



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 212-2008

**SUPPLY AND DELIVERY OF GATE VALVES, BUTTERFLY VALVES, ACTUATORS
AND FITTINGS**

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 SUPPLY AND DELIVERY OF GATE VALVES, BUTTERFLY VALVES, ACTUATORS AND FITTINGS

B2. SUBMISSION DEADLINE

- B2.1 The Submission Deadline is 4:00 p.m. Winnipeg time, March 25, 2008.
- B2.2 Bids determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.
- B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. ENQUIRIES

- B3.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.
- B3.2 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 promptly notify the Contract Administrator of the error, discrepancy or omission at least five (5) Business Days prior to the Submission Deadline.
- B3.3 If the Bidder is unsure of the meaning or intent of any provision therein, the Bidder should request clarification as to the meaning or intent prior to the Submission Deadline.
- B3.4 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.
- B3.5 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.
- B3.6 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B3 unless that response or interpretation is provided by the Contract Administrator in writing.

B4. ADDENDA

- B4.1 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.
- B4.2 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.
- B4.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.
- B4.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Branch internet site for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.
- B4.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 9 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B5. SUBSTITUTES

- B5.1 The Work is based on the materials, equipment, methods and products specified in the Bid Opportunity.
- B5.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B5.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least seven (7) Business Days prior to the Submission Deadline.
- B5.4 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 material, equipment, method or product 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 Contract;
 - (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 Contract.
- B5.5 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.
- B5.6 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.
- B5.6.1 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.
- B5.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B5.8 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 B13.
- B5.9 No later claim by the Contractor for an addition to the price(s) because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B6. BID SUBMISSION

- B6.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices;

- B6.2 Further to B6.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B5.
- B6.3 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.
- B6.4 The Bid Submission shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.
- B6.4.1 Samples or other components of the Bid Submission which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid Submission.
- B6.5 Bidders are advised not to include any information/literature except as requested in accordance with B6.1.
- B6.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, may result in the Bid being determined to be non-responsive.
- B6.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B6.8 Bids shall be submitted to:
The City of Winnipeg
Corporate Finance Department
Materials Management Branch
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B7. BID

- B7.1 The Bidder shall complete Form A: Bid, making all required entries.
- B7.2 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.
- B7.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B7.2.
- B7.3 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.
- B7.4 Paragraph 11 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.

B7.4.1 The name and official capacity of all individuals signing Form A: Bid shall be printed below such signatures.

B7.4.2 All signatures should be witnessed, except where a corporate seal has been affixed.

B7.5 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.

B8. PRICES

B8.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B8.1.1 Prices on Form B: Prices shall include:

- (a) duty;
- (b) freight and cartage;
- (c) Provincial and Federal taxes [except the Goods and Services Tax (GST) and Manitoba Retail Sales Tax (MRST, also known as PST), which shall be extra where applicable] and all charges governmental or otherwise paid;
- (d) profit and all compensation which shall be due to the Contractor for the Work and all risks and contingencies connected therewith.

B8.2 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.

B8.3 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. QUALIFICATION

B9.1 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, or if the Bidder does not carry on business in Manitoba, in the jurisdiction where the Bidder does carry on business; 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.

B9.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

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

B9.3 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);

B9.4 The Bidder shall be prepared to submit, within three (3) business days of a request by the Contract Administrator, the following technical data for determination that all equipment offered complies with the Specifications described in Part E. The Bidder shall also provide the following specific information:

- (a) The name and model number for all gate valves, butterfly valves, and actuators or combinations thereof listed in Form B: Prices and also listed in further detail in Specifications Part E.
- (b) Evidence of compliance with the latest revision of AWWA C509 for Gate Valves and C504 for Rubber Seated Butterfly Valves, for all valve sizes and classes detailed in Specifications Part E.
- (c) A list of references in demonstrating that the equipment to be supplied under this contract shall be designed and manufactured by a company having at least five (5) years prior experience in the manufacturing of these types of products in the sizes and to the pressure ratings specified within Specifications Part E

B9.5 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.

B9.6 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.

B10. OPENING OF BIDS AND RELEASE OF INFORMATION

B10.1 Bids will not be opened publicly.

B10.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.

B10.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract Amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at <http://www.winnipeg.ca/matmgt>.

B10.4 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.

B11. IRREVOCABLE BID

B11.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 10 of Form A: Bid.

B11.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work for the time period specified in Paragraph 10 of Form A: Bid.

B12. WITHDRAWAL OF BIDS

- B12.1 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.
- B12.1.1 Notwithstanding GC.7.05(2), 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.
- B12.1.2 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 11 of Form A: Bid, and only such person, has authority to give notice of withdrawal.
- B12.1.3 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 11 of Form A: Bid; and
 - (c) if the notice has been given by any one of the persons specified in B12.1.3(b), declare the Bid withdrawn.
- B12.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B11.2 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.

