THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 854-2010

REHABILITATION OF BRIDGE AND REPLACEMENT OF THE MIDTOWN FEEDERMAIN AT THE ASSINIBOINE RIVER

AECOM Project No. D265-230-02

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 REHABILITATION OF BRIDGE AND REPLACEMENT OF THE MIDTOWN FEEDERMAIN AT THE ASSINIBOINE RIVER

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, June 9, 2011.

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 Contract Administrator or an authorized representative will be available at the Site from 09:00 to 11:00 on May 26, 2011, to provide Bidders access to the Site. Investigation will commence at the intersection of Aubrey Street and Palmerston Avenue.

B3.2 The Bidder is advised that Access to the Aubrey Flood Pumping Station will be made available at this time.

B3.3 The Bidder shall not be entitled to rely on any information or interpretation received at the Site investigation unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

B3.4 Available exiting drawings may be viewed at the office of the Contract Administrator. The accuracy of these drawings is not guaranteed and the Bidder must interpret based on site investigation.

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 Payments to Non-Resident Contractors are subject to 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 rehabilitation of the existing dedicated steel truss bridge crossing at the Assiniboine River, and replacement of 900 millimetre diameter insulated steel Mid Town Feedermain and associated work.

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

(a) Installation of scaffolding and containment systems on the existing bridge

(b) Removal and disposal of existing insulated steel pipeline, metal cladding, timber pipe saddles and miscellaneous fasteners and appurtenances

(c) Selective demolition on existing concrete piers and pipe supports

(d) Riverbank grading, stabilization and armouring

(e) Bridge structural strengthening

(f) Removal of existing bridge coatings

(g) Metalizing of bridge

(h) Rehabilitation of piers and pipe supports

(i) Installation of 900 millimetre pre-insulated steel Feedermain

(j) Installation of maintenance catwalks on bridge

(k) Installation of electrical heat tracing and controls

(l) Testing and disinfection of 900 millimetre steel Feedermain

(m) Reconnection of 900 millimetre steel Feedermain

(n) Site grading, landscaping, and restoration

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

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is AECOM Canada Ltd., represented by:

Marvin McDonald, C.E.T.
Project Manager
99 Commerce Drive, Winnipeg Manitoba

Telephone No. (204) 928-7422
Facsimile No. (204) 284-2040

D4.2 At the pre-construction meeting, Mr. McDonald 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 facsimile number:

The City of Winnipeg
Chief Financial Officer

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
Legal Services Department
Attn: Director of Legal Services
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 five million dollars ($5,000,000.00) covering bodily injury, property damage, personal and advertising injury, products and completed operations, City of Winnipeg as an additional insured, broad form completed operations, contractual liability, cross liability clause, loading or unloading, underground property damage, unlicensed motor vehicle liability, and non-owned automobile liability. Such commercial general liability insurance to remain in force at all times during the performance of the Work and throughout the warranty period.

(b) automobile liability insurance for owned automobiles used for or in connection with the Work in the amount of at least two million dollars ($2,000,000.00) at all times during the performance of the Work and until the date of Total Performance;

(c) a broad form builders risk policy in the amount of one hundred percent (100%) of the total Contract Price, written in the name of the Contractor and The City of Winnipeg, to remain in force during the performance of the Work and until the date of Total Performance.

(d) a contractor's pollution liability policy, in the amount of at least one million dollars ($1,000,000.00).

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. Any exclusion or limitation to these insurance policies which may work against the insurance coverage requested under this clause must be disclosed on the certificate of insurance.

D10.4 The Contractor shall not cancel, materially alter, or cause any 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 ten (10) 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) Commencement
(b) Site preparation and mobilization
(c) Installation of containment and scaffolding on bridge
(d) Mid Town Feedermain shutdown
(e) Removal of pipeline on Midtown Feedermain
(f) Bridge strengthening
(g) Off-bridge pipe replacement
(h) Riverbank re-grading and armouring
(i) Rehabilitation of piers and pipe supports
(j) Bridge coating preparation
(k) Bridge coating metalizing
(l) Installation of on-bridge pipe
(m) Pipe testing and disinfection
(n) Installation of maintenance catwalks on bridge

(o) Site grading landscaping, and restoration

(p) Maintenance of Plant Materials

(q) Critical Stage – Restore Midtown Feedermain to Service

(r) Substantial Performance

(s) 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.

D15. SECURITY CLEARANCE

D15.1 Each individual proposed to perform the following portions of the Work:

(a) any Work on private property;

(b) any Work within City facilities other than:

(i) an underground structure such as a manhole;

(ii) in areas and at times normally open to the public;

(c) communicating with residents and homeowners in person or by telephone;

shall be required to obtain a Criminal Record Search Certificate from the police service having jurisdiction at his place of residence.

D15.2 Prior to the commencement of any Work specified in D15.1, and during the term of the Contract if additional or replacement individuals are proposed to perform Work, the Contractor shall supply the Contract Administrator with a Criminal Record Search Certificate obtained not earlier than one (1) year prior to the Submission Deadline, or a certified true copy thereof, for each individual proposed to perform such Work.

D15.3 Any individual for whom a Criminal Record Search Certificate is not provided, or for whom a Criminal Record Search Certificate indicates any convictions or pending charges related to property offences or crimes against another person, will not be permitted to perform any Work specified in D15.1.

D15.4 Any Criminal Record Search Certificate obtained thereby will be deemed valid for the duration of the Contract subject to a repeated records search as hereinafter specified.

D15.5 Notwithstanding the foregoing, at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated criminal records search. Any individual who fails to provide a satisfactory Criminal Record Search Certificate as a result of a repeated criminal records search will not be permitted to continue to perform any Work specified in D15.1.

SCHEDULE OF WORK

D16. COMMENCEMENT

D16.1 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.

D16.2 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

(ix) the security clearances specified in D15.

(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.

D16.2.1 Further to D16.2(a)(ix), subject to all other requirements being met, the Contractor may commence Work on portions of the Works not requiring access to City of Winnipeg buildings, work on private property or interface with the public, prior to submitting the security clearances.

D16.3 The Contractor shall commence the Work on the Site no later than October 1, 2011.

D16.4 The City intends to award this Contract by July 8, 2011.

D16.4.1 If the actual date of award is later than the intended date, the dates specified for Commencement, Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D17. SCHEDULE RESTRICTIONS

D17.1 Feedermain Shutdowns

(a) Feedermain shutdown periods are scheduled based on a number of factors including routine maintenance and repair work along the Aqueduct, water demand, weather, reservoir operation and other factors. The City shall endeavour to make the specified time periods available to the Contractor to schedule his work requiring removal of the Feedermain from service, without limiting the City's control over the operation of the Feedermain to complete other work, maintain adequate water supply and storage of water and maintain the integrity of the infrastructure. The City shall reserve the right to cancel and/or delay these schedule dates at any time, due to any circumstances that could adversely affect the Feedermain or water supply, including but not limited to high water demand, abnormal weather, failures of related water system components and/or security concerns.

(b) The Bidder shall note that portions of the Work involving removal and replacement of the Midtown Feedermain can only be carried out during the time periods between October 1, 2011 and May 1, 2012, unless amended as specified in D17.1(a). The Contractor shall note the following restrictions applicable during this period:

(i) The Feedermain will not be taken out of service unless all delivery schedules for all Feedermain components, installation hardware and materials are confirmed in writing to the Contract Administrator,

(c) The Contractor shall provide a minimum of ten (10) Working Days notice to the Contract Administrator, in writing, of requiring a Feedermain shutdown. The City will endeavour to schedule the shutdown as requested, pursuant to D17.1(a).

D18. CRITICAL STAGES

D18.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) Midtown Feedermain Service Restored – May 1, 2012

D19. SUBSTANTIAL PERFORMANCE

D19.1 The Contractor shall achieve Substantial Performance by June 15, 2012.

D19.2 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.

D19.3 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.

D20. TOTAL PERFORMANCE

D20.1 The Contractor shall achieve Total Performance by June 30, 2012.

D20.2 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.

D20.3 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.

D21. LIQUIDATED DAMAGES

D21.1 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) Midtown Feedermain Service Restored– one thousand five hundred dollars ($1,500.00);

(b) Substantial Performance - one thousand five hundred dollars ($1,000.00);

(c) Total Performance - five hundred dollars ($500.00)

D21.2 The amounts specified for liquidated damages in D21.1 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.

D21.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D22. SCHEDULED MAINTENANCE

D22.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Maintenance of Plant Material as specified in E23;

(b) 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

D23. JOB MEETINGS

D23.1 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.

D23.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

D24. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D24.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

MEASUREMENT AND PAYMENT

D25. PAYMENT

D25.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D26. WARRANTY

D26.1 Warranty is as stated in C13.

FORM H1: PERFORMANCE BOND
(See 0)

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. 854-2010

REHABILITATION OF BRIDGE AND REPLACEMENT OF THE MIDTOWN FEEDERMAIN AT THE ASSINIBOINE RIVER

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 0)

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 854-2010

REHABILITATION OF BRIDGE AND REPLACEMENT OF THE MIDTOWN FEEDERMAIN AT THE ASSINIBOINE RIVER

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 J: SUBCONTRACTOR LIST
(See D12)

REHABILITATION OF BRIDGE AND REPLACEMENT OF THE MIDTOWN FEEDERMAIN AT THE ASSINIBOINE RIVER

Name	Address

FORM K: EQUIPMENT
(See D13)

REHABILITATION OF BRIDGE AND REPLACEMENT OF THE MIDTOWN FEEDERMAIN AT THE ASSINIBOINE RIVER

1. Category/type:

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

2. Category/type:

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

3. Category/type:

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

FORM K: EQUIPMENT
(See D13)

REHABILITATION OF BRIDGE AND REPLACEMENT OF THE MIDTOWN FEEDERMAIN AT THE ASSINIBOINE RIVER

4. Category/type:

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

5. Category/type:

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

6. Category/type:

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

Make/Model/Year: _____ Serial No.: _____

Registered owner: _____

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:

Drawing No.	Drawing Name/Title
D-12227	Cover Sheet and List of Project Drawings
D-12228	Civil – Site Access & Removals
D-12229	Civil – Pipe Plan and Profiles
D-12230	Civil – Pipe Sections and Details
D-12231	Civil – Pipe Sections and Details
D-12232	Structural – Scope of Work
D-12233	Structural – Layout of Bridge Strengthening and Modifications
D-12234	Structural – Details 1
D-12235	Structural – Details 2
D-12236	Structural – Concrete Pier SU2 & SU3 Work
D-12237	Structural – Concrete Pier SU1 & SU4 Work
D-12238	Electrical – Site Plan & Building Plan
D-12239	Electrical – Control Schematic, Panel Schedule & Details
D-12240	Geotechnical – Profile & Test Hole Location Plan
D-12241	Geotechnical – Erosion Protection Plan & Cross-Sections
D-12242	Landscape – Revegetation Plan
D-12243	Landscape – Revegetation Plan 2
D-12427	Landscape – Fencing and Miscellaneous Details

E2. SOILS INVESTIGATION REPORT

E2.1 Further to C3.1, the Test Hole Logs provided on the Drawings, are provided to supplement the Bidder's evaluation of the Site conditions within the work areas. The information is considered accurate at the locations indicated and at the time of the investigation. However, variations in soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally.

E2.2 Any test holes or test pits made by the bidder shall be done in accordance with the requirements of the Water and Waste Department. Bidders shall notify the Contract Administrator prior to proceeding with any subsurface investigations.

GENERAL REQUIREMENTS

E3. OFFICE FACILITIES

E3.1 The Contractor shall supply office facilities meeting the following requirements:

(a) The field office shall be conveniently located near the Site of the Work.

(b) The building shall have a minimum floor area of 20 square metres, with window area of 3 square metres and a door entrance with suitable lock satisfactory to the Contract Administrator.

(c) The building shall be suitable for all-weather use. It shall be capable of maintaining a temperature range between 16^{o}C and 25^{o}C.

(d) The building shall be supplied with adequate lighting and 120 Volt power supply.

(e) The building shall be furnished with one desk, one meeting table, one drafting table, one filing cabinet and six chairs, all satisfactory to the Contract Administrator.

(f) A separate toilet with door lock shall be supplied for the Contract Administrator.

(g) The field office shall be cleaned weekly immediately prior to the Job Site Meetings to the satisfaction of the Contract Administrator.

(h) The provision of the field office with the aforementioned furnishings and equipment shall also include maintenance and removal of the field office, operating costs and any service installation costs.

E4. PROTECTION OF INSTRUMENTATION

E4.1 The Contractor is advised that instrumentation (slope inclinometers and piezometers) have been installed in test holes PN-08-01, SI-08-02, PN-08-02 SP-08-02 SI-08-03 and SP-08-03 at the locations shown on Drawing D-12240.

E4.2 The Contractor shall take necessary precautions to prevent damage to instrumentation as a result of his/her Work. In addition, the Contractor shall take necessary precautions to prevent damage as a result of his/her Work to any new instrumentation that is installed.

E4.3 The Contractor shall repair or replace instrumentation damaged as a result of his/her Work at no cost to the City.

E5. VERIFICATION OF WEIGHTS

E5.1 All Material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.

