joints immediately outside of chambers, until completion of construction and partial backfill of chamber, to allow maximum differential deflection and settlement prior to final backfill.

(c) Steel Split Ring Closures

- (i) Plain end wall pieces shall be accurately trimmed after installed, to accommodate plain end by flange valve adaptors. The pipe shall be accurately marked around the circumference, from the face of the butterfly valve flanges, to accommodate the flange by plain end adaptor, plus gap allowance shown on the drawings.
- (ii) Buried pipe closures shall be accurately measured, cut and installed. Welded Split Sleeve closures shall be installed by a certified welder.
- (iii) Completed field welds shall be inspected by a certified welding inspector, using magna-flux methods or other methods approved by the Contract Administrator. A detailed inspection report including test data shall be submitted to the Contract Administrator within 5 Business Days of completion of testing.

(d) Connection to Chamber Piping

- (i) For AWWA C301 pipe, connection to chamber piping of similar pipe materials may be made by means of bell and spigot joints.
- (ii) For AWWA C301 pipe connection to dissimilar chamber piping, connections shall be made by means of steel sleeve typed coupling. Pipe coupling to be protected from corrosion by Denso tape system.

E9.3.3 Pipe Installation - AWWA C905 PVC

(a) Installation of Pipe

- (i) All pipe shall be installed on a 150 millimetre thick bed of sand placed in the bottom of the trench prior to the installation of the pipe. The sand bedding shall be levelled and compacted to 90% SPMDD, such that it forms a continuous solid bedding for the full length of the pipe except at the midpoint of each pipe and at the joints. The middle of the trench bedding for a width of one third of the pipe outside diameter, shall remain uncompacted.
- (ii) A small groove shall be left at the midpoint to facilitate the removal of the sling after the pipe has been laid. Another groove shall be provided at each joint to facilitate placing of the pipe bell. Both grooves shall be filled with compacted sand after the removal of the sling and after placing of the diaper band.
- (iii) Sand bedding shall be placed to 50 millimetres above the haunch of the pipe and thoroughly compacted to 90% SPMDD, to provide adequate lateral support of the pipe wall. Sand initial backfill shall then be placed to a depth above the pipe to a depth of 200 millimetres above the top of the pipe, for the full trench

- width. The Contractor shall ensure that disturbance of the pipe or damage to the pipe coating does not occur during sand bedding and backfilling operations.
- (iv) The pipe shall be laid and fitted together so that when complete, the pipe will have a smooth and uniform invert. The trench shall be free of water while the pipe is being installed. The excavation of the trench shall be fully completed a sufficient distance in advance so as not to interfere with the laying of the pipe.
 - (v) Pipe shall be installed utilizing trench methods. Coring, augering or jacking methods shall not be undertaken without approval of the Contract Administrator.
 - (vi) The exposed end of the pipe shall be fully protected with an approved stopper to prevent foreign matter from entering the pipe. The interior of the pipe shall be kept free of all dirt, concrete or superfluous material as the Work proceeds.
- (b) Jointing
 - (i) Pipe shall be joined in accordance to manufacturers instructions and accepted industry practice. Over-insertion of pipe joints shall not be permitted.
 - (c) Connection to Chamber Piping
 - (i) For pipe connection to chamber piping, connections shall be made by means of steel sleeve typed coupling. Pipe coupling to be protected from corrosion by Denso tape system.

E9.3.4 Frost Conditions

- (a) No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Contract Administrator shall deem that there is danger of the formation of ice or the penetration of frost at the bottom of the excavation. Every precaution must be taken to prevent frost from penetrating the ground to depths below the foundations during construction. Any pipe which, in the opinion of the Contract Administrator, shall have been injured through neglect of this provision of the specifications, shall be removed and made good by the Contractor and at the Contractor's expense.
- (b) Heating of the pipe, sand, mortar and gaskets shall commence when the ambient temperature falls below -5 C. The pipe shall be heated throughout with a low heat immediately prior to installation (warm to the touch).
- (c) All mortar for joints shall be heated, and heated sand shall be placed around the pipe for the full height of the specified bedding and initial backfill and to at least 600 millimetres on either side of the joint, all to the satisfaction of the Contract Administrator.

E9.3.5 Thrust Blocks

- (a) Thrust blocks shall be installed at all tees, wyes, elbows, bends, plugs, reducers and crosses and at location shown on the Drawings. Thrust blocks shall consist of concrete as specified in Specification CW2160 and shall be installed as shown on the Drawings. The thrust block shall bear against undisturbed soil and the soil shall be cut smooth and at the proper angle to the pipe. No horizontal struts or braces required for trench bracing shall remain in the concrete thrust block. A bond breaker consisting of 0.20 millimetre (8 mil) polyethylene sheeting shall be installed between fittings, valves or plugs and the concrete of the thrust block to allow future removal of the thrust block without disturbing the fitting, valve or plug. Before any concrete is placed, all thrust block formwork shall be inspected and approved by the Contract Administrator.

E9.3.6 Clay Dikes

- (a) Clay dikes shall be constructed every 200 linear metres, 5 metres on each side of offtake/valve chamber walls, and as directed by the Contract Administrator. Clay dikes shall consist of compacted clay material extending the width of the trench and for a length of 600 millimetres and shall extend from the bottom of the sand bedding, i.e. from undisturbed earth to the top of the sand backfill.

E9.3.7 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 new Prestressed concrete cylinder pipe shall be made by means of bell and spigot joint. The Contractor shall provide a new pipe gasket for this connection.
- (c) 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.
- (d) All pipe joints included in connection sections shall be exposed after recommissioning to inspect for leakage.
- (e) The Contractor shall carefully remove the existing 750 mm diameter bulkhead from the tie-in connection to the existing 750 mm Feedermain at Waverley Street and Bision Drive and transport the bulkhead to the City's "Y" yard for storage.
 - (i) The removed bulkhead will remain property of the City of Winnipeg.

E9.3.8 Painting

- (a) All exposed metal surfaces including valves, fittings, anchor bolts, flange bolts etc. where not specified to be copper, brass or galvanized, and all galvanized surfaces exposed by welding connections shall be painted.
- (b) Metal surfaces shall be cleaned thoroughly by wire brushing or abrasive blasting.
- (c) Paint exposed surfaces in accordance to AWWA C213.

E9.3.9 Change in the Laying Schedule

- (a) If the Contractor requests changes in the laying schedule, that is relocation of items such as offtakes, closures, valve chambers or any other alteration of the laying schedule, all costs associated with these changes shall be paid for by the Contractor.

E9.4 Quality Control

E9.4.1 Inspection

- (a) The Contractor shall afford the Contract Administrator every facility to access and inspect all plant to be provided, work to be performed, materials to be supplied and equipment or machinery to be installed.

E9.4.2 Line and Grade

- (a) The pipe shall be installed to the line and grade shown on the Drawings and as set in the field by the Contract Administrator. Vertical variance from grade shall not exceed 25 millimetres and horizontal variance from line shall not exceed 100 millimetres. Sharp bends will not be permitted even though the pipe remains within these tolerances. Alignment corrections allowed in main line piping but not at closures. Tees and bends shall be installed to the grades and at the locations shown on the Drawings or where required to connect to existing pipelines.