B13. EVALUATION OF BIDS

- B13.1 Award of the Contract shall be based on the following bid evaluation criteria:
- (a) compliance by the Bidder with the requirements of the Bid Opportunity (pass/fail);
 - (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B9 (pass/fail);
 - (c) Total Bid Price;
 - (d) economic analysis of any approved alternative pursuant to B5.
- B13.2 Further to B13.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid Submission is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities if the interests of the City so require.
- B13.3 Further to B13.1(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.
- B13.4 Further to B13.1(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.
- B13.4.1 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.
- B13.5 This Contract will be awarded as a whole.

B14. AWARD OF CONTRACT

- B14.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

- B14.2 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.
- B14.2.1 Without limiting the generality of B14.2, 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.
- B14.3 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.
- B14.3.1 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

C1. GENERAL CONDITIONS

C1.1 The *General Conditions for the Supply and Delivery of Goods* (Form 21: 88 03) are applicable to the Work of the Contract.

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

- D1.1 In addition to the *General Conditions for the Supply and Delivery of Goods*, these Supplemental Conditions are applicable to the Work of the Contract.
- D1.2 The General Conditions are amended by striking out "The City of Winnipeg Act" wherever it appears in the General Conditions and substituting "The City of Winnipeg Charter".
- D1.3 The General Conditions are amended by striking out "Board of Commissioners" or "Commissioner" wherever it appears in the General Conditions and substituting the "Chief Administrative Officer".
- D1.4 The General Conditions are amended by striking out "Tender Package" wherever it appears in the General Conditions and substituting "Bid Opportunity".
- D1.5 The General Conditions are amended by striking out "Tender Submission" wherever it appears in the General Conditions and substituting "Bid Submission".
- D1.6 The General Conditions are amended by striking out "Bidding Instructions" wherever it appears in the General Conditions and substituting "Bidding Procedures".

D2. SCOPE OF WORK

- D2.1 The Work to be done under the Contract shall consist of the supply, delivery, field testing (if required) and commissioning of various sizes of gate valves, butterfly valves and miscellaneous fittings.
- D2.2 The major components of the Work are as follows:
- (a) Supply and delivery of AWWA C509 Gate Valves
 - (b) Supply and delivery of AWWA C504 Butterfly Valves
 - (c) Supply and delivery of manual and electric actuators
 - (d) Supply and delivery of miscellaneous fittings such as, but no limited to, crosses, flanges, couplings etc.
 - (e) Field testing of valves.
 - (f) Inspection of installation and commissioning.
 - (g) Supply of Operation and Maintenance manuals.

D3. DEFINITIONS

- D3.1 When used in this Bid Opportunity:
- (a) "**Business Day**" means any Calendar Day, other than a Saturday, Sunday, or a Statutory or Civic Holiday;
 - (b) "**Submission Deadline**" and "**Time and Date Set for the Final Receipt of Bids**" mean the time and date set out in the Bidding Procedures for final receipt of Bids;
 - (c) "**Award Authority**" means the authority having the jurisdiction to award the Contract according to the City's by-laws, policies or procedures;
- D3.2 Notwithstanding GC.1.01, when used in this Bid Opportunity:
- (a) "**ANSI**" means American National Standards Institute;
 - (b) "**ASME**" means American Society of Mechanical Engineers;

- (c) "**ASTM**" means American Society for Testing and Materials;
- (d) "**AWWA**" means American Water Works Association;
- (e) "**CSA**" means Canadian Standards Association;
- (f) "**IEC**" means International Electrotechnical Commission;
- (g) "**ISO**" means International Organization for Standardization;
- (h) "**NACE**" means National Association of Corrosion Engineers;
- (i) "**NEMA**" means National Electrical Manufacturers Association;
- (j) "**NSF**" means National Sanitation Foundation;
- (k) "**SAE**" means Society of Automotive Engineers.

D3.2.1 The above definitions shall comply with the latest edition of standards, including amendments and supplements, in effect on the date of issue of this Bid Opportunity and shall apply to the Work.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is:
Doug Berg, C.E.T.
Design and Construction Technologist
110 – 1199 Pacific Avenue, Winnipeg, MB, R3E 3S8
Telephone No. (204) 986-4452
Facsimile No. (204) 986-5345

D5. NOTICES

D5.1 GC.7.05 is hereby amended to delete reference to "registered mail" and to replace same with "ordinary mail".

D5.2 GC.7.05 is further amended hereby to include delivery by facsimile transmission (fax) as an acceptable means of delivering notices, consents, approvals, statements, authorizations, documents or other communications required or permitted to be given under this Contract. Deliveries by fax will be deemed to have been received on the day of delivery, if a business day, or if not a business day, on the business day next following the day of delivery.

D5.3 Further to GC.7.05, all notices, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D5.4, D5.5 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.

D5.4 All notices of appeal to the Chief Administrative Officer shall be sent to the following address or facsimile number:

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

D5.5 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following address or facsimile number:

The City of Winnipeg
Corporate Services Department

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

SUBMISSIONS

D6. AUTHORITY TO CARRY ON BUSINESS

D6.1 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.