E5.2 All weight tickets shall have the gross weight and the time and date of weighing printed by an approved electro/mechanical printer coupled to the scale.

E5.3 The tare weight and net weight may either be hand written or machine printed. All weights, scales and procedures shall be subject to inspection and verification by the Contract Administrator. Such inspection and verification may include, but shall not be limited to:

(a) Checking the Contractors or suppliers scales for Consumer & Corporate Affairs certification seals;

(b) Observing weighing procedures;

(c) Random checking of either gross or tare weight by having truck or truck trailer combinations weighed at the nearest available certified scale;

(d) Checking tare weights shown on delivery tickets against current tare.

E6. SITE SECURITY AND SAFETY

E6.1 Security

E6.1.1 The Contractor shall be responsible for site security and safety, as stated below:

(a) Provide 24 hour site security personnel during all periods when the live feedermains are exposed and contractor staff is not present on site.

(b) Report all site trespassing or suspicious activity immediately to McPhillips Control Centre at 986-4781.

(c) Refrain from providing statements with respect to water supply, site security or emergency situations to the media. All media inquiries in this regard shall be directed to the City of Winnipeg Customer Services.

(d) Provide secure temporary site storage compound for all specialized components such as valves, pipe and supplies, from the time they are delivered to the Site until they are incorporated into the Works. Compound shall consist of a minimum 1.8 metre chain link fence with lockable access gate. Permitted locations for on-site storage compounds shall be as generally located on the drawings.

(e) All access scaffolding shall be secured with lockable access to prohibit unauthorized site access

E6.2 Safety

E6.2.1 Be fully responsible for all aspects of site and public safety, in compliance with D24.

E6.2.2 Arrange for all required safety watches in the vicinity of buried and overhead hydro utilities, and pay all required safety watch fees.

E6.2.3 Install Contractor's locks on City installed lock-out devices, on feedermain valves at the following locations:

(a) Waverley at Academy

(b) Aubrey at Portage

E6.2.4 The City of Winnipeg will provide access to valve locations. The Contractor shall name a primary contact and backup personnel, available on a 24 hour per day basis, with access to lockout keys, in the event of an emergency.

E7. CONDITION, PROTECTION OF AND ACCESS TO THE AQUEDUCT

E7.1 Condition of the Feedermains

E7.1.1 The Midtown Feedermain, south of the approximate top of the river bank on the south side, and immediately south of Palmerston on the north side of the Assiniboine River, is a prestressed concrete cylinder pipe, constructed in approximately 1957. Prestressed pipe has limited ability to withstand additional dead (soil) or live (vehicle and equipment) loading. The remaining pipeline crossing the River is steel pipe with little to no earth cover. The pipeline repair work on the Aqueduct or working in the vicinity of it shall ensure that:

(a) Equipment shall only be permitted to cross the Aqueducts at existing roadways and designated locations. Site access roads shall be constructed a minimum of 3 meters away from the centre of the Feedermain.

(b) Granular material, construction material, soil or other material shall not be stockpiled on the Aqueduct or within 5 metres of the Aqueduct centerline.

(c) Construction practices shall not subject the Aqueduct to asymmetrical loading at any time.

(d) Construction practices or procedures at or near the Aqueduct shall not impart excessive vibration loads on the Aqueduct and/or cause settlement of the subgrade below the Aqueduct.

(e) Asymmetrical water pressures shall not be permitted to build up on one side of the Aqueduct.

(f) Further to CW 2030-R6, only smooth edged excavation buckets, soft excavation or hand excavation shall be used for excavation adjacent to and over the Aqueduct.

(g) Install watertight bulkheads at all locations where the Aqueducts are exposed, or pipe is removed.

E7.1.2 It is the Contractors' responsibility to ensure that all work crew members understand and observe the requirements of E7.1. Prior to commencement of on-site work, the Contractor's superintendent, foreman and heavy equipment operators shall attend an orientation meeting that will outline restrictions for working on and around the Aqueduct. Failure to comply with these restrictions will be grounds for removing the offending personnel from the Site.

E7.2 Protection Of Bridge Piers and Feedermains

(a) The Contractor shall take necessary precautions to prevent damage to the bridge piers and Feedermain Pipe during grading and armouring.

(b) The Contractor shall be responsible for costs and repairs of damage to the bridge piers and feedermain pipe as a result of his/her work.

E8. ENVIRONMENTAL PROTECTION

E8.1 The Contractor shall be aware that the Midtown feedermain is for potable water supply and no contamination by fuel, chemicals, etc. shall be permitted at any time. Fuels or chemicals shall not be stored within 30 metres of the Feedermain or of rivers.

E8.2 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the environmental protection measures as herein specified.

E8.3 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

E8.3.1 Federal

(a) Canadian Environmental Protection Act (CEPA) c.16

(b) Transportation of Dangerous Goods Act and Regulations c.34

(c) Fisheries Act

E8.3.2 Provincial

(a) The Dangerous Goods Handling and Transportation Act D12

(b) The Endangered Species Act E111

(c) The Environment Act c.E125

(d) The Fire Prevention Act F80

(e) The Manitoba Nuisance Act N120

(f) The Public Health Act c.P210

(g) The Workplace Safety and Health Act W120

(h) And current applicable associated regulations.

E8.4 The Contractor is advised that the following environmental protection measures apply to the Work.

E8.4.1 Materials Handling and Storage

(a) Construction materials shall not be stored within five (5) metres of the Aqueduct centerline.

E8.4.2 Fuel Handling and Storage

(a) The Contractor shall abide by the requirements of Manitoba Environment for handling and storage of fuel products.

(b) All fuel handling and storage facilities shall comply with The Dangerous Goods and Transportation Act Storage and Handling of Petroleum Products Regulation and any local land use permits.

(c) Fuels, lubricants, and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act shall be stored and handled within the approved storage areas.

(d) The Contractor shall ensure that all fuel storage containers are inspected daily for leaks and spillage.

(e) Products transferred from the fuel storage area(s) to specific work sites shall not exceed the daily usage requirement.

(f) When servicing requires the drainage or pumping of fuels, lubricating oils or other fluids from equipment, a groundsheet of suitable material (such as HDPE) and size shall be spread on the ground to catch the fluid in the event of a leak or spill.

(g) Refuelling of mobile equipment and vehicles shall take place at least 100 metres from a water course.

(h) The area around storage sites and fuel lines shall be distinctly marked and kept clear of snow and debris to allow for routine inspection and leak detection.

(i) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on-site. The Contractor shall ensure that additional material can be made available on short notice.

E8.4.3 Waste Handling and Disposal

(a) The construction area shall be kept clean and orderly at all times during and at completion of construction.

(b) At no time during construction shall personal or construction waste be permitted to accumulate for more than one day at any location on the construction site, other than at a dedicated storage area as may be approved by the Contract Administrator.

(c) Indiscriminate dumping, littering, or abandonment shall not take place.

(d) No on-site burning of waste is permitted.

(e) Equipment shall not be cleaned near watercourses; contaminated water from onshore cleaning operations shall not be permitted to enter watercourses.

E8.4.4 Dangerous Goods/Hazardous Waste Handling and Disposal

(a) Dangerous goods/hazardous waste are identified by, and shall be handled according to, The Dangerous Goods Handling and Transportation Act and Regulations.

(b) The Contractor shall be familiar with The Dangerous Goods Handling and Transportation Act and Regulations.

E8.4.5 Emergency Spill Response

(a) The Contractor shall ensure that due care and caution is taken to prevent spills.

(b) The Contractor shall report all major spills of petroleum products or other hazardous substances with the potential for impacting the environment and threat to human health and safety to the Contract Administrator and Manitoba Environment, immediately after occurrence of the environmental accident, by calling the 24-hour emergency telephone phone number (204) 945-4888.

(c) The Contractor shall designate a qualified supervisor as the on-site emergency response coordinator for the project. The emergency response coordinator shall have the authority to redirect manpower in order to respond in the event of a spill.

(d) The following actions shall be taken by the person in charge of the spilled material or the first person(s) arriving at the scene of a hazardous material accident or the on-site emergency response coordinator:

(i) Notify emergency-response coordinator of the accident:

- identify exact location and time of accident
- indicate injuries, if any

- request assistance as required by magnitude of accident (Manitoba Environment 24-hour Spill Response Line (204) 945-4888, Police, Fire Department, Ambulance, company backup)

(ii) Assess situation and gather information on the status of the situation, noting:
- personnel on site
- cause and effect of spill
- estimated extent of damage
- amount and type of material involved
- proximity to waterways and the Aqueduct

(iii) If safe to do so, try to stop the dispersion or flow of spill material:
- approach from upwind
- stop or reduce leak if safe to do so
- dike spill material with dry, inert sorbent material or dry clay soil or sand
- prevent spill material from entering waterways and utilities by diking
- prevent spill material from entering Aqueduct manholes and other openings by covering with rubber spill mats or diking

(iv) Resume any effective action to contain, clean up, or stop the flow of the spilled product.

(e) The emergency response coordinator shall ensure that all environmental accidents involving contaminants shall be documented and reported to the Manitoba Environment according to The Dangerous Goods Handling and Transportation Act Environmental Accident Report Regulation 439/87.

E8.4.6 Controlled Products

(a) Materials classified as “Controlled Products” under Regulation 52/88, “Workplace Hazardous Materials Information System”, including amendments, are prohibited inside the Aqueduct, unless the material will be directly employed in the Work.

(b) Notwithstanding the aforementioned requirement, materials have been tested by an ANSI accredited laboratory and meet the requirements of ANSI/NSF 60, “Standard for Drinking Water Treatment and Chemicals – Health Effects”, and ANSI/NSF 61, “Standard for Drinking Water System Components – Health Effects”, as specified in the Specifications, shall be permitted inside the Aqueduct.

E8.4.7 Department of Fisheries and Oceans Operational Statements

(a) Works being completed on this project are subject to Federal Department of Fisheries and Oceans Operational statements, attached in Appendix A, and noted below;

(i) Os_eo04_e – Bridge Maintenance

(ii) Os_eo07_e – Culvert Maintenance

(iii) Os_eo12_e – Maintenance of Riparian Vegetation in Existing Right-of-Ways

(b) The contractor shall fully comply with all applicable guidelines laid out in these Operational Statements

E9. CONSTRUCTION SEQUENCING AND AQUEDUCT OPERATION

E9.1 Description

E9.1.1 This specification shall generally outline construction sequencing, Feedermain operations, Feedermain shutdown and regional water supply criteria.

E9.2 Pipeline tie-in Location Verification

(a) Immediately upon award of Contract, the Contractor shall arrange for, excavate and expose existing pipelines at proposed re-connection points, as indicated on the Drawings, to confirm the locations, alignment, elevations and configuration of the existing pipes. The exact details and location of existing bell and spigot joints of the existing connection points to PCCP pipe are not available. All work shall be performed in accordance to E7.

(b) The Contract Administrator will locate pipelines in reference to project coordinates, and provide adjustment to proposed pipeline alignments, lengths and / or bend angles to accommodate deviations from design coordinates.

(c) The Contractor shall report any alignment revisions to his suppliers and subcontractors, for incorporation into project layout drawings and pipe laying schedules.

(d) The Contractor shall satisfy himself that design revisions and pipe laying schedule revisions are consistent with field verified conditions.

(e) Where required, the Contractor shall provide temporary pavement restorations over excavations and maintain until permanent pipeline tie-ins are completed, and permanent pavement restoration completed. Temporary pavement restoration shall consist of hard wearing surface of a minimum of 50 millimetres of asphaltic concrete, sacrificial Portland cement concrete, or other surface as approved by the Contract Administrator.

E9.3 General Construction Sequencing for Feedermain Construction

E9.3.1 Without limiting the Contractor's ability to plan, stage and execute the Works, the following general construction sequences and events shall be planned and incorporated in the project schedule:

(a) Site Preparation
  (i) Develop site access roads and laydown areas
  (ii) Remove existing vegetation to limits shown on the Drawings
  (iii) Install erosion control devices
  (iv) Install bridge scaffolding and containment

(b) Demolition and Removals
  (i) Expose existing Feedermain tie in points remove existing pipe and install watertight bulkheads at tie-in points
  (ii) Remove feedermain from bridge and embankments
  (iii) Demolish portions of bridge and shore piers as indicated on the drawings

(c) Bridge Strengthening and Coating
  (i) Prepare for and remove existing coatings from bridge
  (ii) Metalize bridge components as specified and on the drawings
  (iii) Strengthen and replace bridge members as indicated on the drawings

(d) Replacement of Feedermain
  (i) Pour concrete pipe saddles
  (ii) Install new pre-insulated feedermain on bridge
  (iii) Install temporary test bulkheads at reconnection points
  (iv) Pressure test and disinfect pipelines
  (v) Complete pipe tie-ins

(e) Site Restoration and Cleanup
  (i) Complete all lower bank regrading and armouring prior to spring freshet
  (ii) Remove all temporary erosion protection devices (silts fences and silt screens) prior to spring freshet
  (iii) Complete site re-vegetation
  (iv) Demobilize from site.

E10. SITE EXCAVATION AND GRADING

E10.1 Description

E10.1.1 This Specification covers grading works and shall amend and supplement Standard Specification CW 3170-R3.