E9.4.3 Hydrostatic Leakage Testing

- (a) Testing shall be completed in accordance to CW 2125. The Contractor shall slowly fill the feedermain with potable water and ensure all air is expelled from the line.

E9.4.4 Disinfection of Watermains and Feeder mains

- (a) Disinfection of watermains and feeder mains shall be completed in accordance with CW2125 except initial flushing will not be required.
- (b) The Contractor shall take every reasonable precaution during construction to prevent debris from entering the pipeline. If, in the opinion of the Contract Administrator,

deleterious substances have entered the pipeline, the Contractor shall flush the pipeline with sanitized pipeline cleaning equipment at the Contractor's expense.

- (c) Further to CW 2125, disinfection of segments of watermains not disinfected as noted above, shall be completed by swabbing as outlined in Section 3.3.16 of CW 2125.
- (d) Upon completion of disinfection, chlorinated water shall be pumped from the pipeline at the lowest point(s) in the system. Chlorinated water shall not be directly discharged to the environment. Chlorinated water shall be treated by one of the following methods, as recommended in AWWARF - GUIDANCE MANUAL FOR THE DISPOSAL OF CHLORINATED WATER:
 - (i) discharged into a waste water sewer;
 - (ii) discharged into drainage ditch;
 - (iii) be de-chlorinated using Sodium Ascorbate, Vita-D-Chlor™ by Integra Chemical, or approved equal;
 - (iv) contained on Site until chlorine has dissipated to acceptable limits.
- (e) The pipeline shall be refilled with potable water and water samples for health tests taken in accordance to CW 2125, except test samples shall be taken each day at least 24 hours apart for three (3) successive days.

E9.5 Method of Measurement and Basis of Payment

E9.5.1 Supply and Installation of Feeder mains

- (a) Supply and Installation of feeder mains shall be measured and paid on a length basis. The length to be paid for shall be the total number of linear metres acceptably installed as to each size, class, type of backfill and method of installation listed in Form B: Prices "Supply and Installation Main Line Pipe". Measurement shall be made horizontally, at grade, above the centreline of the pipe, through all fittings and appurtenances, as computed by measurements made by the Contract Administrator, include all accessories, appurtenances. The length measured and paid will be from the first pipe joint outside of the valve chambers, to the connection points on the existing feeder mains. Measurement will be from face of bell to face of bell.

Payment for feeder mains will be made on the following payment schedule;

- (i) Thirty percent (30%) payment upon delivery of pipe to the jobsite.
- (ii) Ninety percent (90%) payment upon successful installation of the pipe
- (iii) One hundred percent (100 %) payment upon successful testing, disinfection and recommissioning of the pipe.

- (b) Supply and Installation of fittings and specials shall be made on a unit basis. The units measured and paid shall be the total number of fittings and specials installed, of each size, class and type, as listed in Form B: Prices "Supply and Installation Fittings and Specials".

Payment for fittings and specials will be made on the following payment schedule:

- (i) Thirty percent (30%) payment upon delivery of fittings and specials to the jobsite.
- (ii) Ninety percent (90%) payment upon successful installation of the fittings and specials
- (iii) One hundred percent (100 %) payment upon successful testing, disinfection and recommissioning of the pipe.

E9.5.2 Connection to Existing Pipes

- (a) Connections to existing pipes will be measured on a unit basis. The price paid for the connection shall be the total number of connections made, in accordance with this specification and shall include all excavations, backfill, removal of existing pipes and bulkheads, patching of concrete where required and provision of new pipe gaskets as listed in Form B Prices "Connect to Existing Feeder mains". Where connections

involve installing a tee in an existing line, the price for the connection shall include reconnection of both ends of the tee.

E9.5.3 Construction of Thrust Blocks

- (a) Construction of thrust blocks will be measured on a unit basis. The number of units measured and paid will be the total number of thrust blocks constructed for each size and deflection as listed in Form B: Prices "Construction of Thrust Blocks".

E9.5.4 Testing and Disinfection

- (a) Testing and Disinfection of feeder mains will be measured and paid on a unit basis as listed in Form B: Prices "Pressure Test and Disinfection". The price paid shall include all main cleaning testing, disinfecting, and disposal of chlorinated water, successfully completed in accordance with this specification.

E10. CONSTRUCTION OF VALVE CHAMBER STRUCTURES

E10.1 Description

- E10.1.1 This specification shall cover the construction of the cast-in-place offtake valve chamber, the pre-cast air valve chambers; and shall supplement, revise and amend CW 2160.

E10.2 Materials

- (a) Formwork, Reinforcing Steel and Concrete
 - (i) As per City of Winnipeg CW 2160 and as indicated on the Drawings.
 - (ii) Reinforcing Steel – Bar accessories:
 - (i) To be made from a non-corroding material
 - (ii) Shall not stain, blemish or spall the concrete surface for the life of the concrete
 - (iii) Shall be approved by the Contract Administrator
 - (iv) Bar chairs shall be PVC.
- (b) Concrete Mix Design
 - (i) Concrete Mix Design as per Table CW 2160.1, Type A mix or as indicated on the Drawings.
- (c) Lean-Mix Concrete Design
 - (i) Proportioning of fine aggregate, coarse aggregate, cement and water for lean-mix concrete shall be as follows:
 - (a) Cement : Type 50
 - (b) Class of Exposure: S-1
 - (c) Minimum compressive strength @ 28 days: 35 MPa
 - (d) Slump: 80mm, +/- 20mm
 - (e) Air Content: 5-8%
 - (f) Maximum water/cement ratio: 0.40
- (d) Grout
 - (i) Grout shall be Sika Grout 212 or approved equal.
- (e) Bonding Agent
 - (i) Bonding agent shall be ACRYL – STIX or approved equal.
- (f) Foundation Waterproofing
 - (i) Shall be in accordance with E13 of this Specification.
- (g) Chamber Piping and Fittings
 - (i) As indicated on the Drawings.
- (h) Butterfly Valves and Actuators

- (i) Shall be in accordance with E15 and E16 of this Specification.
- (i) Gate Valves
 - (i) Shall be in accordance with E17 of this Specification.
- (j) Valve Stem Extensions
 - (i) Schedule 40 Stainless Steel ASTM A-276 Type 304, fitted with with 50mm square operating nut. Size and length to be determined in the field by the Contractor.
- (k) Water Stops
 - (i) As indicated on the Drawings.
- (l) Insulation
 - (i) As indicated on the Drawings.
- (m) Precast Air Valve Chambers
 - (i) Precast chambers shall be in accordance to ASTM C478 or ASTM C76 Class 3 pipe.
- (n) Backfill
 - (i) In accordance with CW 2030 and with E6 of this Specification. Class of backfill to be as shown on the Drawings.

E10.3 Submittals

- (a) Submit shop drawings for all valves, fittings, appurtenances, reinforcing steel and concrete mix design in accordance to CW 2160 and E5 of this Specification.
 - (i) Submit shop drawings for reinforcing steel a minimum of two (2) weeks prior to the fabrication of any reinforcing steel.