D7. INSURANCE

D7.1 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; such liability policy to also contain a cross-liability clause, non-owned automobile liability and products and completed operations cover, to remain in place at all times during the performance of the Work;
- (b) if required, 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), to remain in place at all times during the performance of the Work;

D7.2 Deductibles shall be borne by the Contractor.

D7.3 The Contractor shall provide the Contract Administrator 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 on the Site but in no event later than the date specified in GC.3.01 for the return of the executed Contract.

D7.4 The Contractor shall not cancel, materially alter, or cause the policy to lapse without providing at least fifteen (15) Calendar Days prior written notice to the Contract Administrator.

D8. MATERIAL SAFETY DATA SHEETS

D8.1 The Contractor shall provide the Contract Administrator with one (1) copy of Material Safety Data Sheets (MSDS's) for each product to be supplied under the Contract at least two (2) Business Days prior to the commencement of Work but in no event later than the date specified in GC.3.01 for the return of the executed Contract.

D8.2 Throughout the term of the Contract, the Contractor shall provide the Contract Administrator with revisions or updates of the MSDS's as soon as may be reasonably possible.

SCHEDULE OF WORK

D9. COMMENCEMENT

D9.1 The Contractor shall not commence any Work until he is in receipt of a notice of award from the City authorizing the commencement of the Work.

D9.2 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 D6;
 - (ii) evidence of the insurance specified in D7;
 - (iii) the Material Safety Data Sheets specified in D8;
- (b) the Contractor has attended a meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a meeting.

D9.3 The Contractor shall commence the Work within seven (7) Calendar Days of receipt of the notice of award.

D10. FORFEITURE OF CONTRACT

D10.1 Notwithstanding GC.8.02 (1) and GC.8.02 (3), the City shall have the full right and power to take the whole of the Work, or any part or parts thereof, out of the hands of the Contractor, without process or action at law, upon giving the Contractor written Notice.

D11. CRITICAL STAGES

D11.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

- (a) Gate Valves – June 2, 2008.
- (b) Butterfly Valves and Actuators (except 1050mm) – June 16, 2008.
- (c) 1050 mm Butterfly Valve and Actuator – October 31, 2008.

D12. SUBSTANTIAL PERFORMANCE

D12.1 The Contractor shall achieve Substantial Performance by October 31, 2008.

D12.2 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.

D12.3 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.

D13. TOTAL PERFORMANCE

D13.1 The Contractor shall achieve Total Performance by November 28, 2008.

D13.1.1 The Contractor shall only be considered to achieve Total Performance by the date indicated in D13.1 providing all valves have been successfully shop and field tested as indicated in E5.5.

D13.2 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.

D13.3 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.

D14. LIQUIDATED DAMAGES

- D14.1 If the Contractor fails to achieve critical stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:
- (a) Delivery of Gate Valves – five hundred dollars dollars (\$500.00);
 - (b) Delivery of Butterfly Valves – one thousand dollars dollars (\$1000.00);
 - (c) Substantial Performance - one thousand dollars dollars (\$1000.00);
 - (d) Total Performance – five hundred dollars dollars (\$500.00).
- D14.2 The amounts specified for liquidated damages in D14.1 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.
- D14.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

MEASUREMENT AND PAYMENT

D15. PAYMENT

- D15.1 Further to GC.9.03, effective January 1, 2007 the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.
- D15.2 Further to GC.9.01 and GC.9.03, payment shall be in Canadian funds net thirty (30) Calendar Days after receipt and testing and approval of the Contractor's invoice.

WARRANTY

D16. WARRANTY

- D16.1 Further to GC.10.01, if a defect or deficiency prevents the full and normal use or operation of the Work or any portion thereof, for purposes of calculating the warranty period, time shall be deemed to cease to elapse for the defective or deficient portion, and for any portion of the Work whose use or operation is prevented by such defect or deficiency, as of the date on which the defect or deficiency is observed or the use or operation is prevented and shall begin to run again when the defect or deficiency has been corrected or the Work may be used or operated to the satisfaction of the Contract Administrator.
- D16.2 Notwithstanding GC.10.01 and D16.1, if any law of Manitoba or of the jurisdiction in which the work was manufactured requires, or if the manufacturer provides, a longer warranty period or a warranty which is more extensive in its nature, then the provisions of such law or manufacture's warranty shall apply.

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B5.

E2. GOODS

- E2.1 The Contractor shall supply butterfly valves, gate valves, testing flanges and miscellaneous fittings in various sizes in accordance with the requirements hereinafter specified.
- E2.2 Butterfly valves shall be in accordance with the latest version of AWWA Standard C504, and as specified herein.
- E2.3 Manual actuators shall be in accordance with the latest version of AWWA Standard C504, and as specified herein.
- E2.4 Electric actuators shall be in accordance with the latest version of AWWA Standard C540 or as specified herein.
- E2.5 Gate vales shall be in accordance with the latest revision of AWWA C509.
- E2.6 Fittings shall be in accordance with the latest revision of AWWA C110/A21.
- E2.7 Shop testing of valves.
- E2.8 Inspection of installation in accordance with the requirements hereinafter specified.