E10.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified

E10.2 Construction Methods

E10.2.1 Excavation and grading shall be to the elevations and grades as shown on the Drawings.

E10.2.2 Excavation and grading shall include the removal and disposal of snow, deleterious materials and debris from work area.

E10.2.3 The Contractor shall remove and dispose of any existing rip rap or other erosion protection at the discretion of the Contract Administrator. If the existing rip-rap meets the physical requirements specified in Section E12.1, it may be re-used as erosion protection at the discretion of the Contract Administrator.

E10.2.4 Excavated material, as approved by the Contract Administrator, may be used for grading purposes excluding deleterious material such as snow, frozen soil, roots, tree trunks, and rubble. Fills shall be compacted to a minimum of 95 percent of the Standard Proctor Maximum Dry Density as determined by ASTM D698.

E10.3 Measurement and Payment

E10.3.1 Excavation and grading will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres (c.m.) excavated below original ground surface, in accordance with this specification as computed from measurements verified by the Contract Administrator. No separate measurement or payment shall be made for fill placed above original ground to achieve design grades. Payment shall be at the Contract Unit Price for “Excavation and Grading”

E11. GEOTEXTILE

E11.1 Description

E11.1.1 This Specification covers the supply and installation of the geotextile fabric and shall amend and supplement Standard Specification CW 3130-R2. Sub clauses 2.1 to 2.4, 3.5 to 3.10 and 4.3 apply

E11.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E11.2 Materials

E11.2.1 The geotextile shall be a non-woven geotextile fabric, meeting or exceeding the following properties:

NON-WOVEN GEOTEXTILE PROPERTIES			
	ASTM Test Method	**Units**	**Minimum Average Roll Values**
PHYSICAL			
Grab Tensile Strength	D-4632	N	890
Grab Tensile Elongation	D-4632	%	50
Mullen Burst	D-3786	kPa	2750
Puncture	D-4833	N	575
Trapezoidal Tear	D-4533	N	355
UV Resistance	D-4355	% @ hrs[1]	70/500
HYDRAULIC			
Apparent Opening Size	D-4751	mm	0.150
Permittivity	D-4491	sec^{-1}	1.4
Flow Rate	D-4491	$L/sec/m^2$	54

[1] Percent grab tensile strength retained per hours of UV exposure following conditioning in accordance with ASTM D-4355.

E11.3 Construction Methods

E11.3.1 Geotextile fabric shall be installed beneath the rip-rap as shown on the Drawings.

E11.3.2 Installation, handling and storage of geotextile fabric shall conform to the manufacturer's recommendations.

E11.3.3 If more than one piece of fabric is used to cover the ground surface the joints shall be overlapped by 0.6 m, in a shingle pattern, with the up-slope pieces overlapping the down-slope pieces and the up-stream pieces overlapping the down-stream pieces.

E11.3.4 Tears or other damage in the geotextile fabric shall be repaired with a piece of geotextile fabric placed over the damaged area and extending 1.0 m in all directions beyond the damaged area. Damaged or torn geotextile shall be replaced or repaired at the Contractors expense.

E11.4 Measurement and Payment

E11.4.1 Geotextile fabric will be measured on an area basis. The area to be paid for shall be the total number of square metres of geotextile fabric installed in accordance with this Specification as computed from measurements verified by the Contract Administrator. Payment shall be at the Contract Unit Price for “Supply and Placement of Geotextile”.

E12. RIP-RAP

E12.1 Description

E12.1.1 This Specification covers all operations necessary for placing rip-rap, as erosion protection, along the river banks and around the piers and the existing outfall at the north riverbank, as shown on the drawings or determined by the Contract Administrator. This Specification amends and supplements Standard Specification CW 3615.

E12.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E12.2 Materials

E12.2.1 Rip-rap shall be manufactured from hard, durable limestone or dolomite that is resistant to the action of water and frost and suitable in all respects for the purpose intended. The rock shall meet the following physical requirements:

(a) Class 350, well graded having a full range of and even distribution of sizes.

(b) minimum bulk specific gravity of 2.6 (ASTM C127),

(c) maximum Los Angeles abrasion loss of 35% (ASTM C131),

(d) maximum soundness loss of 18% (ASTM C88),

(e) maximum absorption of 2.5% (ASTM C127),

(f) maximum moisture content of 3 percent by weight (ASTM D2216-98),

E12.2.2 Large Stone Riprap manufactured from hard, durable limestone or dolomite that is resistant to the action of water and frost and suitable in all respects for the purpose intended. The rock shall meet the following physical requirements:

(a) Maximum size stone 450 mm to 600 in largest dimension, suitable for placement to provide uniform base coverage. Stone shall be site infilled with Class 350 riprap to provide complete ground coverage.

(b) Physical Properties as per E12.2.1 (b) through (f)

E12.2.3 Acceptance of Material

(a) The Contractor shall supply a representative sample of 1 tonne of rip-rap delivered to the AECOM office (99 Commerce Drive), or provide access to the quarry manufacturing the rip-rap at least ten (10) Business Days prior to the commencement of the Construction.

(b) The Contractor shall submit the proposed supplier and location of the rock and confirm that sufficient quantity of specified rock is available at least (10) Business Days prior to the commencement of the Construction

(c) The Contract Administrator shall perform the necessary tests to determine compliance with the specified properties.

E12.3 Construction Methods

E12.3.1 Rip-rap shall be installed to the elevations, grades, thickness and dimensions as shown on the Drawings, or as directed by the Contract Administrator.

E12.3.2 Rip-rap shall be placed in a manner that prevents damage to the geotextile.

E12.3.3 Rip-rap shall be placed in a manner such that larger pieces are uniformly distributed, smaller rocks fill the spaces between the larger rocks, and that excessive segregation of the various rock sizes does not occur.

E12.3.4 For Large Stone Riprap, carefully place large pieces on geotextile to provide general single layer uniform ground coverage. Infill large pieces with select Class 350 riprap to provide complete ground coverage

E12.4 Measurement and Payment

E12.4.1 Supply and installation of rip-rap will be measured and paid for on a weight basis. The weight to be paid for shall be the total number of Tonnes of riprap delivered and placed in accordance with this Specification and as accepted by the Contract Administrator. Payment shall be at the Contract Unit Price “Supply and Placement of Rip-rap”.

E13. STRUCTURAL STEEL

E13.1 Description

E13.1.1 This Specification shall cover the supply, fabrication, transportation, handling and erection of structural steel and all incidental structural steel elements, components and fasteners, as specified herein.

E13.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all

things necessary for and incidental to the satisfactory performance and completion of all Work as herein specified and as indicated on the Drawings.

E13.2 Materials

E13.2.1 General

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

(b) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E13.2.2 Structural Steel

(a) All structural steel and incidental structural steel elements shall conform to the requirements of CSA Standard CAN/CSA - G40.21-04, Grade 350W.

(b) Plate steel from coils will not be permitted.

(c) Edges of all plates shall be subject to visual inspection, and any plates found to include laminations shall not be used on the Work.

E13.2.3 Hot-Dip Galvanizing

(a) All steel items supplied under this Specification shall be hot-dip galvanized in accordance with CSA Standard G164-M92 to a retention of 610 gm/m^2 after fabrication unless specified otherwise.

E13.2.4 Galvanizing Touch-up

(a) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing on-site and to galvanize field welds, shall be done with Zinga or Zinc metalizing as specified in E14.

E13.2.5 Welding Consumables

(a) Welding consumables for all processes shall be certified by the manufacturer as complying with the requirements of CSA Standard W59-03 and the following specifications:

(i) Manual, Shielded Metal Arc Welding (SMAW):

(ii) All electrodes for manual, shielded metal arc welding shall conform to CSA W48.1-M1991, CSA W48.3-93 classification E480XX or imperial equivalent.

(iii) Gas, Metal Arc Welding (GMAW):

(iv) All electrodes used in the gas, metal arc-welding process shall be composite electrodes conforming to CSA W48.4-95 classification ER480S-X or imperial equivalent.

(v) Shielding gas shall be welding grade carbon-dioxide with a guaranteed dew point of -46°C.

(vi) Submerged Arc Welding (SAW):

(vii) Welding electrodes and fluxes used in the submerged arc welding process shall conform to CSA W48.6-1996 classification F480X-EXXX or imperial equivalent.

(viii) All electrodes, wires and fluxes used shall be of a classification requiring a minimum impact of 27 joules at -30°C as outlined in the various codes mentioned above.

(b) The proposed welding procedures and welding consumable certificates shall be submitted to the Contract Administrator for his review at least twenty-one (21) Calendar Days prior to the scheduled commencement of any fabrication.

(c) In multiple pass welds, the weld may be deposited such that at least two layers on all surfaces and edges are deposited with one of the filler metals listed above for each

particular welding process, provided the underlying layers are deposited with one of the filler metals specified in CSA Standard W59.

E13.2.6 High-Strength Bolts, Nuts and Washers

(a) All permanent high-strength bolts shall be hot-dipped galvanized and shall conform to the requirements of ASTM Specification A325, Type 1. Nuts shall be hot-dipped galvanized and conform to the requirements of ASTM Specification A563, Grade DH. Washers shall be hot-dipped galvanized and conform to the requirements of ASTM Specification F436, Type 1.

E13.3 Equipment

E13.3.1 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E13.4 Construction Methods

E13.4.1 Scope of Work

(a) It is intended that this Specification covers the following structural steel Works including all components and related fasteners:
  (i) Strengthen specified verticals on trusses
  (ii) Strengthen all floor beams
  (iii) Strengthen specified bottom chord diagonal laterals
  (iv) Walkways on bridge and access ladder to walkways

E13.4.2 Fabrication

(a) General
  (i) Except as otherwise specified herein, steel Work shall be fabricated in accordance with the latest A.W.S. Specification D1.1 and subsequent revisions. Fabrication shall be in accordance with the latest AASHTO LRFD Bridge Design and Construction Specifications and all subsequent revisions.
  (ii) No fabrication or welding of steel Work shall commence until permission to do so has been received from the Contract Administrator.
  (iii) The procedure for the repair of any members damaged during fabrication shall be accepted by the Contract Administrator prior to any Work taking place.

(b) Submissions
  (i) At least twenty-one (21) Calendar Days prior to the scheduled commencement of any fabrication, the qualifications of Contractor, the qualifications or operators, the shop drawings, mill certificates shall be submitted to the Contract Administrator for his review.
  (ii) At least twenty-one (21) Calendar Days prior to the scheduled installation of structural steel, the installation methods and equipment shall be submitted to the Contract Administrator for his review.

(c) Shop Drawings
  (i) Submit Shop Drawings as per CW1110.
  (ii) The shop drawings shall clearly show shapes, weights, dimensions, details, connections (including proper AWS welding identification), bolt holes, accessories and erection procedures.
  (iii) The Contractor shall field measure all dimensions as required prior to submission of the structural steel shop drawings.

(d) Preparation of Material
  (i) Straightening Material
    - Prior to being used in fabrication, all structural steel shall be straight and free from kinks or bends. The flatness tolerance of plate in excess of 1 m wide shall be in accordance with the tolerance of the finished

product as stated in Clause E13.4.2(p). If straightening is necessary, it shall be done by methods that will not injure the metal. The steel shall not be heated unless permission is given by the Contract Administrator. Sharp kinks and bends will be cause for rejection of the steel.

(ii) Camber

- Beams shall be cambered as indicated on the Drawings.
- The required camber shall be produced within the tolerances as set out in CSA Standard W59-03. The fabricator shall record measurements of the actual camber of each beam, at the points indicated on the Drawings.
- If the shop-measured actual camber of a beam is not within the tolerances as set out in CSA Standard W59-03, the Contract Administrator shall be so informed immediately, the fabricator shall submit a record of the actual camber of any such beam and a proposal as to possible corrective measures. No remedial measures shall be undertaken by the fabricator until his proposal has been given due consideration and has been accepted in writing by the Contract Administrator.

(iii) Edge Preparation for Welding

- The edges of plates or sections which are to be welded together shall be prepared by sawing, shearing, flame-cutting, machining, chipping or arc air gouging to the details shown on the shop drawings. Surfaces and edges to be welded shall be smooth, uniform and free from fins, tears, cracks, and other defects which would adversely affect the quality or strength of the weld. Surfaces to be welded shall also be free from loose scale, slag, rust, grease, moisture or other material that will prevent proper welding. Mill scale that withstands vigorous wire brushing, a light film of drying oil or a thin rust-inhibitive coating may remain, except that all mill scale shall be removed from the surfaces on which welds are to be made by submerged arc welding or by shielded metal arc welding with low hydrogen electrodes. Surfaces within 50 mm of any weld location shall be free from any paint or other material that would prevent proper welding or produce objectionable fumes while welding.
- All flange plates shall be cut so that the direction of applied stress is parallel to the direction of plate rolling.
- Edges of material thicker than specified in the following list shall be trimmed if and as required to produce a satisfactory welding edge wherever a weld along the edge is to carry calculated stress:

  Sheared edges of material thicker than ..... 12 mm

  Rolled edges of plates (other than Universal Mill Plates) thicker than ..... 9 mm

  Toes of angles or rolled shapes (other than wide flange sections) thicker than ..... 16 mm

  Universal Mill Plates or edges of flanges of wide flange section thicker than ..... 25 mm

- Edges may be prepared by oxygen cutting, providing a smooth and regular surface free from cracks and notches is secured, and providing that an accurate profile is secured by the use of a mechanical guide. Freehand cutting shall be done only where acceptable to the Contract Administrator.