E10.4 Construction Methods

- (a) Cast-in-place concrete as per CW 2160 and E10 of this Specification
- (b) Floor Drains
 - (i) Construct Floor drain as detailed on the drawings.
- (c) Pipe, Valves Fittings and Appurtenances
 - (i) As per E18 , E7 and E9.
- (d) Install Precast Air Valve Chambers in accordance with CW 2130 Clause 3.8
- (e) Construction Method Submission
 - (i) No work shall commence on construction of cast-in-place valve chambers until after the Contract Administrator's review of the Contractor's Construction Method submission.
 - (ii) Excavation for the construction of the valve chambers shall be by the shored excavation method.
 - (iii) Prepare for the Contract Administrator's review a Construction Method submission detailing:
 - (i) Construction sequence to be followed including all methods to be employed to ensure no damage occurs to existing structures or adjacent properties within or adjacent to an excavation.
 - (ii) Shoring system to be used.
 - (iii) Proposed method of chamber construction.
 - (iv) Specialized equipment to be used.
 - (v) Any design revisions proposed to accommodate the Contractor's proposed construction method.
 - (vi) Water control considerations including details on the Contractor's proposed method of groundwater and surface runoff control.

- (iv) The Contractor shall respond to any concerns that may be raised by the Contract Administrator after review of Construction Method submission.
- (f) Excavation
 - (i) Remove excavated material from the site immediately. Excavated material shall not be stockpiled on-site and shall be removed the same day it is excavated.
 - (ii) Place a minimum 75mm thick lean mix concrete slab in the bottom of the excavation to provide a clean working base upon completion of the excavation to the required limits. Allow the concrete to set for twenty-four (24) hours before setting up forms or placing reinforcing steel.
 - (iii) Lean mix concrete shall be well-tamped and screened to give a level working platform for setting up forms and placing reinforcing steel.
 - (iv) Supply and place lean mix concrete, as directed by the Contract Administrator, as backfill for any portions of the excavation, carried beyond the required limits of excavation. The limits of excavation shall be considered to be the inside face of the shoring system and the underside of the working base slab.
 - (v) All working areas below grade shall be kept adequately and securely supported during and after excavation until the shoring and bracing is in place to prevent loss of ground or injury to any person from falling material.
- (g) Excavation Security Fence
 - (i) Further to Clause 3.1 of CW 1130, completely cover the excavation and provide a security fence to completely surround the excavation when unattended generally in accordance with the following.
 - (ii) Security fence shall be chain link fence or approved equal in accordance with B5, a minimum 1.80 metres high with metal support posts embedded far enough into the ground and spaced close enough together so the fence will not sag or collapse.
 - (iii) Attach fencing securely to posts.
 - (iv) Secure the gate or end of the fencing to a post with chain and a padlock.
 - (v) Provide alternate security fence proposal to Contract Administrator for approval.
- (h) Shoring
 - (i) The type, strength, and amount of shoring and bracing shall be such as the nature of the ground and attendance conditions may require, taking into account property lines, existing slopes, utilities and roadways.
 - (ii) All material used for shoring construction shall be in a like-new condition, and shoring and bracing shall be so spaced and dimensioned as to prevent caving, loss of ground, surface settlement, or squeezing of the soil beyond the neat lines of excavation. It shall be free from defects that might impair its strength or suitability for the work. Sheeting/shoring and bracing shall conform to the latest revisions of the "Construction Safety Act" of the Department of Labour of the Government of Manitoba.
 - (iii) Supporting design calculations as required to facilitate review of the submission for conformance with the Contract Documents.
 - (iv) Submit Shop Drawings and design calculations for the shoring/excavation system designed and sealed by a Professional Engineer registered or licensed to practice in the Province of Manitoba and experienced in the structural design of shoring systems. The designer of the shoring system shall inspect the system during construction and certify, in writing to the Contract Administrator, that construction is in conformance with the approved design.
 - (v) Shoring and bracing shall be installed such that the structure size, wall thickness, and any work relating to the construction of the valve chamber as shown on the drawings can be achieved subsequent to installation of the shoring system.
- (i) Cast-in-place Concrete Chamber Construction

- (i) Construct cast-in-place concrete chambers in accordance with CW 2160, except as supplemented, revised or amended in this specification and as indicated in the construction notes on the Drawings.
- (ii) Adjust the location of reinforcing steel adjacent to openings to frame those openings in accordance with good practice, and maintain the bar spacing intent.
- (iii) Do not use welded splices for reinforcing steel.
- (iv) Order all wall reinforcing steel in lengths to best suit the spacing of walers so that reinforcing bars will not be bent or misformed in order to remove the walers.
- (v) Install foundation waterproofing in accordance with E14 of this Specification.
- (j) Backfill
 - (i) Place and compact backfill material as indicated on the Drawings in accordance with CW 2030. Do not place backfill material in a frozen state. Supply heating and hoarding in accordance with CW 2160 if required to ensure material does not freeze before compaction is complete.
 - (ii) Notify the Contract Administrator at least one (1) full working day in advance of any backfilling operation. No Backfill shall be placed against concrete until approved by the Contract Administrator and in no case before field cured test cylinders show the concrete strength to be 75% of that specified.
- (k) Grout
 - (i) Mix and apply grout in accordance with the manufacturer's instructions. Consistency to be suitable for the intended application.

E10.5 Method of Measurement and Basis of Payment

- (a) Construction of Valve Chambers shall be measured on a lump sum basis, for each valve chamber structure constructed in accordance to these specifications, as listed in the items under Form B Prices "Construction of Underground Concrete Structures". The lump sum price shall include excavation, backfill, cast-in-place concrete works, installation of butterfly and gate valves, installation of chamber piping, supply and installation of miscellaneous valves, appurtenances, miscellaneous metals, couplings, sub drains, interior plumbing, miscellaneous materials and bollards.
 - (i) Chamber piping shall be considered all piping within the chamber, to the first joint outside the chamber wall.

E11. OFF-TAKE VALVE CHAMBER REMOVEABLE CONCRETE ROOF PANELS

E11.1 Description

- (a) This specification shall cover construction of the removable roof panels, and the supply and install of the lifting lugs.
- (b) The Work shall consist of:
 - (i) The supply of materials and the fabrication of cast-in-place or precast roof panels as shown and described on the Drawings and in this Specification.
 - (ii) The supply of all materials embedded in the cast-in-place roof panels.
 - (iii) The handling, storage and loading of the cast-in-place roof panels.
 - (iv) The quality control testing of all materials.

E11.2 Materials

- (a) Concrete Mix Design
 - (i) Concrete mix design shall be as indicated in the Construction Notes on the Drawings.
- (b) Lifting Lugs
 - (a) To be made from a non-corroding material.
 - (b) Shall not stain, blemish or spall the concrete surface for the life of the concrete.

- (c) Shall be approved by the Contract Administrator.
- (d) Shall be galvanized in accordance with CSA G164.