E3. DELIVERY

- E3.1 Goods shall be delivered F.O.B., destination and freight prepaid to the Water Services Division Stores compound located at 552 Plinguet Street, Winnipeg, Manitoba.
- E3.2 Goods shall be delivered between 8:30 a.m. and 3:30 p.m. on Business Days. The successful bidder shall give forty-eight (48) hours notice to the Contract Administrator before delivery so that arrangements for receiving can be made.
- E3.3 The Contractor shall off-load goods and place into storage at the delivery location as directed by the Contract Administrator or representative.
- E3.4 The Contractor shall carefully prepare equipment for shipment as follows:
 - (a) Clearly tag and identify each item.
 - (b) Cover or plug openings in equipment.
 - (c) Securely crate or strap equipment to pallets and cover to prevent movement and damage during transport.
 - (d) Ensure corners or castings do not extend beyond crate or pallet.
 - (e) Provide suitable lifting hooks for handling crates, pallets and any other heavy pieces.

- E3.5 The Contract Administrator or a representative will inspect and record the condition of all equipment and material upon delivery and will reject equipment and material found to be damaged to the extent that it cannot be put into the use for which it was intended.
- E3.6 The Contractor shall take possession of rejected equipment and material, make the necessary arrangements and pay the costs for prompt repair and return or replacement of the equipment and material so as not delay date to be put into operation by the City and to the Contract Administrator's satisfaction.
- E3.7 The Contractor shall promptly repair superficially damaged equipment and material at his own expense and to the Contract Administrator's satisfaction so as not to delay date to be put into operation by the City.

E4. SHOP DRAWINGS

E4.1 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 show on all submissions for Engineering review.
- (b) Shop Drawings
- (i) Original drawings are to be prepared by the Contractor, Subcontractor, Supplier, Distributor, or Manufacturer, which illustrate appropriate portion of Work; showing fabrication, layout, setting or erection details as specified in appropriate sections.
- (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, initialed or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.
- (e) Other Considerations
- (i) Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.
 - (ii) Material and equipment delivered to the Site 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.

E4.2 Measurement and Payment

- E4.2.1 Further to D15.2, preparation and submittal of Shop Drawings will be included in the Contract Work and no additional payment will be made for such work.

E5. BUTTERFLY VALVES

E5.1 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).

E5.2 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
1050	1	Electric	250B	Control (Modulating)
600	5	Manual	150B	Isolation (Open/Close)
450	1	Manual	150B	Isolation (Open/Close)
400	4	Manual	150B	Isolation (Open/Close)

E5.3 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, except the 1050 mm diameter valve, shall be flanged and drilled to ANSI B16.1 standard for cast iron flanges, Class 125.
 - (ii) The ends of the 1050 mm diameter valve shall be flanged and drilled to ANSI B16.1 standard for cast iron flanges, Class 150.
- (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) 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.
- (m) Acceptable Products
- (i) DeZurik
 - (ii) K-Flo 47 Series
 - (iii) Mueller
 - (iv) Pratt
 - (v) Rodney Hunt
 - (vi) Val-Matic
 - (vii) Or Approved Equal

E5.4 Submittals

- (a) Shop Drawings
 - (i) Submit Shop Drawings in accordance to E4.
 - (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.

E5.5 Valve Testing and Acceptance

E5.5.1 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 E5.5.1(a)(i), provide all testing results to the Contract Administrator for review prior to shipping valves.

(b) Butterfly Valves

- (i) All valves shall be tested with mated actuators mounted and adjusted.
- (ii) All valves shall be tested with valves mounted in the vertical operating orientation.
- (iii) Each valve shall be subjected to hydrostatic tests under a pressure (1000 kPa for class 150B valves and 1724 kPa for Class 250B valves) by the manufacturer at their facilities prior to shipping. The tests shall be conducted in the following manner, in accordance with the latest revision of AWWA Standard C504.
 - ◆ A hydrostatic pressure of (1000 kPa for class 150B valves and 1724 kPa for Class 250B 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.

E5.5.2 Field Tests

(a) Butterfly Valves

- (i) The Contractor shall perform a hydrostatic leak test, in the presence of the Contract Administrator, on all valves once they arrive at the City warehouse.
- (ii) The Contractor will provide a suitable 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 and 1724 kPa for Class 250B 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.

E5.5.3 The Contractor shall ensure a qualified representative of the valve manufacturer is present for the testing of the valves to correct any deficiencies found.

E5.6 Measurement and Payment

E5.6.1 Further to D15.2, the Butterfly Valves and Actuators shall be for each size listed on Form B: Prices and shall include the Valve, Actuator, Testing, and Delivery as identified in E3. Payment will be made on the following schedule;

- (a) Seventy (70) percent upon delivery,
- (b) Twenty (20) percent upon satisfactory completion of all shop and field testing of valves,
- (c) Seven (7) percent upon successful installation and commissioning of all valves.
 - (i) The City shall consider all valves to be successfully installed and will pay the Contractor for such no later than two (2) Calendar years after the date set for Total Performance in D13.1.
- (d) Three (3) percent upon delivery and acceptance of Operation and Maintenance Manuals.