- All flange plates prepared by flame cutting shall be preheated in accordance with Clause E13.4.2(i).
- In all oxygen cutting, the cutting flame shall be so adjusted and manipulated as to avoid cutting beyond (inside) the prescribed lines. Roughness of cut surfaces shall not be greater than that defined by the United States Standards Institute surface roughness value of 1,000 (USAI B46.1, Surface Texture). Roughness exceeding this value shall be removed by machining or grinding. Occasional gouges will be tolerated only at the discretion of the Contract Administrator and shall be repaired in accordance with his instruction.

(iv) Edge Preparation (Nonwelded Edges)

- Steel may be cut to size by sawing, shearing, flame-cutting or machining. All steel after cutting shall be marked by a method agreed to by the Contract Administrator so that its specification may be immediately identified.
- Sheared edges of plates more than l6 mm in thickness shall be planed to a depth of 6 mm.
- Any flame cutting of steel shall be in accordance with Clause E13.4.2(d)(iii)
- Special attention shall be given to the cutting of cover plates or flange plates. Occasional gouges not in excess of 6 mm deep will be accepted in areas of low stress at the discretion of the Contract Administrator. The repair or removal of such gouges shall be to the Contract Administrator's instructions.
- Edges of flame cut flange plates shall be ground to a radius of 2 mm. Re-entrant cuts shall be filleted to a radius of not less than 19 mm.

(e) Bolt Holes

(i) All holes for high strength bolts shall be either subpunched to a maximum of 22 mm and reamed, or drilled, and shall be of a nominal diameter not more than 2 mm in excess of the nominal bolt diameter.

(ii) Reamed holes shall be cylindrical and perpendicular to the member. Where practicable reamers shall be directed by mechanical means. Reaming shall be done with twist drills.

(iii) Drilling shall be done with twist drills. Burrs on the outside surfaces shall be removed.

(iv) Poor matching of holes will be cause for rejection.

(f) Assembly and Welding Sequences

(i) If requested by the Contract Administrator, the Fabricator shall supply full details of the proposed assembly and welding sequence of any particular weldment.

(g) Marking

(i) Prior to fabrication, all steel shall be marked for identification by heat number and specification by a marking system acceptable to the Contract Administrator.

(h) Assembly

(i) The shop assembly of the various components of the weldments shall be executed in accordance with A.W.S. D1.1 Subsections 3.3 and 3.4.

(ii) Tack welding shall be done by qualified operators, using the smallest size weld required to hold the components of the assembly together. Tack welds shall not be less than 50 mm in length and shall be incorporated in the final weld.

(iii) Tack welds shall be made with 4 mm maximum size electrodes and shall be subject to the preheat requirements of Clause E13.4.2(i).

(i) Preheat and Interpass Temperatures

(i) No welding shall be done when the ambient temperature is lower than -20°C.

(ii) At temperatures below 0°C, the steel shall be preheated to a temperature of at least 10°C in excess of that stated in Table 1.

(iii) Preheat shall be applied to all steel to be welded so that the steel within 80 mm of the weld is heated to the temperature shown in Table 1.

(iv) Preheat shall be applied in such a manner that moisture from the heating equipment does not penetrate the joint.

(v) For all welding processes, preheat and interpass temperatures shall be maintained during welding, at temperatures not less than stated in Table 1.

Table 1
Minimum Preheat and Interpass Temperatures

Thickness of Thickest Part at Point of Welding	CSA Standard W59-M1989 Grade 350WT
Less than 19 mm	10°C
19 mm to 38 mm	10°C
38 mm to 64 mm	65°C
Over 64 mm	107°C

(vi) Preheat temperatures above the minimum shown in Table 1 may be required for highly restrained joints if designated by the Contract Administrator.

(vii) Preheat temperature shall in no case exceed 200°C but there shall be no limit on interpass temperature.

(viii) Preheat requirements for tack welds shall be as in the above table except that where single pass tack welds are used and are to be incorporated and consumed in a weld made by the submerged arc and the gas metal arc processes, preheat is unnecessary.

(j) Welding

(i) Welding shall be done by the manual, shielded metal arc, gas shielded metal arc or submerged arc processes in accordance with the approved procedures and A.W.S. D1.1 Section 4, Technique.

(ii) All welding shall be done under cover and, in the case of gas metal arc welding, shall be done in an area free from wind or draft.

(iii) Where the submerged arc or gas metal arc processes are to be used, the Contract Administrator may order that:

- A preliminary test run of the accepted procedure be made over the length of the joint to prove that the disposition of the equipment, the handling of hoses, and the method and accuracy of travel are satisfactory.
- Each operator makes a weld specimen not less than 1.2 m in length for fillet welds and 150 mm in length for butt welds. Steel of the same specification and thickness as that to be used in the Work shall be used in the specimen welds. No welding shall be done on the Work until such a specimen is satisfactory to the Contract Administrator.

(iv) Materials to be used for backing strips and runoff tabs shall conform to the same specifications as the base material.

(v) Butt welds shall be extended beyond the edges of the parts to be joined by means of start and runoff tabs providing sufficient thickness to avoid the weld burning through and with a joint preparation similar to that on the main material. For manual shielded metal arc welding, the width of the tabs shall be not less than the thickness of the thicker part being joined or 75 mm, whichever is greater. For submerged arc welding, the width of the tabs shall be not less than 75 mm. Each weld pass shall be carried far enough beyond the edge of the parts being joined to ensure sound welds in the joint. Tabs shall be

removed upon completion and cooling of the weld without damage to the parent plate and the end of the weld made smooth and flush with the edges of the abutting parts.

(vi) In gas metal arc welding, the equipment shall be capable of sustaining a gas flow rate of from 0.85 to 1.27 m^3 per hour (30 to 45 ft^3 per hour).

(vii) Mechanical scaling tools shall not be used on any weld surface that is a final weld surface. Scaling tools may be used on welded passes provided their use does not crack or injure the first pass of a multipass weld.

(viii) Semiautomatic machines may be used only when they are equipped with a mechanical control of travel speed.

(ix) Repairs to welds of base metal shall be made by grinding or arc air-gouging followed by grinding. The use of flame gouging or oxygen gouging will not be permitted.

(k) Weld Profiles

(i) Weld profiles shall meet the requirements of CSA Standard W59-03 Clause 5.9.

(l) High-Strength Bolt Installation

(i) Installation of high-strength bolts shall be in accordance with "AASHTO Standard Specifications for Highway Bridges - 1996, Division II, Clause 11.5 - Assembly" turn of the nut method.

(ii) Sufficient bolts, nuts and washers shall be furnished to complete the entire structure with an ample surplus to replace all bolts damaged or lost.

(m) Bent Plates

(i) When bending plates, the plates shall be so taken from the stock plates that the bend line will be at right angles to the direction of rolling. The radius of the bend measured inside, shall be not less than the thickness of the plate.

(ii) Before bending, the corners of the plate shall be rounded to a radius of 2 mm throughout that portion of the plate at which bending is to occur.

(n) Machined Surface

(i) Machine finished surfaces, as designated on the Drawings, shall be coated with an accepted protective compound.

(o) Shop Assembly

(i) A shop trial assembly of field bolted connections is to be done. The assembly, alignment, and accuracy of holes shall be accepted by the Contract Administrator before reaming is recommended.

(p) Dimensional Tolerances

(i) Members and parts of members shall be straight, true to line, and free from twists and bends. In determining acceptability under these general requirements, the tolerances stated herein after shall be applied.

(ii) Deviation from specified camber at centre of beam: in accordance with CSA Standard W59-03, Clause 5.8(c).

(iii) Lateral deviation on H or I members: ± 6 mm.

(iv) Deviation from flatness of girder webs measured between flanges or between stiffeners: As per CSA Standard W59-03, Clause 12.5.3.

(v) Combined warpage and tilt of flanges of girders, determined by measuring the offset between the end of the flange plate and the flange plate at the centre of the web plate: As per CSA Standard W59-03, Clause 5.8(f).

(vi) This tolerance does not apply to the following cases:

- Abutting parts of flanges to be butt welded, which shall meet the requirements of CSA Standard W59.1-03, Clause 5.4.4.
- Flange plates at bearings shall meet the requirements of the following clause:

- ♦ Flanges of members at bearings shall not be out of square with the theoretical vertical axis of the member. The flange plate shall have full contact with the bearing sole plate.

(vii) Deviation from specified depth: As per CSA Standard W59-03, Clause 5.8 (j).

(viii) Intermediate Stiffeners: As per CSA Standard W59.1-03, Clause 5.8 (k).

(ix) Bearing Stiffeners: As per CSA Standard W59.1-03, Clause 5.8 (l).

(x) The maximum deviation from the specified length measured on centreline of web: ± 6 mm.

(q) Shipping

(i) Structural members shall be loaded in such a manner that they can be transported and unloaded at their destination without being excessively stressed, deformed or otherwise damaged.

(ii) All necessary haulage permits shall be obtained by the Contractor from the proper authorities prior to transportation by vehicles of any structural members.

(r) Delivery

(i) The Contractor shall be responsible for arranging directly, with the appropriate authorities, a route and schedule acceptable to them; the Contractor shall keep the authorities and Contract Administrator advised and obtain the authorities' approval on any changes as the project proceeds.

(ii) Railway cars or vehicles containing materials shall be promptly unloaded by the Contractor upon delivery and, in case of failure to do so, the Contractor shall be liable to any demurrage charge.

E13.4.3 Allowable Construction Loads

(a) The Contractor is advised that the Midtown Feedermain Bridge is a structure with a live load restriction during normal operation. For this reason, the following weight restrictions shall be strictly enforced during construction while the Feedermain is removed from the bridge. The loading from all equipment, platforms, materials, work persons, etc. shall be restricted so that the total forces from these loadings in the steel superstructure are less than or equal to the total forces from the existing Feedermain full of water. The weight of the existing Feedermain full of water is 9.3 kN/metre. The Contractor shall have this verified by a Professional Engineer registered in the Province of Manitoba. Detailed design notes and drawings for each stage of construction, bearing the Professional Engineer’s seal, shall be submitted to the Contract Administrator for review at least twenty-one (21) Calendar Days prior to carrying out each stage of the works.

(b) The following further load restrictions will apply during the replacement of rivets with bolts and during the attachment of strengthening member to the existing steel superstructure members. The environmental containment shall be removed and any collected materials for disposal shall be removed. Also, this work shall be carried out when the wind speed is less than or equal to 30 km/h.

(c) Further, the walkways shall not be placed on the superstructure until all of the strengthening has been completed and the environmental containment has been removed and any collected materials for disposal have been removed.

E13.4.4 Erection

(a) Erection of Structural Steel

(i) The Contractor shall obtain the Contract Administrator's acceptance on erection procedures and scheduling prior to the commencement of erection of structural steel.

(ii) The Contractor shall furnish, construct and subsequently dismantle and remove off-site, all falsework including working bridge required for the erection of the steelwork. Falsework shall be designed by the Professional Engineer registered in the Province of Manitoba and employed by the Contractor.

(b) Erection Methods and Equipment

(i) At least twenty-one (21) Calendar Days prior to the scheduled commencement of any steel erection on site, the Contractor shall submit to the Contract Administrator, the proposed schedule, methods and sequence of operations for review.

(ii) Drawings sealed by a Professional Engineer registered in the Province of Manitoba shall be submitted detailing the Contractor's proposed scaffolding, platforms, and swingstages to be employed. All scaffolding, platforms, and swingstages shall be designed, constructed, erected and operated in accordance with Workplace Safety and Health Division requirements. No Works shall commence without prior written approval of the Contract Administrator.

(iii) Tack welding for the purpose of falsework attachments or any other temporary attachment will not be permitted.

(c) Handling and Storing Materials

(i) The Contractor shall design whatever special handling requirements there may be for transporting and erecting. This design must be submitted with the falsework submission and be designed by a Professional Engineer registered in the Province of Manitoba and employed by the Contractor. The Contractor shall ensure the stability of all components and provide temporary structural steel bracing, when required, during: handling, transportation, and erection and until the structural steel is in its final location with all permanent bracing, connections, and supports in place.

(ii) Material to be stored shall be placed on skids above the ground. It shall be kept clean and properly drained. Caution shall be exercised when storing structural steel which is exposed to weather or condensation to prevent local corrosion which may develop in areas where water is trapped. Coating with a water-soluble oil after fabrication may be used to avoid this problem. Long members shall be supported on skids placed near enough to prevent injury from deflection. The Contractor shall be responsible for the loss of any material while in his care, or for any damage to it.

(d) Field Assembly

(i) The parts shall be accurately assembled as shown on the Drawings and any match marks shall be followed. Hammering which will injure or distort the members shall not be done. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled.