E11.3 References and Related Specifications

- (a) All reference standards shall be current issue or latest revision at the first date of tender advertisement unless otherwise noted.
 - CSA-A23.1, Concrete Materials and Methods of Concrete Construction
 - CSA-A23.2, Methods of Test and Standard Practices for Concrete
 - CSA-A23.4/CSA-A251, Materials and Construction/Qualification Code for Architectural and Structural Precast Concrete Products
 - CSA-A3001, Cementitious Materials for Use in Concrete
 - CSA – G30.18, Billet-Steel Bars for Concrete Reinforcement
 - CAN/CSA G 164, Hot Dip Galvanizing of Irregularly Shaped Articles
 - ASTM C 260, Standard Specification for Air-Entraining Admixtures for Concrete
 - ASTM C 494, Standard Specification for Chemical Admixtures for Concrete
 - ASTM C 1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

E11.4 Submittals

- (a) The Contractor shall submit the following to the Contract Administrator:
 - (i) Proof of certification by the Canadian Standards Association that the Fabricator meets the requirements of CSA A23.4/CSA-A25.1, Categories “SC” and “PC” at the time of tender. Proof of this certification shall be provided to the Contract Administrator prior to award of the contract.
 - (ii) Concrete mix design that meets the minimum compressive strength of 35 MPa at 28 days. Any changes to the concrete mix design shall be reviewed by the Contract Administrator prior to the Fabricator implementing the change.
 - (iii) Copies of all reports, including but not limited to: "Record of Concrete Strength" form and material quality control test results.
 - (iv) Shop drawings for the reinforcing steel that are stamped, signed and dated by a Professional Engineer registered to practice in the Province of Manitoba.

E11.5 Supply of Materials

- (a) Concrete
 - (i) Concrete shall be in accordance with E10 of this specification.

E11.6 Construction Methods

- (a) General
 - (i) The Fabricator shall ensure that the concrete is properly batched, mixed, placed and cured.
- (b) Tolerances
 - (i) Cross-sectional dimensions throughout the entire length of the roof panel shall not vary from those shown on the Drawings by more than 5 mm.
 - (ii) The locations of the reinforcing steel shall not vary from those shown on the Drawings by more than 5 mm.
- (c) Forms
 - (i) The faces of the forms shall be smooth so as to impart a good finish to the concrete. Forms shall produce precast concrete pier segments that conform to the shape, lines and dimensions as shown on the Drawings and within the tolerances described in E11.7 of this Specification.
 - (ii) The faces of the forms shall be treated with a release agent to ensure that stripping may be carried out without damage to the concrete. Care shall be taken to prevent

the release agent from coming in contact with any reinforcing steel or embedded materials.

(d) Installation of Embedded Materials

- (i) Embedded materials shall be placed in the positions as indicated on the Drawings and fixed securely to the forms to ensure that there is no displacement during the placing or vibrating of concrete.

(e) Reinforcing Steel

- (i) Reinforcing steel shall be placed accurately in the positions shown on the Drawings, and shall be retained in such positions by means of bar accessories and wires so that the bars shall not be moved out of alignment during or after the depositing of concrete. Bar accessories shall be galvanized or shall be made from non-rusting material.
- (ii) Reinforcing steel shall be kept free of all foreign materials in order to ensure a positive bond between the concrete and steel. The Fabricator shall remove any material that has been deposited on the reinforcing steel before concrete is placed.
- (iii) Intersecting bars shall be tied positively at each intersection.

(f) Depositing of Concrete

- (i) Concrete shall be deposited carefully and vibrated so that it fills the forms completely and makes complete contact with all reinforcing bars and embedded materials.
- (ii) The Fabricator shall provide sufficient personnel to deposit and vibrate the concrete and shall ensure that each batch of concrete is vibrated properly into place as it is deposited.
- (iii) Depositing of concrete shall be a single continuous complete operation so that each roof panel be monolithic without joints.
- (iv) Before any concrete shall be deposited, the interior of the forms shall be cleaned of all chips, earth, shavings, sawdust, rubbish or other foreign substances.

(g) Vibrating Concrete

- (i) Vibrators shall be of sturdy construction, adequately powered and capable of transmitting to the concrete not less than 3,600 impulses per minute when operating under load. The vibration shall be sufficiently intense to cause the concrete to flow or settle readily into place and to visibly affect the concrete over a radius of at least 450 mm from the vibrator when used in concrete having a 25 mm slump.
- (ii) A sufficient number of vibrators shall be employed so that at the required rate of placement, vibration and complete compaction are obtained throughout the entire pier segment. At least one extra vibrator shall be on hand for emergency use.
- (iii) Internal vibrators shall be constantly moving vertically in the concrete and shall be applied at points uniformly spaced that are not farther apart than the radius over which the vibrator is visibly effective. Internal vibrators shall be applied close enough to the forms to vibrate the surface concrete effectively but care shall be taken to avoid displacing or damaging the forms.
- (iv) The vibration shall be of sufficient duration and intensity to thoroughly consolidate the concrete but shall not be continued so as to cause segregation or draw a pool of grout from the surrounding area.

(h) Concrete Finish

- (i) Immediately after the removal of the forms, all defects in the concrete shall be repaired as directed by the Contract Administrator, provided the defects are not extensive enough to cause rejection of the pier segment. Should the top surface exhibit excessive laitance or "frothing", or any other deleterious effects, the Fabricator shall repair the concrete to the satisfaction of the Contract Administrator.
- (ii) Honeycomb, if any, shall be repaired as soon as the forms are taken off. When approved by the Contract Administrator, repairs shall be accomplished by: removing all aggregate that is loose or that is not bonded thoroughly to the surrounding

concrete, washing the sound concrete with clean water, using a wire brush to remove any loose particles, applying an approved epoxy resin to the dried areas, and applying a cementitious mortar. The cementitious mortar shall have the same quality and mix as that used for the concrete. Patched areas shall be rubbed flush with the surrounding surface after the cementitious mortar has hardened.

- (iii) All objectionable fins, projections, offsets, streaks, and other surface imperfections shall be removed totally to the Contract Administrator's satisfaction by approved means.
 - (iv) If, in the Contract Administrator's opinion, repairs to the concrete are not satisfactory or will be detrimental to the strength or long-term durability of the roof panel, the Fabricator shall, at his own expense and as directed by the Contract Administrator replace the roof panel.
- (i) Curing
- (i) Concrete shall be either moist-cured for a minimum of three (3) days from the time of casting or steam-cured until the concrete has reached a strength of 25 MPa.
 - (ii) If steam-curing is used, steam shall not be applied until after the initial set has taken place.
 - (iii) During steam curing, the rise in the ambient air temperature shall not exceed 20° C per hour to a maximum temperature of 70° C.
 - (iv) Once curing has been completed, the temperature of the concrete shall not be allowed to fall at a rate exceeding 20° C per hour.
 - (v) The pier segments shall not be subjected to freezing temperatures before reaching the design strength. The pier segments, including any patched areas, shall be properly cured within the plant a minimum of three (3) days as specified in this Specification. The Fabricator shall monitor the rate of cooling of the pier segments and avoid thermal shock from prematurely subjecting the pier segments to freezing temperatures.
- (j) Handling, Storage and Loading
- (i) Lifting devices shall be cast into the concrete. The lifting devices shall be of such a nature as to avoid twisting, racking or other distortions while handling, storing, moving and installing. The devices shall be anchored to the main body of concrete. The Fabricator shall satisfy himself as to the adequacy of the devices. The pier segments shall be picked up only by the lifting devices.
 - (ii) The Fabricator shall be responsible for storage of the pier segments from the completion of their fabrication until they are required by the Contractor.
 - (iii) Care shall be exercised during the handling, transportation and storage of the roof panels to avoid twisting, cracking or other distortion that may result in damage.
 - (iv) Cracking of the roof panels during transportation will be basis for rejection by the Contract Administrator.
 - (v) The Contractor will give the Fabricator 48 hours notice of his intention to pick up the roof panels.