E6. VALVE ACTUATORS

E6.1 Description

- (a) This specification shall cover the design and manufacture of manual and electric 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 and electric 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.

E6.2 Submittals

- E6.2.1 Shop Drawings
- (a) Submit Shop Drawings in accordance to E4.
 - (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.
- E6.2.2 Testing
- (a) Provide all factory pressure test reports.
 - (i) Electric actuators shall be tested in accordance with the latest version of AWWA Standard C540.
 - (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
- E6.3 Manual Actuators
- E6.3.1 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.
- E6.3.2 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 seven and one half (7.5) 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.
- E6.3.3 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.

E6.3.4 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.

E6.3.5 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.

E6.3.6 Protective Coatings

- (a) All external ferrous components including adaptor and mounting plates, shall be painted and tested in accordance to Clause E5.3(l) Painting and Coating and Clause E5.5.1(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.

E6.3.7 Acceptable Manufacturers

- (a) Rotork,
- (b) Limitorque,
- (c) or approved equal as identified in B5.

E6.4 Electric Actuators

E6.4.1 General Design Requirements

- (a) The electric valve actuators shall be suitable for use with nominal 575 VAC, 3 phase 60 Hz power supply and shall consist of a drive motor, integral reversing starter, quarter turn drive gearing, terminal enclosure, handwheel and pushbutton control station with indicator lights.
- (b) Butterfly valves requiring electric actuators shall be identified as such in the items listed as same in Form B: Prices.

E6.4.2 Actuator Sizing

- (a) The electric actuator for the butterfly valve shall be sized to provide the torque required to close or open the valve for full bi-directional flow at a differential pressure equal to the AWWA numerical class designation of the valve. The maximum thrust output of the actuator shall not exceed the valve shaft torque capability as indicated in Table 4 of AWWA C504.

E6.4.3 Valve Closing Time

- (a) The actuator operating speed shall be sufficient to operate the valve from full-open to full-close or full-close to full-open as follows:
 - (i) 1050mm dia. five (5) minutes

E6.4.4 Ambient Temperature

- (a) The electric actuator shall be capable of functioning in an ambient temperature ranging from -30°C to +70°C.

E6.4.5 Motor

- (a) Motors shall be CSA Approved and of the totally-enclosed, reversing, squirrel cage induction type with Class B insulated windings and suitable for operation at 10% above and below normal 575 volt, 3 phase, 60 cycle power supply. Motor duty rating shall be sufficient for one complete operating cycle (open-close-open) without exceeding its temperature rating. Motor bearings shall be adequately proportioned, of the anti-friction type and permanently lubricated.
- (b) The motor shall be of a design that allows for electrical and mechanical disconnection without disturbing the gear case or valve position.
- (c) The actuator shall include circuitry to ensure the motor runs with the correct rotation for the required direction of operation with any phase sequence of the 3 phase power supply.

E6.4.6 Motor Protection

- (a) Protection shall be provided for the motor as follows:
 - (i) The motor shall be de-energized in the event of a stall when attempting to unseat a jammed valve,
 - (ii) Motor temperature shall be sensed by a thermostat to protect against overheating,
 - (iii) Single phasing protection,
 - (iv) Instantaneous reversal protection whereby an automatic time delay circuit limits the current surges when the actuator is signalled to instantaneously reverse direction

E6.4.7 Controller and Transformer

- (a) The reversing controller, control transformer and local controls shall be integral with the valve actuator, suitably housed to prevent breathing and condensation built-up. The controller shall be suitable for 60 starts per hour, and of rating appropriate to motor size. Solid state reversing controls may be used where feasible
- (b) The primary and secondary windings shall be protected by easily replaceable fuses.
- (c) The reversing motor controller shall consist of separate contactors for controlling valve movement in either the opening or closing direction. Each contactor shall be magnetic, full voltage across-the-line type, sized to suit the motor power rating, and shall provide low voltage and thermal overload protection by means of three bi-metallic or melting alloy elements which shall be correctly related to the motor nameplate full load current and temperature rise of the motor. The contactors shall be of robust construction with double break contacts, requiring a minimum of

maintenance and being easily replaceable; mechanical and electrical interlocks shall be provided.

E6.4.8 Gearing

- (a) The actuator gearing shall be totally encased in an oil or grease filled, sealed gear case complete with fill and drain taps, suitable for operation at any angle. All gearing shall be of hardened steel alloy and alloy bronze construction with machine cut teeth. Thrust bearings of the ball or roller type shall be provided at the base of the operator. The gear case shall be designed to be opened for inspection or repair without releasing the stem thrust or taking the valve out of service.