(ii) Field connections shall have one half of the holes filled with bolts and cylindrical erection pins (half bolts and half pins) before final bolting. Fitting-up bolts shall be the same nominal diameter as the high strength bolts, and cylindrical erection pins shall be 1 mm larger.

(e) Straightening Bent Material

(i) The straightening of plates and angles or other shapes shall be done by methods that will not produce fracture or other injury. The metal shall not be heated unless permitted by the Contract Administrator, in which case the heating shall not be to a higher temperature than that producing a "dark cherry red" colour. After heating, the metal shall be cooled as slowly as possible.

(ii) Following the straightening of a bend or buckle, the surface of the metal shall be carefully inspected for evidence of fracture, and if necessary, replaced or repaired to the satisfaction of the Contract Administrator.

(f) Bolting

(i) All field connections shall be bolted with high-strength bolts with the head side of the bolt on the exterior side of the connections. Bolting with high-strength bolts shall be carried out in accordance with "AASHTO Standard Specifications for Highway Bridges - 1996, Division II, Clause 11.5 - Assembly" turn of nut method.

(g) Splice Connections

(i) Galvanized surfaces at splice connection locations shall be hand-wire brushed prior to installing bolted splices, as directed by the Contract Administrator.

(h) Misfits

(i) The correction of minor misfits involving harmless amounts of reaming, cutting and chipping as determined by the Contract Administrator will be considered a legitimate part of erection. However, any error in shop fabrication which prevents the proper assembling and fitting-up of parts by the moderate use of drift pins or by a moderate amount of reaming and slight chipping or cutting, shall be the responsibility of the Contractor.

(i) Damage to Substructure

(i) The substructure shall be carefully protected during erection of the structural steel by the Contractor. All concrete surfaces and corners liable to damage shall be protected with wood blocking, sacking, or other means, to prevent damage and chipping of concrete due to wire ropes, swing loads, or other activities. The Contractor shall repair any such damage to the satisfaction of the Contract Administrator at his own cost.

(ii) The erection of structural steel shall be done so that there shall be no forces applied to cause overstressing of the piers.

(j) Welding to Galvanized Metal

(i) All galvanizing should be removed from prepared surfaces to be field welded.

(ii) After field welding the metal shall be touched up by the Galvanizing Touch-up Process in accordance with Clause E13.4.4(k) of these Specifications. All repairs shall be made flush with adjacent metal.

(k) Galvanizing Touch-up Procedure

(i) Any areas of damaged galvanizing, and all field welds, are to receive field-applied galvanizing, in accordance with manufacturer of Zinga for two coats of Zinga or Zinc metalizing in accordance with E14.

E13.5 Quality Control

E13.5.1 Inspection

(a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works which are not in accordance with the requirements of this Specification.

E13.5.2 Access

(a) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times.

E13.5.3 Qualifications of Contractor

(a) The Contractor shall produce evidence that his plant is recently fully approved by the C.W.B. to the requirements of CSA Specification W47.1-09, Division 1 or 2.1.

E13.5.4 Qualifications of Operators

(a) The Contractor shall produce evidence that all welding operators to be employed on the Work are currently qualified by the C.W.B. at the time of fabrication and in the processes in which they are to be employed on the Work. Such qualification shall have been issued within two (2) years of the commencement of fabrication.

(b) The Contractor shall also produce evidence relative to each operator, that he has been executing satisfactory welding in the required processes within the six-month period previous to the award of this Contract.

E13.5.5 Welding Procedures

(a) The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.

(b) Such procedures shall be accompanied by documentary proof that they have been qualified previously by the Canadian Welding Bureau at the plant where the Work is to be carried out.

(c) The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment, including a description of travel for automatic welding

(d) The use of gas welding will be limited to light structural elements.

E13.5.6 Quality and Details of Welds

(a) The quality and details of welds shall be in accordance with CSA Standard W59-03, Clause 12.5.4.

(b) Welds shall have no cracks, inadequate penetration or lack of fusion, and shall have no other defects exceeding the limits in size and frequency of occurrence as specified in CSA Standard W59-03, Clause 12.5.4. Fusion type defects referred to in the Clause shall be interpreted as slag inclusions and similar generally elongated defects.

(c) Undercut at the toe of the flange-to-web fillet weld will not be allowed, except in regions of low stress at the discretion of the Contract Administrator.

E13.5.7 Material Storage and Care

(a) Steel

(i) Structural material, either plain or fabricated, shall be stored above the ground upon platforms, skids or other supports. It shall be kept free from dirt and other foreign matter, and shall be protected, as far as practical, from corrosion. Long members shall be supported on skids placed near enough together to prevent injury from deflection.

(ii) Prior to fabrication, all steel shall be marked for identification by heat number and specification by a marking system acceptable to the Contract Administrator.

(b) Welding Consumables

(i) All electrodes having low hydrogen coverings shall be dried for at least 2 hours between 230°C and 260°C, before they are used. Electrodes shall be stored immediately after drying in storage ovens held at a temperature of at least 120°C. Electrodes that are not used within 4 hours after removal from a drying or storage oven shall be redried before use. Electrodes that have been wet shall not be used.

(ii) Electrode wire used in submerged arc welding and gas metal arc welding shall be stored in the original container at room temperature and kept free of moisture, oil, dirt or other contaminators.

(iii) Flux used for submerged arc welding shall be dry and free of contamination from dirt, mill scale, oil, or other foreign material. Fused flux shall not be used on the Work.

(iv) Gas for gas metal arc welding shall be stored in marked steel bottles and shall not be subjected to temperatures in excess of 50°C nor temperatures of less than 0°C.

(c) Testing

(i) In addition to the Contractor's own quality control testing, all materials, welding procedures, Shop Drawings, and steelwork fabrication will be inspected by the Contract Administrator to ascertain compliance with the Specifications and Drawings.

(ii) A testing agency will work with the Contract Administrator to carry out inspection and testing. The Contractor shall cooperate fully with the testing firm.

(iii) The minimum extent and frequency of weld inspection shall be as follows:

(iv) Radiographic Inspection:

- 100% of all flange butt welds
- 100% of all web butt welds

(v) Magnetic Particle Inspection

- 50% of web-to-flange welds
- 10% of web-to-stiffener welds
- 100% of stiffener-to-tension flange welds

(vi) All welds will be visually inspected.

(vii) The inspector shall have access to all of the fabricator's normal quality control records for this Contract specified herein.

(viii) Weld inspection will be carried out in accordance with the requirements of CSA Standard W59-03.

(ix) Welds that are found to be inadequate and unsatisfactory shall be repaired in accordance with CSA Standard W59-03, retested and paid for by the Contractor. All initial testing will be paid for by the City.

(x) No repair shall be made until agreed to by the Contract Administrator.

E13.5.8 Unacceptable Work

(a) Any Work found to be unacceptable shall be corrected in accordance with CSA Standard W59-03, Clause 5.10.

(b) No repair shall be made until agreed to by the Contract Administrator.

E13.5.9 Measurement and Payment

(a) The supply and erection of all structural steel, including all incidental structural steel elements, components and fasteners, will not be measured. This item of work shall be paid for at the Contract Lump Sum Price for “Structural Steel”. The payment will be considered full payment for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E14. SURFACE PREPARATION AND COATING OF STRUCTURAL STEEL

E14.1 Description

E14.1.1 This Specification shall cover surface preparation and coating of all existing structural steel throughout the bridge as specified herein.

E14.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E14.2 Materials

E14.2.1 General

(a) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and approval by the Contract Administrator. There shall

be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

E14.2.2 Coatings

(a) Galvanizing Coating (Zinc Metallizing)

(i) The galvanizing coating shall consist of a zinc metallizing process utilizing a 100% zinc base.

E14.2.3 Coating Material Supply Requirements

(a) All metallizing material shall be delivered in the original unopened spools with manufacturer's labels intact. Any material that has been damaged or otherwise deteriorated shall not be used. The Contractor shall provide, if and when requested by the Contract Administrator, a listing, updated weekly, of the weight and number of spools and the type of metallizing material (as identified by a mill test report and corresponding heat number for each spool) received from the metallizing manufacturer on this project.

(b) All material shall be stored under cover in a secured place as approved by the Contract Administrator and shall be kept within storage temperature limitations recommended by the manufacturer.

E14.2.4 Abrasive for Blast Cleaning

(a) The blast-cleaning abrasive shall be free of corrosion-producing contaminants. Sand abrasive shall be oil free. Slag abrasives shall contain no more than 0.1% oil by weight. The blast-cleaning abrasive and grit size employed shall be capable of achieving an average profile peak-to-valley height of at least 2.5 mils and not exceeding 3.5 mils.

E14.2.5 Incidental and Miscellaneous Materials

(a) Incidental and miscellaneous materials utilized in undertaking the surface preparation and coating Works shall be supplied strictly in accordance with the manufacturer's guidelines, as approved in advance by the Contract Administrator, and in accordance with these Specifications.

(b) This will include solvent mixtures associated with solvent cleaning operations, and any other incidental materials used in conjunction with the Works of this Specification.

(c) The use of all such materials shall be reviewed with the Contract Administrator to ensure conformance with the Specification, prior to the use of same in the Works. The Contract Administrator's decision in these matters shall be final.

E14.2.6 Water

(a) Water used for high pressure water washing shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. It shall be equal to potable water in physical and chemical properties.

E14.3 Equipment

E14.3.1 Surface Preparation Equipment

(a) All equipment shall be of a type approved by the Contract Administrator and capable of preparing the existing structural steelwork surfaces in accordance with these Specifications.

E14.3.2 Coating Application Equipment

(a) The coating application equipment shall be designed such that the coating will be applied uniformly to all surfaces in the locations required as shown on the Drawings and approved by the Contract Administrator and shall be kept in good working order.

E14.3.3 Wash Cleaning Equipment

(a) Wash cleaning equipment shall provide a high pressure water wash capable of cleaning the existing structural steelwork suitable to receive the coating in accordance with these Specifications.

E14.4 Construction Methods

E14.4.1 Scope of Work

(a) The Works involve surface preparation of the existing superstructure structural steel, and application of coating system thereto, as described here below in Table 2.

Table 2

SURFACE PREPARATION	COATING
SSPC-SP12WJ4-NV2 High Pressure Water Cleaning SSPC SP10 Near White Metal Blast	Galvanizing Coating (zinc metallizing)

E14.4.2 Access

(a) Access methods for workers and equipment to access all areas of the structure must be submitted by the Contractor and approved by the Contract Administrator at least ten (10) working days prior to the proposed commencement of construction.

E14.4.3 Coating Methods and Scheduling

(a) At least twenty-one (21) Calendar Days prior to the scheduled commencement of any surface preparation and coating operations, the Contractor shall submit to the Contract Administrator, the proposed schedule, methods and sequence of operations for review.

(b) Drawings sealed by a Professional Engineer registered in the Province of Manitoba shall be submitted detailing the Contractor's proposed scaffolding, platforms, and swingstages to be employed. All scaffolding, platforms, and swingstages shall be designed, constructed, erected and operated in accordance with Workplace Safety and Health Division requirements. No Works shall commence without prior written approval of the Contract Administrator.

E14.4.4 Precautions Against Overspray and Splatter

(a) Prior to undertaking any Works, the Contractor shall take all necessary precautions to prevent blast-cleaning overspray and overspray/splatter/drift of the primer and coating, all in accordance with E15. All splatter, overspray, and spills shall be promptly removed by the Contractor at his own expense to the satisfaction of the Contract Administrator.

(b) The Contractor must provide adequate protection against sandblast or coating damage to the substructure, bearings, vehicles, water crafts, private property, and the public in the vicinity of the bridge. The Contractor will be held solely liable for any damages or claims resulting from the blast cleaning and coating operations.

E14.4.5 Surface Preparation

(a) General

(i) Prior to actual Work commencement, representative trial areas shall be cleaned in accordance with SSPC Specifications.

(ii) The degree of cleaning and surface profile (where required) achieved, once accepted by the Contract Administrator, will become the standard for all subsequent surface preparations. Furthermore, the Contractor shall prepare and maintain blasted reference panels for the purpose of calibrating magnetic dry film thickness gauges as specified in SSPC Specification PA2.

(b) Surface Cleaning

(i) Before any surface cleaning operations may commence, the Contractor shall have in place an approved Environmental Protection and Capture System as specified in E15.

(ii) General

- Before any blast cleaning operations or any coating applications commence, the following surface cleaning operations shall be undertaken on all structural steel members designated to receive a coating system:
- All organic materials such as bird droppings, nests and any other non-structural obstructions or pollutants attached to the steel are to be removed by hand cleaning operations.
- All oil and grease shall be removed manually with solvent cleaning as per SSPC Specification SP1.
- The entire area shall be washed clean by using high pressure water washing.

(iii) Blast Cleaning Operation

- The Contractor shall prepare all structural steel immediately prior to coating, by blast cleaning as specified in Table 2 hereinbefore.
- No rust scale shall remain within the designated areas.
- Any areas shielded or hidden from the effects of sandblasting shall be cleaned manually or by other means to the satisfaction of the Contract Administrator.
- The blasting shall be performed so as not to damage or contaminate any previously coated areas.
- Freshly prepared steel shall be coated as quickly as practical thereafter. However, if the freshly prepared steel begins to rust prior to application of the coating, the steel must be reblasted to meet the applicable SSPC Specification.
- Where the coating has been damaged or rejected, remove loose or rejected coating to meet surface preparation Table 2. Cleaning shall be performed approximately 20 mm beyond the damaged areas in all directions or until soundly-adhered coating is obtained.