E11.7 Quality Control

- (a) Qualified Personnel for Quality Control Testing
- (i) All quality control testing shall be completed by qualified personnel who are certified at the time of testing as ACI CSA-based Concrete Field Testing Technicians Grade 1.
- (b) Test Cylinders
- (i) The Fabricator shall mold a sufficient number of cylinders for the concrete to be placed in each pier segment in order to establish that the concrete has achieved the minimum compressive strength of 35 MPa. The minimum compressive strength will be deemed to have been obtained when the average compressive strength of three cylinders from an individual batch equals or exceeds 35 MPa.

- (ii) The compressive strength of the concrete shall be determined from standard 100 mm diameter x 200 mm test cylinders or 150 mm x 300 mm test cylinders that have been molded, cured and tested in accordance with CSA-A23.2. All test cylinders shall be cured under the same conditions (i.e. match cured) as the pier segments until such time as the curing of the pier segments has been completed.
- (c) Concrete Batches
 - (i) In addition to the molding of test cylinders, the Fabricator shall perform and record the results of the following tests for the concrete to be placed in each roof panel:
 - (i) slump,
 - (ii) air, and
 - (iii) temperature
 - (ii) The Fabricator shall be responsible for maintaining an up-to-date record of all test results on a "Record of Concrete Strength" form approved by the Contract Administrator. A separate "Record of Concrete Strength" form shall be prepared for each roof panel and the strengths of the test cylinders as well as the pertinent data shall be listed in the same order as the batches of concrete were placed in the forms. A complete set of test results shall be submitted to the Contract Administrator within 7 days after the date that the final cylinder from the last roof panel was tested.

E11.8 Measurement and Payment

- (a) Supply and installation of roof panels will not be measured and will be paid for at the Contract lump sum price as listed in Form B: Prices "Off-take Valve Chamber", which price shall be payment in full for supplying all materials and for performing all operations herein described, and all other items incidental to the work.

E12. OFF-TAKE VALVE CHAMBER PRE-CAST CONCRETE MANHOLE

E12.1 Description

- (a) This specification shall cover construction of a concrete base, collar, and the supply and installation of a pre-cast concrete manhole as shown on the Drawings.

E12.2 Materials

- (a) Pre-cast concrete manhole shall be in accordance with section 2.7 of CW 2130.
- (b) Manhole Frames and Covers
 - (i) Cover: Unmarked Titan TF-114 cast iron solid cover.
 - (ii) Frame: 125-millimetre high cast iron frame.

E12.3 Construction Methods

- (a) Install pre-cast concrete manholes as shown on the Drawings and in accordance with section 3.8 and 3.9 of CW 2130.
- (b) Miscellaneous Metal Fabrications
 - (i) Install miscellaneous metal fabrications as shown on the Drawings and in accordance with E15 of this specification.

E12.4 Measurement and Payment

Supply and installation of pre-cast concrete manhole will not be measured and will be paid for at the Contract lump sum price as listed in Form B: Prices "Off-take Valve Chamber", which price shall be payment in full for supplying all materials and for performing all operations herein described, and all other items incidental to the work.

E13. OFF-TAKE VALVE CHAMBER FOUNDATION WATERPROOFING

E13.1 Description

(a) General

- (i) This Specification shall cover the supply and placement of underground concrete valve chamber foundation waterproofing.

E13.2 Materials

- (a) Waterproofing membrane: Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, reinforced with non-woven polyester weighing 180 g/m². Top surface polyethylene film. Bottom surface: thermofusible plastic film. Acceptable material: Soprema Sopralene Flam 180, IKO Aquabarrier TG or approved equal.
- (b) Primes, mastic sealant and accessories: as recommended by membrane manufacturer, applicable for substrate.
- (c) Protection board: insulating fibreboard to CAN/CSA-A247, Type II, 12 millimetres thick.

E13.3 Construction Methods

(a) Quality Assurance

- (i) Installation of waterproofing membrane shall be performed by workers approved and trained by manufacturer for application of its products. Applicators must have minimum 5 years proven experience. If requested, submit proof of experience, in writing, from manufacturer.

(b) Warranty

- (i) Provide written warranty, signed and issued in the name of The City of Winnipeg stating that the waterproofing is guaranteed against leaking, loss of adhesion, for a period of five (5) years from the date of acceptance.

(c) Environmental Requirements

- (i) Maintain air temperature and structural base temperature at installation area above membrane manufacturer's recommendations before, during and 72 hours after installation.
- (ii) For applications in freezing weather do not commence application until authorized by membrane manufacturer.
- (iii) For enclosed applications ensure adequate forced air circulation during curing period.
- (iv) Install membrane on dry substrates, free of snow and ice. Use only dry materials and apply only during weather that will not introduce moisture beneath waterproofing membrane.

(d) Preparation

- (i) Examine substrates and site conditions to ensure acceptability for application of waterproofing membranes. Notify Contract Administrator, in writing, of unsuitable surfaces or working conditions.
- (ii) Do not commence application until all other work that will penetrate membrane is complete.
- (iii) Clean substrates of all snow, ice, loose particles, oil, grease, dirt, curing compounds, or other foreign matter detrimental to application of primers and waterproofing membranes.
- (iv) Ensure concrete surfaces are fully cured and dry using test methods recommended by membrane manufacturer.
- (v) Repair defects in concrete surfaces such as spalled or poorly consolidated concrete. Remove sharp protrusions, sharp edges and form lines.
- (vi) Patch rough areas with a weld-adhered parge coat to provide smooth surface. Allow to fully cure and dry.

(e) Priming

- (i) Apply primer in accordance with manufacturer's instructions at recommended rate of application.