E6.4.9 Manual Operation

- (a) Motorized actuators shall be provided with a handwheel which shall not rotate during motor operation. The handwheel shall be made of cast iron or aluminum with the word "OPEN" and a directional arrow cast in relief on the rim. Spinners shall be provided on the hand wheels. The handwheel operation shall be accomplished by a padlockable declutch lever. The handwheel shall disengage automatically from the operating mechanism once the motor is capable of operation. The handwheel shall be located sufficiently away from the valve flanges, housings, etc. that personnel will not hit their knuckles on any of these obstructions when using the handwheel.
- (b) The handwheel shall be sized to allow one man operation with a maximum rim pull of 356 Newtons (80 ft. lbs.) at maximum torque conditions.
- (c) The direction of opening shall be counter clockwise.

E6.4.10 Drive Bushing

- (a) The operator shall be furnished with a drive bushing easily detachable for machining to suite the valve stem or gearbox input shaft. The drive bushing shall be positioned in the base of the operator to facilitate the valve stem extensions.

E6.4.11 Position Limit and Torque Limit Switches

- (a) Limit switches shall be provided and set to stop the motion of the valve when it reaches the fully open and fully closed position. In addition, torque limiting switches shall be provided for open and close position as well as to prevent damage to the operating mechanism in the case of torque overload. The torque switches shall be fitted with a mechanical interlock to prevent torque trip on valve opening. Provision shall be made for four extra limit switches, adjustable to any valve position.
- (b) Switch design shall permit visual verification of switch position without disassembly.
- (c) Switch contact rating on inductive circuits shall be 600VAC per NEMA standard ICS 2-125 heavy duty.
- (d) Torque protection reset shall not allow repeated starting in the same direction when control signal is maintained.
- (e) The manufacturer's representative shall field check the calibrations and settings of the limit and torque switches after installation, in the presence of the Contract Administrator or his representative.
- (f) Torque sensing must be affected purely electrically or electronically. Extrapolating torque from mechanically measured motor speed is not acceptable due to response time.
- (g) Latching to be provided for the torque sensing system to inhibit torque off during unseating or during starting in mid travel against high inertia loads.

E6.4.12 Position Indication

- (a) The actuator shall incorporate an illuminated, mechanical dial indicator and digital readout to show continuous movement from fully open to fully closed in one (1) percent increments. The digital display shall be maintained even when the power to the actuator is isolated.
- (b) The local display should be large enough to be viewed from a distance of 1.83 meters when the actuator is powered up.
- (c) Provision shall be made in the design for a contact-less transmitter to give a 4-20mA analog corresponding to valve travel for remote indication.

E6.4.13 Push Buttons and Selector Switches

- (a) Each actuator shall be complete with a local Open-Stop-Close push-button station with external Red-Open, Green-Closed indicating lights and a Local-Off-Remote selector switch padlockable in any one of the following positions:
 - (i) Local Control Only
 - (ii) Off (No Electrical Operation)
 - (iii) Remote Control plus Local Stop Only
- (b) It shall be possible to select maintained or non-maintained local control.
- (c) The local controls shall be arranged so that the direction of valve travel can be reversed without the necessity of stopping the actuator.

E6.4.14 Controls

- (a) The internal control and monitoring circuits shall operate at nominal 24V DC with interposing relays to energize the 120V AC contactor coil circuits (where employed). All necessary transformers shall be provided.
- (b) The necessary wiring and terminals shall be provided in the actuator for the following control functions:
 - (i) Additional geared limit switch closed when valve fully open,
 - (ii) Additional geared limit switch closed when valve fully closed.
- (c) Removable links for substitution by external interlocks to inhibit valve opening and/or closing.
- (d) Provision of 4 to 20ma R to I position transmitter suitable for any one or more of the following methods of control:
 - (i) Open, Close and Stop,
 - (ii) Open and Close,
 - (iii) Overriding Emergency Shut-down to Close (or Open) valve,
 - (iv) Two-wire control, energize to close (or open), energize to open (or close).
- (e) Selection of maintained or push-to-run control for modes a) and b) above shall be provided by links.
- (f) The internal circuits associated with the control and monitoring functions are to be designed to withstand simulated lightning impulses of up to 1kV.

E6.4.15 Monitoring Facilities

- (a) Facilities shall be provided for monitoring actuator operation and availability as follows:
 - (i) Motor (availability) relay, having one normally open contact, the relay being energized from the control transformer only when the Local/Off/Remote selector switch is in the Remote position to indicate that the actuator is available for remote (control room) operation.

- (ii) If required, it shall be possible to provide indication of thermostat trip and "Remote" selected as discreet signals.
- (iii) Provision shall be made for the addition of a diagnostic module which will store and enable download of historical actuator data and permit analysis of changes in actuator or valve performance.
- (iv) Diagnostic status screens must be provided to show multiple functions simultaneously.
- (v) Provide one (1) copy of the actuator diagnostic/programming software in a PC based version, including one (1) data communications cable for connection between the PC and the actuator.