(c) Clean-up Operations

(i) Following all blast cleaning operations and prior to the Contract Administrator's inspection, all surfaces involved shall be blown off with compressed air or cleaned by vacuum for the purpose of removing any and all traces of blast products from the surface, and for the removal of abrasive from all pockets and corners.

(ii) Following surface preparation clean-up operations, the Contractor shall immediately notify the Contract Administrator so that an inspection can be made prior to the application of coating.

(iii) The coating shall be applied as soon as possible after the surface preparation clean-up operation as approved by the Contract Administrator.

(d) Surface Testing and Inspection

(i) The Contractor shall provide the Contract Administrator with a minimum of four (4) hours notice prior to coating, to allow for testing and inspection of prepared surfaces.

(ii) Immediately following blast cleaning and clean-up operations, the Contractor shall notify the Contract Administrator in order that a chemical analysis of the blasted steel be carried out. No coating shall be applied to any prepared surface until written acceptance of complete surface preparation of an area has been given by the Contract Administrator.

E14.4.6 Coating Application

(a) General

(i) The areas to be coated shall undergo additional cleaning operations as required, to remove any new rust to ensure a clean surface exists at the time that application of the coating commences in accordance with the Specifications.

(ii) Under no circumstances shall the coating be applied until the surface preparation has been inspected and approved by the Contract Administrator immediately prior to commencement of coating application operations.

(iii) Coating shall only be carried out when the surfaces are dry, free of dirt, oil, grease and other surface contaminants.

(iv) Any coating damaged by cold, heat or other environmental condition shall be replaced by the Contractor to the satisfaction of the Contract Administrator.

(v) The minimum recoat time, as agreed upon by the Contract Administrator and specified by the coating manufacturer, must be adhered to when coating at lower temperatures before application of next coat.

(b) Coating Thickness

(i) The coating shall consist of the dry film thicknesses, based on percentage of solid content by volume; in accordance with Table 3 here below:

Table 3

ITEM	% SOLIDS CONTENT BY VOLUME	DRY FILM THICKNESS*
GALVANIZING COATING		
Zinc Metallizing	100%	10 mils
* Thickness as measured over the peaks of the blast profile, as specified herein.		

(ii) The coating thicknesses specified herein shall be the thickness over the peaks of the blast profile. To ensure this thickness is being measured, dry film thickness measurements and gauge calibration methods shall be as described in SSPC Specification PA2.

(iii) When the dry film thickness for an area, measured as specified herein, averages less than the thickness specified or has any spot thickness less than the minimum spot thickness specified herein, then additional layer(s) of the same materials shall be applied until the minimum required thickness is attained.

(iv) Zinc Metallizing shall be applied by either of the following methods: flame spray or electric arc spray. The existing metal shall not be heated to a temperature exceeding 350°C.

(v) Minimum times between coats shall be in compliance with the manufacturer's written instructions. The Contract Administrator reserves the right to require longer times, as he sees fit.

(c) Clean-up Operations

(i) All areas of overspray, spillage, leakage, etc., shall be immediately cleaned up to the satisfaction of the Contract Administrator.

E14.4.7 Extent of Surfaces to be Coated

(a) All existing steel member surfaces shall be coated with the specified coating.

E14.5 Quality Control

E14.5.1 General

(a) The Contractor shall supply coating samples to the Contract Administrator or his Inspector for testing purposes, from time to time as required. There shall be no charge to the City for samples taken.

(b) The Contractor shall arrange for regular site visits by a representative of the coating manufacturer who shall ensure that the coating is being applied in accordance with the manufacturer's recommendations. The Contract Administrator shall be notified of each such visit and may request additional visits. The Contract Administrator shall be immediately advised of any proposed deviation from this Specification or the manufacturer's requirements.

(c) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, including all operations, from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given.

(d) The zinc metallizing shall achieve adhesion of at least 500 psi to the steel as determined by testing per ASTM 4541.

E14.5.2 Guarantee

(a) Manufacturer Guarantee

(i) The Contractor shall ensure that the manufacturer/supplier of each coating type shall provide to the Contract Administrator written guarantee within five (5) working days of contract award stating that the product will perform satisfactorily for a minimum period of five (5) years from the date of issue of the Certificate of Total Performance, provided that both the application and surface preparation of the coating has been carried out in accordance with this Specification. The Supplier shall state that they have reviewed these Specifications and the application and surface preparation procedures and find them in accordance with their recommendations. The Supplier shall guarantee the replacement of the coating materials at no cost to the City in the event that the coating does not perform satisfactorily.

(b) Surface Preparation and Application Guarantee

(i) The General Contractor shall ensure that the surface preparation and coating application is performed in such a manner that will not void the manufacturer's guarantee.

(ii) The General Contractor shall provide to the Contract Administrator a guarantee in writing, stating that the coating system will perform satisfactorily for a period of five (5) years from the date of issue of the Certificate of Total Performance. He shall provide in the guarantee for the reapplication of the coating system at no cost to the City in the event that the coating system does not perform satisfactorily.

E14.6 Measurement and Payment

E14.6.1 Surface Preparation and Coating of Structural Steel for Galvanizing Coating (Zinc Metallizing)

(a) Surface preparation and coating of structural steel, as defined in this Specification, will not be measured. This item of work will be paid for at the Contract Lump Sum Price for “Surface Preparation and Coating of Structural Steel”. The payment will be considered full payment for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E15. ENVIRONMENTAL CONTAINMENT, COLLECTION AND DISPOSAL

E15.1 Description

E15.1.1 This Specification shall cover all Works associated with the provision of environmental protection and capture systems associated with all site Works, as specified herein.

E15.2 Materials

E15.2.1 General

(a) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and approval by the Contract Administrator.

E15.2.2 Miscellaneous Materials

(a) Miscellaneous materials shall conform to the requirements indicated on the Drawings and as required for a complete installation and as approved by the Contract Administrator.

E15.3 Equipment

E15.3.1 General

(a) All equipment shall be of a type approved by the Contract Administrator and shall be kept in good working order.

E15.4 Construction Methods

E15.4.1 Scope of Work

(a) It is intended that this Specification cover the following Works associated with environmental protection:

(b) Containment, collection and disposal of spent sandblasting abrasive and new coating overspray (hazardous waste unless proven otherwise by the Contractor).

(c) Containment, collection and disposal of debris generated by concrete demolition Works as well as reinforcing steel and concrete surface preparation Works (non-hazardous waste unless contaminated with spent sandblasting abrasive and new coating overspray).

E15.4.2 General

(a) In general the Contractor shall ensure that the debris from concrete demolition Works, surface preparation of structural steel, reinforcing steel and concrete surfaces and the overspray from coating application will not result in harmful effects or nuisance to river, land, buildings, vehicles, pedestrian and water craft in the vicinity of the Contract area.

(b) The Contractor shall conduct his operations in accordance with all current Federal, Provincial or other regulations with respect to environmental protection and pollution control. It shall be the Contractor's responsibility to be familiar with all applicable environmental regulations, to obtain all necessary approvals and permits for his operations and to ensure that all applicable environmental requirements are met and adhered to.

E15.4.3 Allowable Construction Loads

(a) The Contractor is advised that the Midtown Feedermain Bridge is a structure with a live load restriction during normal operation. For this reason, the following weight restrictions shall be strictly enforced during construction while the Feedermain is removed from the bridge. The loading from all equipment, platforms, materials, work persons, etc. shall be restricted so that the total forces from these loadings in the steel superstructure are less than or equal to the total forces from the existing Feedermain full of water. The weight of the existing Feedermain full of water is 9.3 kN/metre. The Contractor shall have this verified by a Professional Engineer registered in the

Province of Manitoba. Detailed design notes and drawings for each stage of construction, bearing the Professional Engineer's seal, shall be submitted to the Contract Administrator for review and found acceptable at least twenty-one (21) Calendar Days prior to carrying out each stage of the works.

(b) The wind loads on the structure from the added containment and collection system shall be limited. Therefore the containment and collection system shall be limited to a maximum total length along the bridge of 21m.

(c) The following further load restrictions will apply during the replacement of rivets with bolts and during the attachment of strengthening member to the existing steel superstructure members. The environmental containment shall be removed and any collected materials for disposal shall be removed. Also, this work shall be carried out when the wind speed is less than or equal to 30 km/h.

(d) Further, the walkways shall not be placed on the superstructure until all of the strengthening has been completed and the environmental containment has been removed and any collected materials for disposal have been removed.

E15.4.4 Containment, Collection and Disposal

(a) Spent Sandblasting Abrasive and Coating Overspray (Hazardous Waste)

(i) The Contractor is advised of the general concern regarding contamination of land areas and waterways by old paint, blasting abrasives and new coating materials. The Contractor shall ensure that such contamination does not take place.

(ii) The Contractor shall provide for containment of the superstructure steel areas during all surface preparation and coating application operations. The containment shall be achieved by hoarding (tarps, scaffolding, etc.) so that the structure is enclosed in order to prevent spent blasting abrasives, cleaned-off paint residue and new coating material overspray from migrating to outside the enclosure.

(iii) The Contractor shall ensure that the amount of blasting medium to remove old paint and the amount of overspray from the application of new coating material is kept to the absolute minimum by conscientious efforts of his workforce and by efficient use of equipment.

(iv) The Contractor shall collect all spent blasting abrasives, cleaned-off paint residue and new coating material overspray from the Work area. All such materials shall be disposed of offsite by the Contractor in accordance with the appropriate regulations to the satisfaction of the appropriate environmental authority and the Contract Administrator.

(v) The Contractor is advised that the waste that will be generated will be classified as hazardous waste as determined by MR 282/87 respecting Classification Criteria for Products, Substances and Organisms Regulation under the Dangerous Goods Handling and Transportation Act. The Contractor in accordance with Manitoba Regulation 175/87 shall apply for and submit an initial Generator Registration Report to the Director of Environmental Approvals to obtain a Provincial Registration Number prior to beginning the rehabilitation Works. The Contractor shall employ a licensed Hazardous Waste Carrier to remove, transfer and dispose this hazardous waste at a facility licensed to receive hazardous waste in accordance with the requirements under the City's Provincial Registration Number 1001-195 including all costs for transportation, storage, and disposal of this hazardous waste.

(vi) At least fourteen (14) working days prior to scheduled commencement of any surface preparation and coating operations, the Contractor shall submit to the Contract Administrator for review the proposed schedule, methods, sequence of operations and all applicable details related to the proposed containment, collection and disposal procedures.

(vii) Design drawings sealed by a Professional Engineer registered in the Province of Manitoba shall be submitted detailing the Contractor's proposed containment

hoarding system. The details will not be accepted if not sealed by the Professional Engineer. The submission of such details to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the containment hoarding system. The containment hoarding shall be designed, constructed, erected and operated in accordance with Workplace Safety and Health requirements. No Work shall commence before the Contract Administrator has completed the review and advised the Contractor. As part of his responsibilities, the design Engineer whose seal is on the documents will be required to inspect the containment hoarding on site to ensure conformity with the design. The design Engineer will certify this conformity in writing and submit this certification to the Contract Administrator.

(b) Non-Hazardous Waste

(i) The Contractor is advised of the general concern regarding contamination of land areas and waterways by the debris generated from concrete and wood removal Works. The Contractor shall ensure that such contamination does not take place.

(ii) The Contractor shall take necessary precautions to ensure that bridge materials do not fall onto the ground or into the water areas below during concrete and wood removal Works. The Contractor shall provide, erect and maintain platforms, hoarding and other structures as required to catch and retain all concrete and wood waste materials.

(iii) Any debris that falls off the bridge shall be immediately cleaned up by the Contractor at his own expense.

(iv) All waste material generated from the concrete and wood removal Works shall become the property of the Contractor. The Contractor shall promptly remove all debris generated by these Works off and away from the site. It shall be the Contractor's responsibility to find suitable disposal areas away from the site.

E15.5 Quality Control

E15.5.1 All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given.

E15.5.2 The Contract Administrator reserves the right to reject materials or Works which are not in accordance with the requirements of this Specification.

E15.6 Measurement and Payment

E15.6.1 Environmental containment, collection and disposal as defined in this Specification will not be measured. This item or work will be paid for at the Contract Lump Sum price for “Environmental Containment”. The payment will be considered full payment for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E15.7 Basis of Payment

E15.7.1 Provision of environment containment, collection and disposal will be paid for at the Contract Lump Sum Price for "Environmental Containment, Collection and Disposal", which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E16. REINFORCED STRUCTURAL CONCRETE

E16.1 Description

(a) This Specification shall cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of reinforced structural concrete Works, as specified herein and as shown on the Drawings.

(b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E16.2 Scope of Work

(a) The Work under this Specification shall involve the following structural concrete Works:

(i) Pier Modification Works:

(i) Pier modification Works shall comprise of all reinforced concrete modifications to Piers 1 through 4.

E16.3 Submittals

E16.3.1 General

(a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed materials to be used.