- (ii) Do not apply primer to frozen or damp surfaces.
 - (iii) Apply primer only when air and surface temperatures are within manufacturer's recommended limits.
 - (iv) Avoid pooling of primer and allow to cure until tack-free.
 - (v) Prime only the area to be covered with membrane in a working day. Re-prime areas not covered with waterproofing within 24 hours of application of primer.
- (f) Membrane Application
- (i) Apply membrane in accordance with manufacturer's instructions and with good construction practice to maintain continuity of waterproofing over building elements below finished grade elevation.
 - (ii) Place membrane in position without stretching, taking care to avoid trapped air, creases or fish mouths.
 - (iii) Ensure membrane is totally bonded to substrate.
 - (iv) Apply membrane vertically in longest possible lengths to reduce number of end joints.
 - (v) Overlap side laps minimum 75 millimetres and end laps minimum 150 millimetres. Stagger end laps minimum 300 millimetres in adjacent rows.
 - (vi) Seal horizontal and vertical terminations by applying heavy pressure to edges with a roller to ensure positive bond. Apply a continuous bead of mastic sealant to all terminations. Make watertight. Seal daily terminations with mastic sealant.
 - (vii) Terminate membrane 300 millimetres below finished grade.
- (g) Membrane Application at Corners
- (i) Remove sharp or protruding edges from external corners prior to application of membrane.
 - (ii) Reinforce external corners with cushion strip of membrane minimum 300 mm wide at each corner. Install cushion strip below main membrane.
- (h) Membrane Application Over Protrusions and Penetrations
- (i) Apply two layers of membrane flashing around protrusions and extend at least 150 millimetres in all directions. Cut and fit membrane neatly and snug fitting, leave no gaps. Seal all terminations with mastic sealant. Flash protrusions with liquid mastic extending 150 millimetres along pipe or conduit.
 - (ii) Seal with liquid mastic all protrusions or difficult detail areas which do not allow easy installation of membrane. Make watertight.
- (i) Inspection and Repair
- (i) Inspect membrane thoroughly before covering and make corrections immediately.
 - (ii) Patch and repair misaligned or inadequately lapped seams, tears, punctures or fishmouths.
 - (iii) Patch with piece of waterproofing membrane and extend minimum 150 millimetres in all directions from fault and seal edges with mastic sealant.
- (j) Protection Board
- (i) Install protection board against all waterproofing membranes to protect against backfilling operations.
 - (ii) Install boards vertically without fasteners or adhesives.
 - (iii) Install protection board during backfilling operations to allow backfill materials to hold protection board tight to waterproofing membrane.
 - (iv) Terminate protection board 600 millimetres below grade.

E13.4 Measurement and Payment

- (a) Supply and installation of waterproofing membrane and protection board will not be measured and will be paid for at the Contract Price as listed in Form B: Prices "Off-take

Valve Chamber”, which price shall be payment in full for supplying all materials and for performing all operations herein described, and all other items incidental to the work.

E14. OFFTAKE VALVE CHAMBER MISCELLANEOUS METAL FABRICATIONS

E14.1 Description

(a) General

- (i) This Specification shall cover the supply, fabrication, transportation, handling, delivery and placement of metal fabrications.

E14.2 Materials

- (a) All materials shall be of a type acceptable to the Contract Administrator, and shall be subject to inspection and testing by the Contractor Administrator.
- (b) Material intended for use in the various assemblies shall be new, straight, clean, with sharply defined profiles.
- (c) Steel Sections and Plates: to CAN/CSA G40.20/G40.21, Grade 300 W, except W, HP and HSS sections, which shall be Grade 350 W.
- (d) Welding materials: to CSA W59.
- (e) Hot dipped galvanized steel repair material: Galvalloy and Gal-Viz
- (f) Stud Anchors: to ASTM A108, Grade 1020.
- (g) Aluminum: to CAN/CSA S157 and the Aluminum Association ‘Specifications for Aluminum Structures’. Aluminum for plates shall be Type 6061-T651. Aluminum plate shall have an approved raised oval or multi-grip pattern.
- (h) Isolating sleeves shall be “Nylite” – headed sleeve as manufactured by SPAE-Naur of Kitchener, Ontario, or approved equal in accordance with B5.
- (i) Anchor bolts and fasteners: ASTM A276, Type 316 stainless steel, of ample section to safely withstand the forces created by operation of the equipment or the load to which they will be subjected.

E14.3 Construction Methods

(a) Submittals

- (i) Submit the qualifications of the fabricator and welders to the Contractor Administrator for acceptance.
- (ii) Submit shop drawings in accordance with E9 clearly indicating materials, core thickness, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and, accessories. Indicate field measurements on shop drawings.

(b) Fabrication

- (i) Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured. Assemble work in such a way that no disfigurements will show in the finished work, or impair the strength.
- (ii) Confirm measurements for all fabrications before fabricating.
- (iii) Cut aluminum plate with edges straight and true, and as far as practical, maintain continuity of the pattern at abutting edges.
- (iv) Pieces shall be of the sizes indicated on the Drawings and shall not be built up from scrap pieces. Confirm sizes with field measurements.
- (v) Where possible, fit work and shop assemble, ready for erection.
- (vi) Angle frames shall be of the same material as the cover plate, and cover plates shall be hinged and be supplied with lifting handles, as shown on the Drawings. Exterior covers shall be supplied with a hasp for a padlock.

- (vii) Remove and grind smooth burrs, filings, sharp protrusions, and projections from metal fabrications to prevent possible injury. Correct any dangerous or potentially harmful installations as directed by Contract Administrator.
 - (viii) All steel welding shall conform to CSA Standard W59. Fabricator shall be fully approved by the Canadian Welding Bureau, in conformance with CSA Standard W.47.1. Welding shall be done by currently licensed welders only.
 - (ix) All aluminum welding shall conform to Welding shall be in accordance with the requirements of CSA W59.2. The fabricator shall be fully certified in conformance with CSA Standard W47.2. All welding shall be done in a licensed welding shop, and no field welding will be permitted unless approved in writing, in advance, by the Contract Administrator.
 - (x) Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
 - (xi) All steel shall be hot-dip galvanizing after fabrication, in accordance with CAN/CSA-G164, to a minimum net retention of 600 gm/m².
 - (xii) Seal exterior steel fabrications to provide corrosion protection in accordance with CAN3-S16.1.
 - (xiii) Use self-tapping shake-proof flat-headed screws on items requiring assembly by screws.
- (c) Erection
- (i) Do steel welding work in accordance with CSA W59 and aluminum welding work in accordance with CSA W59.2
 - (ii) Erect metalwork in accordance with reviewed shop drawings, square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
 - (iii) Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles where not specifically indicated on the Drawings.
 - (iv) Provide components for building in accordance with shop drawings and schedule.
 - (v) Make field connections with bolts to CAN/CSA-S16, or weld.
 - (vi) Touch-up rivets, bolts and burnt or scratched surfaces that are to receive paint finish, with zinc primer after completion of erection.
 - (vii) Repair damaged galvanized surfaces and field welds with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780, Repair of Damaged Hot Dip Galvanizing Coatings. The general procedure shall be to allow a small amount of the repair alloy to flow then spread by brushing briskly with a wire brush. Brushing shall be sufficient to obtain a bright finish. Repeat process three times to ensure a proper thickness is achieved. Temperatures shall be kept below 177°C (350°F) at all times. All heating of structural steelwork shall be done in the presence of the Contract Administrator.
 - (viii) Install access hatch frames square and level at the locations show on the Drawings. Embed anchors in concrete as shown on the Drawings. Install covers and adjust hardware to proper function.
 - (ix) All aluminum surfaces in contact with concrete shall be isolated using alkali-resistant bituminous paint meeting the requirements of CGSB 31-GP-3M.
 - (x) Install electrochemical isolation gaskets and sleeves to electrically isolate dissimilar metals.

E14.4 Measurement and Payment

- (a) Supply, fabrication, transportation, handling, delivery and placement of miscellaneous metal will not be measured and will be paid for at the Contract Lump Sum Price as listed in Form B: Prices "Off-take Valve Chamber", which price shall be payment in full for supplying all materials and for performing all operations herein described, and all other items incidental to the work.

E15. OFFTAKE VALVE CHAMBER BUTTERFLY VALVES

E15.1 Description

- (a) This specification shall cover the design and manufacture of 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".
- (b) 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.
- (c) Direction of opening shall be counter clockwise (left-hand open).