E6.4.16 Wiring and Terminals

- (a) Internal wiring shall be of CSA approved insulated stranded cable of appropriate size for the control and 3-phase power. Each wire shall be clearly identified at each end.
- (b) The terminals shall be embedded in terminal block of high tracking-resistance compound.
- (c) The terminal compartment shall be separated from the inner electrical components of the actuator by means of a watertight 'O' ring seal.
- (d) The terminal compartment of the actuator shall be provided with a minimum of 2 threaded cable entries.
- (e) All wiring supplied as part of the actuator is to be contained within the main enclosure for physical and environmental protection. External conduit connections between components are not acceptable.
- (f) A durable terminal identification card showing plan of terminals shall be attached to the inside of the terminal box cover indicating:
 - (i) Serial number,
 - (ii) External voltage values,
 - (iii) Wiring diagram number,
 - (iv) Terminal Layout.
- (g) The identification card must be suitable to inscribe cable core identification alongside terminal numbers.

E6.4.17 Enclosure

- (a) Actuators shall be O-ring sealed, watertight to NEMA 6/IP68 as well as have an inner watertight and dustproof O-ring seal between the terminal compartment and the internal electrical elements of the actuator, fully protecting the switch mechanism, motor and all other internal electrical elements of the actuator from ingress of moisture and dust when the terminal cover is removed on site for cabling.
- (b) Actuators shall be provided with an internal motor and compartment heater.
- (c) All external fasteners should be stainless steel.

E6.4.18 Acceptable Products

- (a) Electric valve actuators shall be:
 - (i) Rotork Syncropak Control System;
 - (ii) Limitorque LY Series with Control Package,
 - (iii) or approved equal as identified in B5.

E6.4.19 Start-up Kit

- (a) Each actuator shall be supplied with a start-up kit comprising installation instruction, electrical wiring diagram and sufficient spare cover screws and seals to make good any site losses during the commissioning period.

E6.4.20 Testing

- (a) Each electric motorized actuator shall be performance tested by the manufacturer at their facilities prior to shipping. The test shall simulate a typical valve torque load from full-open to full-close and full-close to full-open. The following information shall be recorded:
 - (i) Maximum torque tested,
 - (ii) Current at maximum test torque,
 - (iii) Test voltage and frequency,
 - (iv) Flash test voltage,
 - (v) Actuator output speed and time for full-open to full-close,
 - (vi) Amperage draw on motors at breakaway and normal operation.
- (b) Copies of the test reports for the above Performance Tests signed by the official who is responsible for the actuator assembly and testing shall be forwarded to the Contract Administrator as soon as completed.
- (c) In addition, the test reports shall include details of specification such as gear ratios, closing direction, wiring code number, etc.

E6.5 Measurement and Payment

- E6.5.1 Further to D15.2, the manual and electric actuators, including delivery as identified in E3, shall be included in the price for "Supply and Delivery of AWWA C504 Butterfly Valves and Actuators" for each valve size shown in Form B: Prices.

E7. INSPECTION OF INSTALLATION OF BUTTERFLY VALVES AND ACTUATORS

E7.1 General

- (a) The butterfly valves and actuators will be installed by City forces at a later date (within 2 years) and the Contractor will be required to provide a qualified technical representative to:
 - (i) Be present at the field testing of valves and actuators.
 - (ii) Inspect each valve and actuator installation, provide any assistance necessary in setting up the actuators, instruct City personnel in the operation and maintenance of the actuators and provide a letter or certificate of satisfactory installation for each valve and actuator.
- E7.1.1 Unless otherwise specifically stated in the Specifications, the Contractor shall provide, and shall allow for in his Bid, a factory-trained representative who, in conjunction with the Contract Administrator, shall give instructions regarding the installation of the equipment.
 - E7.1.2 The Contractor's factory-trained representative shall visit the site, as required, to ensure that the installation work is being performed in a proper and workmanlike manner.
 - E7.1.3 The Contractor's representative shall be present to supervise the commissioning, initial operation and functional testing of the equipment.
 - (a) If the Contractor is requested by the Installation Contractor or the Contract Administrator to send a representative to the jobsite to investigate or rectify a suspected fault in the equipment furnished by the Contractor but it is found that the said equipment or Contractor is not at fault, the Contractor shall be entitled to be reimbursed for all reasonable costs and expenses incurred by him in sending his representative to the jobsite at the rate indicated in Form B: Prices.

- (b) Additional time required for testing, installation inspection and commissioning required as a result of deficient work or materials attributed to supply and delivery of the valves shall be borne by the Contractor

E7.2 Measurement and Payment

- E7.2.1 Further to D15.2, inspection of installation and commissioning of Butterfly Valves and Actuators shall be at the contract unit price for "Supply of Site Inspection and Commissioning Services" for each valve size shown in Form "B" Prices.
- E7.2.2 Payment shall be compensation in full for site time and expenses including, but not limited to, travel, food and lodging.
 - (a) If these items are not completed, it will be understood that no charges will apply.