(c) Shop Drawings shall be submitted in accordance with the latest edition of the Reinforcement Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada (RSIC).

E16.3.2 Concrete Mix Design Requirements

(a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlined on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump). If pumping methods are to be used, the method of placement must include a clear description of the pumping methods (line, vertical drop, length of hose, etc.).

(b) The Supplier shall submit directly, in confidence, to the City of Winnipeg, the concrete mix designs for each of the concrete types specified herein. The purpose of this confidential submission will be for record keeping purposes only. The concrete mix design shall contain a description of the constituents and proportions, and at the minimum the following:

(i) Cementitious content in kilograms per cubic metre or equivalent units, and type of cementitious materials;

(ii) Designated size, or sizes, of aggregates, and the gradation;

(iii) Aggregate source location(s);

(iv) Weights of aggregates in kilograms per cubic metre or equivalent units. Mass of aggregates is saturated surface dry basis;

(v) Maximum allowable water content in kilograms per cubic metre or equivalent units and the water/cementitious ratio;

(vi) The limits for slump;

(vii) The limits for air content; and

(viii) Quantity of other admixtures.

(c) The concrete mix design statements must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each the concrete types.

(d) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance to CSA A23.1-09 Clause 4.3.2.3.2.

(e) Any change in the constituent materials of any approved mix design shall require submission of a new concrete mix design statement, mix design, and mix design test data. If, during the progress of the Work, the concrete supplied is found to be unsatisfactory for any reason, including poor workability, the Contract Administrator may require the Contractor to make any necessary adjustments and associated resubmissions.

E16.3.3 Concrete Mix Design Test Data

(a) Concrete

(i) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, test data showing that the concrete to be supplied will meet the performance criteria stated in this Specification for each concrete type.

(ii) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, flexural strength for Fibre Reinforced Concrete (FRC) only, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. In addition, test data shall be submitted to support requirements for post-cracking residual strength index (R_i) and fibre dispersion in accordance with the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-06, Section 15, Fibre Reinforced Structures, Clause 16.6.

(iii) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.

(b) Aggregates

(i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, the location of the sources where aggregate will be obtained in order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

(ii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on sieve analysis of fine and coarse aggregates in accordance with CSA Standard Test Method A23.2-2A.

(iii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.2-7A.

(iv) The Contractor shall submit to the Contract Administrator for review and approval recent test information on relative density and absorption of coarse aggregate, in accordance with CSA Standard Test Methods A23.2-12A.

(v) The Contractor shall submit to the Contract Administrator for review and approval recent test information on petrographic examination of aggregates for concrete, in accordance with CSA Standard Test Methods A23.2-15A. The

purpose of the petrographic analysis is to ensure the aggregates provided are of the highest quality for use in the production of concrete and will produce a durable concrete. An acceptable aggregate will have an excellent rating as judged by an experienced petrographer, with a (weighted) petrographic number typically in the range of 100 to 120.

(vi) The Contractor shall submit to the Contract Administrator for review and approval recent test information on resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles Machine, in accordance with CSA Standard Test Method A23.2-16A.

(vii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on potential alkali reactivity of cement aggregate combinations (mortar bar method), in accordance with CSA Standard Test Method A23.2-27A.

(c) The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

E16.3.4 Notification of Ready Mix Supplier

(a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier that he is proposing to use, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement. The Contract Administrator will verify the acceptability of the Supplier and the concrete mix design requirements. Acceptance of the Supplier and the concrete mix design(s) by the Contract Administrator does not relieve or reduce the responsibility of the Contractor or Supplier from the requirements of this Specification.

E16.3.5 Temporary False Work, Formwork and Shoring Works

(a) The Contractor shall submit to the Contract Administrator for review, at least twenty-one (21) Calendar Days prior to the scheduled commencement of concrete placement, detailed design calculations and Shop Drawings for any temporary Works, including false work, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.

(b) Design Requirements

(i) The Contractor shall design false work, formwork and shoring for the concrete modification to Piers 1 through 4.

(ii) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.

(iii) The false work, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. False work shall be designed according to the requirements of CSA S269.1, “False Work for Construction Purposes.” The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.

(iv) The false work, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with CSA Standard CAN/CSA S269.3-M92. All proposed fastening methods to the concrete piers must be submitted to the Contract Administrator for review and approval.

(v) The loads and lateral pressures outlined in Part 3, Section 102 of "Recommended Practice for Concrete Formwork", (ACI 347) and wind loads as specified by the National Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.

(vi) As a minimum, the following spacings shall apply, for studding and waling:

- 20-mm plywood: studding 400 mm centre to centre (max.)
  walers 760 mm centre to centre (max.)

(vii) Forms shall be designed and constructed so that the completed Work will be within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.

(viii) Formwork shall be designed to provide chamber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.

(ix) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be accommodated in the design, in coordination and cooperation with the trade concerned. No openings in structural members are to be shown on the Shop Drawings without the prior written approval of the Contract Administrator.

(x) Shores shall be designed with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.

(xi) Mud sills of suitable size shall be designed beneath shores, to be bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.

(xii) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

(xiii) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.

(xiv) Formwork shall be designed to have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.

(xv) Forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.

(c) Shop Drawings shall show design loads, type, and number of equipment to be used for placing the concrete, method of construction, method of removal, type and grade of materials, and any further information that may be required by the Contract Administrator. The Contractor shall not proceed with any Work on site until the Shop Drawings have been reviewed and approved in writing by the Contract Administrator. False work must be designed to carry all loads associated with construction of overhangs including deflection due to dead loads, placement of concrete, hoarding, construction live loads, and any other loads that may occur.

(d) For timber formwork and false work, the Shop Drawings shall specify the type and grade of lumber and show the size and spacing of all members. The Shop Drawings shall also show the type, size and spacing of all ties or other hardware, and the type, size and spacing of all bracing.

E16.4 Materials

E16.4.1 General

(a) All materials supplied under this Specification shall be of a type approved by the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.

(b) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E16.4.2 Handling and Storage of Materials

(a) All materials shall be handled and stored in a careful and workmanship like manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with CSA Standard CAN/CSA-A23.1-09.

(b) Bundles of reinforcing steel shall be identified by tags containing bar marks.

E16.4.3 Concrete

(a) Concrete materials susceptible to frost damage shall be protected from freezing.

(b) Concrete shall have nominal compressive strengths (f'_c) and meet the requirements for hardened concrete as specified in the following Table 4.

Table 4
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size
Type 1	Pier Modifications	35 @ 28 Days	C-1	1	20 mm

E16.4.4 Aggregates

(a) General

(i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.

(ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA A23.2-27A-09. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-14A-09 or CSA A23.2-25A-09 is required.

(iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.

(b) Fine Aggregate

(i) Fine aggregate shall meet the grading requirements of CSA A23.1-09, Table 10, FA1, be graded uniformly and not more than 3% shall pass an 80 um sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.

(ii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-09, Table 12.

(c) Coarse Aggregate - Standard

(i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CSA A23.1-09, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass an 80 um sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall

be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.

(ii) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, an excess of thin particles or any other extraneous material.

(iii) Course aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.

(iv) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-09, Table 12, for concrete exposed to freezing and thawing.

E16.4.5 Admixtures

(a) Air-entraining admixtures shall conform to the requirements of ASTM C260.

(b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

(c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators and air-reducing agents, will not be permitted, unless otherwise approved by the Contract Administrator.

E16.4.6 Cementitious Materials

(a) Cementitious materials shall conform to the requirements of CSA-A3001 and shall be free from lumps.

(b) Should the Contractor choose to include a silica fume admixture in the concrete mix design, the substitution of silica fume shall not exceed 8% by mass of cement.

(c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class C-1 or F and the substitution shall not exceed 30% by mass of cement.

(d) Cementitious materials shall be stored in a suitable weather-tight building that shall protect these materials from dampness and other destructive agents. Cementitious materials that have been stored for a length of time resulting in the hardening, or the formation of lumps, shall not be used in the Work.

E16.4.7 Water

(a) Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall conform to the requirements of CSA A23.1-09 and shall be free of oil, alkali, acidic, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

E16.4.8 Formwork

(a) Formwork materials shall conform to CSA Standard A23.1-09, and American Concrete Institute Publication SP4, “Formwork for Concrete.”

(b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121-M1978, a minimum of 20 mm thick.

(c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-M1978. Approved Manufacturers are “Evans” and “C-Z.”

(d) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.

(e) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a non-

rusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

(f) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.

(g) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.

(h) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.

(i) Stay-in-place formwork or false work is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E16.4.9 Form Coating

(a) Form coating shall be "Sternson C.R.A." by Sternson, "SCP Strip Ease" by Specialty Construction Products, or equal as accepted by the Contract Administrator, in accordance with B6.

E16.4.10 Permeable Formwork Liner

(a) Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B6. This formwork liner shall be used on all exposed formed surfaces.

E16.4.11 Curing Compound

(a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-98a.

(b) WR Meadows 1215 WHITE Pigmented Curing Compound is an approved product, or equal as accepted by the Contract Administrator, in accordance with B6.

E16.4.12 Bonding Agents

(a) Latex Bonding Agent

(i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B6. Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than 28 days in age.

(b) Bonding Grout

(i) The grout for bonding the new concrete to the existing concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:

- 1 part water;
- 1 part latex bonding agent; and
- 1½ parts Type GUSF Portland cement.

(ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E16.4.13 Epoxy Adhesive

(a) Epoxy adhesive for bonding concrete to steel shall be one of the following approved products: Sternson ST432 or ST433, Dural Duralbond, Capper Capbond E, Sikadur 32 Hi-bond, Concressive 1001 LPL, Meadows Rezi-Weld 1000, or equal as accepted by the Contract Administrator, in accordance with B6.

E16.4.14 Epoxy Grout

(a) Epoxy grout shall be one of the following approved products: Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows

Rezi-Weld EG-96, or equal as accepted by the Contract Administrator, in accordance with B6.

E16.4.15 Cementitious Grout

(a) Cementitious grout shall be non-shrink and non-metallic. Approved products are Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, or equal as accepted by the Contract Administrator, in accordance with B6. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E16.4.16 Patching Mortar

(a) Patching mortar shall be made of the same material and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2 parts sand by damp loose volume. White Portland Cement shall be substituted for a part of the grey Portland Cement on exposed concrete in order to produce a colour matching the colour of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling or placing.

E16.4.17 Flexible Joint Sealant

(a) Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non-staining, grey polyurethane, accepted by the Contract Administrator and applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended. Approved products are Vulkem 116 by Mameco, Sonolastic NP1 by Sonneborn, Sikaflex-1a by Sika, Bostik 915 by Bostik, or equal as accepted by the Contract Administrator, in accordance with B6.

E16.4.18 Fibre Joint Filler

(a) Fibre joint filler shall be rot-proof and of the preformed, non-extruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM Standard D1751-99 or equal as accepted by the Contract Administrator, in accordance with B6.

E16.4.19 Backup Rod

(a) Backup rod shall be preformed compressible polyethylene, urethane, neoprene, or vinyl foam backer road, extruded into a closed cell form and oversized 30 to 50%.

E16.4.20 Expansion Board Cap

(a) The expansion board cap shall be installed between the fibre joint filler and backup rod. The approved product is Greenstreak Expansion Board Cap No. 941.

E16.4.21 Galvanized Dowels and Galvanized Expansion Sleeves

(a) Dowels and expansion sleeves shall be fabricated in accordance with CSA Standard CAN/CSA-G30.18-M92.

(b) The dowels shall be galvanized in accordance with CSA Standard G164-M92, to a minimum net retention of 600 g/m^2.

E16.4.22 Reinforcing Steel

(a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, hooks and dowels.

(b) Reinforcing steel shall be black steel as shown on the Drawings and shall conform to the requirements of CAN/CSA G30.18-M Grade 400W.

(c) If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel.

(d) All reinforcing steel shall be straight and free from paint, oil, mill scale and injurious defects. Rust, surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross-sectional area, and tensile properties of a hand wire-brushed specimen are meeting the requirements of ASTM A615 Grade 75 and ASTM A1035-07.

E16.4.23 Bar Accessories

(a) Bar accessories shall be of a type acceptable to the Contract Administrator. They shall be made from a non-rusting material and they shall not stain, blemish or spall the concrete surface for the life of the concrete.

(b) Bar chairs, bolsters and bar supports shall be of cementitious material. No plastic, PVC or galvanized bar supports shall be used. Total Bond Precast High Performance Concrete Bar Supports as supplied by:

(i) Con Sys Inc.
Box 341
Pinawa, MB R0E 1L0
(204) 753-2404

(c) Placing of bar supports shall be done to meet the required construction loads.

(d) Tie wire shall be the following:

(i) Black, soft-annealed 1.6 mm diameter wire.

(e) Bar accessories shall include bar chairs, spacers, clips, wire ties, wire, hooks or other similar devices and are to be acceptable to the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of black reinforcing steel.

E16.4.24 Miscellaneous Materials

(a) Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with B6.

E16.5 Equipment

E16.5.1 General

(a) All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E16.5.2 Vibrators

(a) The Contractor shall have sufficient numbers of internal concrete vibrators and experienced operators on site to properly consolidate all concrete in accordance with ACI 309. The type and size of vibrators shall be appropriate for the particular application, the size of the pour, and the amount of reinforcing and shall conform to standard construction procedures.