E15.2 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.

(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 500 Kilopascals (75 p.s.i.)
- (vii) Valve Test Pressure (2 times Operating) 1000 KPa (150 p.s.i)
- (viii) Type of Body (All) Flanged Short Body
- (ix) Maximum Non-Shock Shut-Off Pressure (All) 1000 Kilopascals (150 p.s.i.)
- (x) Body (All) Cast Iron or Ductile 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).

NOMINAL PIPE SIZE (MM)	QUANTITY	ACTUATOR TYPE	VALVE CLASS	PRIMARY SERVICE FUNCTION
750	2	Manual	150B	Isolation (Open/Close)

E15.3 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 short body 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) Gaskets
 - (i) Rubber gaskets for flanges shall conform to AWWA C111, Standard for Rubber-Gasket Joints for Cast Iron and Ductile Iron pressure pipe and fittings.
- (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) Val-Matic
 - (vi) Or Approved Equal

E15.4 Submittals

- (a) Shop Drawings
 - (i) Submit Shop Drawings in accordance to E5.
 - (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.

E15.5 Valve Testing and Acceptance

E15.5.1 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 E15.5.1(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) 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) 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.

E15.5.2

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 Contractor's or Supplier's warehouse facility and prior to construction installation.
- (ii) The Contractor will provide a suitable blind flange for testing, which will remain 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.

E15.5.3 The Contractor shall ensure a qualified representative of the valve manufacturer is present for the testing of the valves to correct any deficiencies found.

E15.6 Measurement and Payment

- (a) Offtake valve chamber butterfly valve supply and installation will not be measured for payment and will be paid for at the lump sum price as listed in Form B: Prices for "Off-take Valve Chamber", which price shall be payment in full for supplying all materials and for performing all operations herein described, and all other items incidental to the work.

E16. BUTTERFLY VALVE ACTUATORS

E16.1 Description

- (a) 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" and AWWA Standard C540, "Power-Actuating Devices for Valves and Sluice Gates".
- (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.

E16.2 Submittals

E16.2.1 Shop Drawings

- (a) Submit Shop Drawings in accordance to E5.
- (b) Shop Drawings shall state all performance and design criteria.
- (c) Allow two (2) calendar weeks in delivery schedule for review of Shop Drawings, commencing at the date of receipt by the Contract Administrator.
- (d) 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.
- (e) Provide valve torque calculations for operating conditions listed.

E16.2.2 Testing

- (a) Provide all factory pressure test reports.
- (b) In the absence of factory inspection and the witness of tests by the Contract Administrator, the Contractor shall provide copies of the following test reports prior to delivery of the actuators:
 - (i) Proof-of-Design test,
 - (ii) Performance tests

E16.3 Manual Actuators

E16.3.1 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) Butterfly valves requiring manual actuators shall be identified as such in the items listed as same in Form B: Prices.

E16.3.2 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 four and one half (4.5) metres water submergence for forty-eight (48) hours.
- (d) Accessible parts of the actuator requiring lubrication shall be provided with button-head alemite grease fittings.

E16.3.3 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.

E16.3.4 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.

E16.3.5 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.

E16.3.6 Protective Coatings

- (a) All external ferrous components including adaptor and mounting plates, shall be painted and tested in accordance to Clause E15.3(n) Painting and Coating and Clause E15.5.1(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.

E16.3.7 Acceptable Manufacturers

- (a) Rotork,

- (b) Limitorque,
- (c) or approved equal as identified in B6.

E16.4 Measurement and Payment

- E16.4.1 Actuator supply and installation will not be measured for payment and will be paid for at the lump sum price as listed in Form B: Prices for "Off-take Valve Chamber", which price shall be payment in full for supplying all materials and for performing all operations herein described, and all other items incidental to the work.

E17. OFFTAKE VALVE CHAMBER GATE VALVES

E17.1 Description

- E17.1.1 Gate Valves shall be flanged unless otherwise indicated and come complete with gaskets, nuts, bolts and fasteners.
- E17.1.2 This specification shall cover the design and manufacture of gate valves to be supplied under this contract. This specification is supplementary to and shall be read together with the latest revision of AWWA Standard C509.

E17.2 Materials

E17.2.1 Flanged Gate Valves

- (a) Shall be in accordance with The City of Winnipeg specification for resilient-seated gate valves with non-rising stems, Specification No. AT-4.1.1.80;
- (b) Stem sealing shall be with double O-rings. Flanges shall conform in dimension and drilling to ANSI B16.1, Class 125. Direction of Opening as indicated in unit prices in Form B: Prices.
- (c) Flanges to conform in dimension and drilling to ANSI/ASME B16.1, Class 150.
- (d) All gate valves shall be in accordance with the latest revision of AWWA C509.

E17.2.2 Gaskets

- (a) Flange gaskets: one piece, full faced cloth reinforced, black rubber, 3 millimetres in thickness.

E17.2.3 Nuts, Bolts and Fasteners

- (a) Flange nuts and bolts: to ASTM A276, Type 316 stainless steel sized to requirements of flange. Thread on bolts to extend past nut a minimum of 6 millimetres.

E17.3 Measurement and Payment

- E17.3.1 Offtake Valve Chamber gate valves for supply and installation will not be measured for payment and will be paid for at the lump sum price as listed in Form B: Prices for "Off-take Valve Chamber", which price shall be payment in full for supplying all materials and for performing all operations herein described, and all other items incidental to the work.

E18. INSTALLATION OF BUTTERFLY VALVES, MISCELLANEOUS VALVES AND FITTINGS

E18.1 Description

- E18.1.1 This specification shall cover the supply and installation of construction of butterfly valves, miscellaneous valves and fittings, including shop testing and inspection of installation in accordance with requirements hereinafter specified.

E18.2 Materials

- E18.2.1 Butterfly valves shall be in accordance with the latest version of AWWA Standard C504, and as specified in E15.