E8. BUTTERFLY VALVE & ACTUATOR OPERATION & MAINTENANCE MANUALS INCLUDING SPARE PARTS LISTS

E8.1 General

- E8.1.1 For each size of butterfly valve and type of actuator equipment, five (5) sets of Operation and Maintenance Manuals shall be submitted to the Contract Administrator for review. The Contractor shall provide these manuals within thirty (30) Calendar Days of achieving substantial performance.
- E8.1.2 All instructions in these manuals shall be in the English language to guide the City in the proper operation and maintenance of the equipment.
- E8.1.3 Bind contents in a three-"D-Ring", hard-covered, plastic-jacketed binder with full cover and spine insert. Organize contents into applicable sections of work, parallel to Specifications breakdown.
- E8.1.4 Provide all required data in electronic format. Text documents shall be Microsoft Word or Adobe format. Drawings, scanned documents, parts lists, test forms shall be in Adobe format. If possible, documents shall be an original electronic format. Documents that require scanning shall be high quality scans and fully legible. Documents shall be submitted on a high quality compact disk. Compact disk and case shall be labeled in type, with the following:
 - (a) Bid opportunity number.
 - (b) Job Title.
 - (c) Description of Equipment.
- E8.1.5 In addition to information called for in the Specifications, the following shall be included:
 - (a) Title sheet, labelled "Butterfly Valve and Actuator Operation and Maintenance Instructions," containing project name and date.
 - (b) List of contents.
 - (c) Reviewed shop drawings of all equipment.
 - (d) Certified factory test results.
 - (e) Full description of entire mechanical system, operation, and control
 - (f) Names, addresses, and telephone numbers of all major sub-contractors and suppliers.
 - (g) Detailed specification and operating and maintenance instructions for all items of equipment provided including a preventative maintenance program.

- (h) An itemized list of spare parts recommended for five years of service, particularly those components failure of which will render the equipment supplied inoperative. Any special tools or other ancillary items necessary for commissioning and/or proper operation and maintenance shall also be listed.
- (i) Part books that illustrate and list all assemblies, sub-assemblies, and components.
- (j) Routine test procedures for all electronic and electrical circuits.
- (k) Troubleshooting chart covering the complete valve and controls/electrical power systems, showing description of trouble, probable cause, and suggested remedy.

E8.1.6 The Contractor shall modify and supplement the manual as required by the Contract Administrator. When accepted, five (5) additional copies, including electronic versions, shall be provided to the Contract Administrator by the Contractor for distribution purposes. The City's staff shall be in receipt of these manuals prior to the date set out for Total Performance. The Contract shall not be considered complete, for the purpose of issuing a Certificate of Total Performance, until the above manuals have been completed and submitted to the satisfaction of the Contract Administrator.

E8.2 Measurement and Payment

E8.2.1 Further to D15.2, the cost of the Operation and Maintenance Manuals shall be included in the price for "Supply and Delivery of AWWA C504 Butterfly Valves and Actuators" for each valve size listed in Form "B" Prices

E9. GATE VALVES

E9.1 Description

E9.1.1 Gate Valves shall be flanged unless otherwise indicated and come complete with gaskets, nuts, bolts and fasteners.

E9.1.2 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.

E9.2 Materials

E9.2.1 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.

E9.2.2 Gaskets

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

E9.2.3 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.

E9.3 Measurement and Payment

E9.3.1 Further to D15.2, the gate valves, including gaskets, nuts, bolts and fasteners shall be paid for at the contract unit price for each valve size listed in "Supply and Delivery AWWA C509 of Gate Valves" for each valve size shown in Form "B" Prices.

E10. FITTINGS

E10.1 Description

E10.1.1 This specification shall cover the design and manufacture of fittings, including removable flanges and couplings to be supplied under this contract.

E10.2 Materials

E10.2.1 Fittings

- (a) Ductile iron pipe: to AWWA C151, thickness Class 52.
- (b) Cast Iron fittings: to ANSI/AWWA C110/A21.10, 1.0 Mpa working pressure complete with integrally cast flanges.

E10.2.2 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.

E10.2.3 Gaskets

- (a) Rubber gaskets for adaptor/removable flanges shall conform to AWWA C111, Standard for Rubber-Gasket Joints for Cast Iron and Ductile-Iron pressure pipe and fittings.

E10.2.4 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.

E10.2.5 Testing Flanges

- (a) Contractor to supply and deliver Testing Flanges for performing field testing of butterfly valves as described in E5.5.2.
- (b) Testing Flanges shall be in accordance with AWWA Standard C207.

E10.2.6 Couplings

- (a) Couplings shall be Victaulic Style 44 or approved equal.
 - (i) Ductile iron conforming to ASTM – A536.
 - (ii) Hot dipped galvanized coating.
 - (iii) Gasket to be Buna-N or approved equal.
 - (iv) Bolts to be heat treated plated carbon steel conforming to ASTM A-183 or approved equal.

E10.3 Measurement and Payment

E10.3.1 Further to D15.2, the fittings, including all flanges, couplings, gaskets, nuts, bolts and fasteners shall be paid for at the contract unit price for each size and type listed under "Supply and Delivery of Fittings" as shown in Form "B" Prices.