- E18.2.2 Manual actuators shall be in accordance with the latest version of AWWA Standard C504, and as specified E16.
- E18.2.3 Gate vales shall be in accordance with the latest revision of AWWA C509 and as specified in E17.
- E18.2.4 Fittings shall be in accordance with the latest revision of AWWA C110/A21.
- E18.2.5 Chamber Pipe
- (a) Steel Pipe Conforming to AWWA C200
 - ◆ Minimum steel yield strength of 307 MPa (30,000 psi)
 - ◆ Minimum wall thickness 6.3 millimetres (600 and 300 millimetre size)
 - ◆ Paint for exposed steel surfaces shall be in accordance with AWWA C213.
 - ◆ Interior coatings shall comply with ANSI/NSF 61 “Drinking Water System Components – Heath Effects”
 - ◆ 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.
 - (b) Ductile Iron Pipe conforming to AWWA C151
 - ◆ Class 54
 - ◆ Cement Lined as per AWWA C104
 - (c) Prestressed Concrete Cylinder Pipe conforming to AWWA C301
- E18.2.6 Chamber Fittings
- (a) Fabricated steel fittings conforming to AWWA C208
 - (b) Ductile Fittings conforming to AWWA C110
- E18.2.7 Bolts
- (a) Bolts shall be ASTM A307 grade B. Bolt size, type and diameter shall be in accordance to AWWA C207-01. Bolt length shall be sufficient to accommodate flanges, gaskets and insulators.
 - (b) Flange insulator kits shall be Advance Products and Systems or approved equal, including full faced gasket, hole sleeves and washers.
- E18.2.8 Flange Gaskets
- (a) 3mm, full faced, cloth inserted SBR rubber gaskets or Nylon inserted neoprene in accordance with AWWA C207. Gaskets shall be one piece construction where possible. Segmented gaskets shall be constructed of a minimum number of segments and joints shall be of dovetailed construction, or other jointing methods approved by the Contract Administrator.
- E18.2.9 Blind Flanges
- (a) Steel Flanges shall be AWWA C207-01 Class D.
 - (b) Cast and Ductile flanges shall be ASME/ANSI B16.1 Class 125
- E18.2.10 Adaptor or Removable (Universal) Flanges
- (a) Thread-on flanges for ductile-iron pipe: to AWWA C115 or ASME B16.1.
 - (b) Adaptor/Removable Flanges: ductile iron, Grade 65-45-12, conforming to the current ASTM Standard A536 Standard for Ductile-iron castings. Bolt holes shall be in accordance with AWWA C115 or ANSI/ASME B16.1.
 - (c) Clamping screws on adaptor/removable flanges shall be zinc-plated, heat treated steel with a minimum tensile strength of 28 Mpa.
- E18.2.11 Valve Stem Extensions

- (a) Schedule 40 Stainless Steel ASTM A-276 Type 304. Size and length as shown on the drawings, fitted with 50mm square operating nut.

E18.2.12 Threaded Valves

- (a) Small diameter threaded gate valves (75mm diameter and less) shall be all cast bronze, solid wedge disk, rising stem c/w hand wheel rated for minimum 1.0 MPa non-shock cold water service. Direction of opening shall be counter clockwise and shall be indicated on the hand wheel. Bronze material shall conform to ASTM B62. Acceptable product; Crane, Jenkins, Kennedy, Mueller, or approved equal.

E18.2.13 Threaded Piping, Fittings and Flanges

- (a) Small diameter brass threaded piping, fittings and flanges (75mm diameter and less) shall be cast red brass conforming to ASTM B43 or cast bronze conforming to ASTM B62. Flange dimension and drilling shall be in accordance with ANSI B16.24 - 150#.
- (b) Small Diameter steel threaded fittings and flanges (75mm diameter and less) shall accordance with ANSI B16.5 - Class 150.
- (c) Small diameter steel pipe nipples shall be Schedule 80 steel.

E18.2.14 Air Release Valves

- (a) Air Release Valves shall have a minimum of a 50 millimetre threaded inlet, and a 4.76 millimetre orifice, APCO Model S 200A, Val-Matic Series 38 or approved equal.
- (b) 316 Stainless Steel trim, levels and floats
- (c) Design Pressure 1000 KPa

E18.3 Design

- (a) All Pipe and fittings shall be designed for a operating pressure of 700 kilopascals (100 p.s.i.) and a test pressure of 1000 Kilopascals (150 p.s.i.)

E18.4 Submittals

- (a) Submit shop drawings in accordance with E5 and data sheets for all valves and pipe specials.
- (b) Submit layout drawings for all chamber pipe.

E18.5 Construction Methods

- (a) Installation of Butterfly Valves
 - (i) Prior to installation of butterfly valves, the Contractor shall receive installation instructions from the Valve Supply Contractor.
 - (ii) Install butterfly valves as shown on the drawings. Valves shall be installed with the valve shaft in the horizontal position. The Contractor shall arrange for the Supply Contractor to provide installation supervision and to certify satisfactory installation upon successful installation.
 - (iii) 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.
- (b) Installation of Gate Valves
 - (i) As indicated in the latest revision of CW 2110.
- (c) Commissioning of Butterfly Valves
 - (i) The Contractor shall assist in operation of the butterfly valves for the purpose of commissioning. The Contract shall arrange for the Supply Contractor to provide a qualified representative to check the installed equipment, and verify the equipment installed to be operating in accordance to the specifications.
- (d) Threaded Valves and Fittings

- (i) Install threaded nipples and flanges where indicated. Wrap all threads with a minimum of two wraps of Teflon tape or "pipe dope" containing Teflon. Isolate dissimilar metal flanges with gaskets, insulating bolt sleeves and non metallic washers.
- (e) Valve Chamber Sump Drains
 - (i) Install sump drains, traps and cleanouts as indicated on the drawings.
 - (ii) Install 150 millimetre valve chamber drain to limits shown on drawings. Install timber marker at plug end.

E18.6 Method of Measurement and Basis of Payment

- (a) Installation of butterfly valves, miscellaneous valves and fittings as described in this section shall be measured on a lump sum basis, for each valve chamber structure constructed in accordance to these specifications, as listed in the items under Form B Prices for "Construction of Underground Concrete Structures". The lump sum price shall include the installation of all equipment and miscellaneous materials.

E19. SURFACE RESTORATIONS

- E19.1 Prior to construction, inspect the grassed, pavement and gravel surfaces within and adjacent to the Site with the Contract Administrator to record the current existing conditions. After construction and Site clean-up is completed, re-inspect the condition with the Contractor Administrator, any deficiencies noted shall be corrected at the Contractor's expense.
- E19.2 Restoration of grassed areas damaged as a result of construction activities will be restored in accordance with CW 3510. Restoration of grassed areas will not be measured for payment and shall be included as part of the Work being done.
- E19.3 Earth surface restoration along the proposed extension of Bison Drive R.O.W. shall be returned to existing slope and grade conditions with suitable firmness. Surplus excavated material may be spread and bladed over the site, subject approval from the Contract Administrator.
- E19.3.1 Any existing drainage ditches, swales or culverts damaged by construction activity shall be restored and returned to existing slope and grade.
- E19.3.2 Earth surface restorations will not be measured for payment and shall be included as part of the Work being done.
- E19.4 Existing ditches damaged by construction activity shall be re-graded to original slope and grade. Restoration of ditches will not be measured for payment and shall be included as part of the Work being done.
- E19.5 Any existing approaches damaged by construction activity shall be restored in accordance with SD – 239 of the City of Winnipeg's Standard Construction Specifications and no additional payment will be made for such work.
- E19.6 Pavement damaged as a result of construction activities will be restored in accordance with CW 3230, CW 3240 and CW 33410.
- E19.6.1 Pavement restoration shall be measured at the contract unit price for such work as indicated in the items under Form B: Prices for "Provisional Items". The contract unit price shall include all work to complete restoration.
- E19.7 Gravel Surfacing damaged as a result of construction activities will be restored with granular material in accordance with CW 3150.
- E19.7.1 Gravel resurfacing work shall include placing a maximum 50mm compacted depth of granular material over damaged areas, or as determined and measured by the Contract Administrator and will include any required base preparation.
- E19.7.2 Gravel Surfacing restoration shall be measured at the contract unit price for such work as indicated in the items under Form B: Prices for "Provisional Items". The contract unit price

shall include all work to complete restoration including any base preparation required as determined by the contract Administrator