(b) The Contractor shall have standby vibrators available at all times during the pour.

E16.6 Construction Methods

E16.6.1 General

(a) It is intended that this Section cover all construction Work associated with Structural Concreting operations.

(b) Rate of application shall be the rate required to meet the requirements of ASTM C309-98a for the texture of concrete the curing compound is being applied to.

E16.6.2 Temporary False Work, Formwork, and Shoring

(a) Construction Requirements

(i) The Contractor shall construct false work, formwork and shoring for the new concrete overhangs strictly in accordance with the approved Shop Drawings.

(ii) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.

(iii) The false work, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the approved Shop Drawings.

(iv) Forms shall be constructed and maintained so that the completed Work is within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.

(v) Formwork shall be cambered, where necessary to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.

(vi) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be formed or set in coordination and cooperation with the trade concerned. No openings shall be made in structural members that are not shown on the Shop Drawings without the prior written approval of the Contract Administrator.

(vii) Shores shall be provided with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.

(viii) Mud sills of suitable size shall be provided beneath shores, bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.

(ix) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

(x) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.

(xi) Formwork shall have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.

(xii) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.

(b) Form panels shall be constructed so that the contact edges are kept flush and aligned.

(c) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against absorption of moisture from the concrete by a field applied form coating or a factory applied liner as accepted by the Contract Administrator.

(d) Where prefabricated panels are used, care shall be taken to ensure that adjacent panels remain flush. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface.

(e) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 25 mm in diameter. Break-back type form ties shall have all spacing washers removed and the tie shall be broken back a distance of at least 20 mm from the concrete surface. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in colour.

(f) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.

(g) It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being

removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and his decision shall be final regarding the use of them again.

(h) Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two panels of representative samples of the forms he proposes for reuse and shall strip them after 48 hours for the Contract Administrator to judge the type of surface produced.

(i) All form lumber, studding, etc., becomes the property of the Contractor when the Work is finished, and it shall be removed from the concrete and the site by the Contractor after the concrete is set, incidental to the work of this Specification, and the entire site shall be left in a neat and clean condition.

E16.6.3 Concrete Construction Joints

(a) Concrete construction joints shall be located only where shown on the Drawings or as otherwise directed in writing by the Contract Administrator. Concrete construction joints shall be formed at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints.

(b) Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.

(c) After the forms are stripped off the construction joint, the entire face of the joint, including the reinforcing steel, shall be thoroughly cleaned down to sound concrete and the surface roughened.

(d) Refer to, E16.6.7, “Preparation for Concreting Against Hardened Concrete”, for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E16.6.4 Permeable Formwork Liner

(a) Permeable formwork liner shall be used on all exposed surfaces.

(b) The permeable formwork liner shall be used for only one (1) application.

(c) The supply, setup, application, and removal of permeable formwork liner shall be considered incidental to the placement of structural concrete, and no separate measurement or payment shall be made for this Work.

E16.6.5 Pier Modification Works

(a) Pier Modification Works include modifications as shown on the Drawings.

E16.6.6 Supply of Structural Concrete

(a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.

(b) All mixing of concrete must meet the provisions of CSA A23.1-09, Clause 5.2, Production of Concrete.

(c) Time of Hauling

(i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.

(ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement 24 hours prior to the scheduled placing of concrete.

(iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.

(iv) Unless otherwise noted in Table 4, "Requirements for Hardened Concrete", no retarders shall be used.

(v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CSA A23.1-09 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers' designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.

(vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the Owner upon request.

(d) Delivery of Concrete

(i) The Contractor shall satisfy himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of re-handling, and without damage to the structure or the concrete.

(e) Concrete Placement Schedule

(i) The Contractor shall submit to the Contract Administrator the proposed concrete placement schedule for all concrete placements for review and approval. If, in the opinion of the Contract Administrator, the volume of the placement is deemed larger than can be placed with the facilities provided, the Contractor shall either:

- Limit the amount to be placed at any time (using adequate construction joints);
- Augment his facilities and Plant in order to complete the proposed placement;

(ii) In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting; and

(iii) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E16.6.7 Preparation for Concreting Against Hardened Concrete

(a) All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:

(i) Concrete shall be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris.

(ii) All existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residues.

(iii) Immediately prior to placing new concrete, bonding grout shall be thoroughly brushed onto the entire surface of the existing hardened concrete in a thin and even coating that will not run or puddle.

E16.6.8 Placing Structural Concrete

(a) General

(i) The Contractor shall notify the Contract Administrator at least one (1) Working day prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.

(b) Placing Structural Concrete

(i) Placement of concrete shall not be permitted when the surface moisture evaporation exceeds 0.75 kg/m^2/h.

(ii) The nomograph, Figure D1, Appendix D of CSA Standard A23.1-09 shall be used to estimate surface moisture evaporation rates.

(iii) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. Pumping of concrete will be allowed for all concrete. All equipment and processes are subject to acceptance by the Contract Administrator.

(iv) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.

(v) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.

(vi) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.

(vii) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.

(viii) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or “cold joints” within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.

(ix) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.

(x) The maximum free drop of concrete into the forms shall not be greater than 1.5 m, otherwise rubber tubes or pouring ports spaced not more than 1.5 m vertically and 2.5 m horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.

(xi) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute immersed.

(xii) Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally 300 to 900 mm). Apply the vibrator at any point until the concrete is sufficiently compacted (5 to 15 seconds), but not long enough for segregation to occur. The vibrators shall be inserted vertically and withdrawn out of the concrete slowly. Spare vibrators in good working condition shall be kept on the job site during all placing operations.

(xiii) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.

E16.6.9 Finishing of Concrete Surfaces

(a) Finishing Operations for Unformed Surfaces

(i) The Contractor shall ensure that sufficient personnel are provided for the finishing of the surfaces. In the event that the depositing, vibrating, and screeding operations progress faster than the concrete finishing, the Contractor shall reduce the rate of concrete placement or cease the depositing of concrete until the exposed area of unfinished concrete has been satisfactorily minimized. The Contract Administrator's judgement in this matter shall be final and binding on the Contractor. All loads of concrete that exceed the 120 minute discharge time limit during the delay, while the finishing operations catch up, shall be rejected.

(b) Type 1 Finish – Exposed Formed Surfaces

(i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2 finish.

(ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.

(iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.

(iv) The surfaces shall be patched as specified in this Specification.

(c) Type 2 Finish – Unformed Surfaces

(i) All unformed concrete surfaces shall be finished as outlined hereinafter.

(ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.

(iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.

(iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.

E16.6.10 General Curing Requirements

(a) Refer to E16.6.13 for cold weather curing requirements and E16.6.14 of this Specification for hot weather curing requirements.

(b) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, damp proofing, a waterproofing membrane, or an asphalt overlay.

(c) Freshly finished concrete shall have either a curing compound applied, or shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only.

(d) Curing compound shall be applied at the rate required by ASTM P198 for the accepted product. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.

(e) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, running water, vibration, and mechanical shock. No machinery shall travel in the vicinity of freshly placed concrete for a period of 24 hours. Concrete shall be protected from freezing until at least 24 hours after the end of the curing period.

(i) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3ºC in one hour or 20ºC in 24 hours.

(f) Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The

Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator.

(g) Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces.

(h) After the finishing is completed, the surface shall be sprayed with an initial coating of curing compound. As soon as initial set has occurred, the surface shall receive a second roller-applied application of curing compound, to the satisfaction of the Contract Administrator.

E16.6.11 Form Removal

(a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written approval of the Contract Administrator.

(b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.

(c) Notwithstanding the above, the minimum strength of in-place concrete prior to removal of vertical forms shall be 25 MPa, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super-imposed construction loads.

(d) Field-cured test specimens representative of the cast-in-place concrete being stripped shall be tested as specified in this Specification to verify the concrete strength.

E16.6.12 Patching of Formed Surfaces

(a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to removal of forms. Immediately after forms have been removed and before the Contractor commences any surface finishing or concrete patching operations, all newly exposed concrete surfaces shall be inspected by the Contract Administrator. Any repair or surface finishing started before this inspection may be rejected and required to be removed.

(b) Patching of formed surfaces shall take place within 24 hours of formwork removal.

(c) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 mm from the surface before patching.

(d) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one hour before final finishing, to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.

(e) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.

(f) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

E16.6.13 Cold Weather Concreting

(a) The requirements of CSA Standard A23.1-09 shall be applied to all concreting operations during cold weather, i.e., if the mean daily temperature falls below 5°C during placing or curing.

E16.6.14 Hot Weather Concreting

(a) General

(i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.

(ii) Concrete at discharge shall be at as low a temperature as possible, preferably as low as 15°C, but not above 25°C. Concrete containing silica fume shall be between 10°C minimum and 18°C maximum at discharge. Aggregate stockpiles should be cooled by water sprays and sun shades.

(iii) The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water; provided it has melted by the time mixing is completed.

(iv) Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.

(v) Sun shades and wind breaks shall be used as required during placing and finishing.

(vi) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".

(vii) The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water reducing agents to maintain Workability and strength, and these must appear in the Mix Design Statement submitted to the Contract Administrator.

(viii) Hot weather curing shall follow immediately after the finishing operation.

(b) Hot-Weather Curing

(i) When the air temperature is at or above 25°C, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation.

(ii) Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20°C, in order to minimize the temperature rise of the concrete.

(c) Job Preparation

(i) When the air temperature is forecast to rise to 25°C or higher during the placing period, provisions shall be made by the Contractor for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by mist fogging and evaporation, to the satisfaction of the Contract Administrator.

(d) Concrete Temperature

(i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table 5, “Acceptable Concrete Temperature”, for the indicated size of the concrete section.

Table 5
ACCEPTABLE CONCRETE TEMPERATURES

THICKNESS OF SECTION, M	TEMPERATURES °C	
	MINIMUM	MAXIMUM
Less than:		
1	10	27
1.2	5	25

E16.6.15 Cleanup

(a) The Contractor shall cleanup equipment and construction debris on at least a daily basis to the satisfaction of the Contract Administrator.

E16.6.16 Fabrication of Reinforcing Steel

(a) All reinforcing steel shall be fabricated in accordance with the latest edition of the Reinforcement Steel Manual of Standard Practice by the RSIC, to the lengths and shapes as shown on the Drawings.

E16.6.17 Placing of Reinforcing Steel

(a) Reinforcing steel shall be placed accurately in the positions shown on the Drawings and shall be retained in such positions by means of a sufficient number of bar accessories so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contract Administrator's decision in this matter shall be final.

(b) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete which has been deposited on the steel from previous pouring operations before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.

(c) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior acceptance by the Contract Administrator shall be obtained where other splices must be made. Welded splices shall not be permitted.

(d) Reinforcing steel shall be placed to provide a clear space between the reinforcing bars as shown on the Drawings to accurately place preformed holes where necessary.

(e) Reinforcing steel shall not be straightened or re-bent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel shall not be permitted without prior acceptance by the Contract Administrator.

(f) Reinforcing steel shall be placed within the tolerances specified in CSA A23.1-04.

E16.6.18 Installing Reinforcing Steel into Hardened Concrete

(a) If shown on the Drawings, the Contractor shall drill holes into adjacent slabs for hooks of the diameters and depths specified for each size of reinforcement. Drill bits shall have a diameter not larger than 2 mm larger than the nominal hook.

(b) Holes shall be located to the correct depth and alignment as indicated on the Drawings. The spacing of holes shall be as per RSIC.

(c) Drilling equipment shall be operated so as to ensure that no damage to the concrete results from such drilling operation. Coring of holes is not permitted. In the event that existing reinforcing steel bars are hit during the drilling operations, the hole shall be abandoned and a new hole shall be drilled nearby to the correct depth. Touch-ups shall be completed using 3M Skotchkote or equivalent, as approved by the Contract Administrator, in accordance with B6. All abandoned holes shall be filled with non-shrink grout.

(d) Holes for reinforcing steel shall be blown clean with compressed air. Bonding agent shall be placed in the back of the drilled hole. The reinforcing steel shall be worked back into the holes for complete coverage around the portion of the bar that extends into the hole, such that bonding agent is squeezed from the hole.

(e) Once all reinforcing steel is in position, it shall be inspected and approved by the Contract Administrator before any new concrete is placed. Otherwise, the concrete may be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

E16.7 Concrete Quality

E16.7.1 Inspection

(a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work.

(b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

(c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

(d) A minimum of one (1) Business Day advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcement.

E16.7.2 Access

(a) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times. The Contractor shall supply samples to the Contract Administrator or his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E16.7.3 Materials

(a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Quality Assurance Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.

(b) All materials shall conform to CSA Standard A23.1-09.

(c) All testing of materials shall conform to CSA Standard A23.2-09.

(d) All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E16.7.4 Quality Assurance and Quality Control

(a) The Contract Administrator shall be afforded full access for the inspection and assurance testing of concrete and constituent materials, both at the site of Work and at any plant used for the production of concrete, to determine whether the concrete is being supplied in accordance with this Specification.

(b) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.

(c) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for Quality Assurance tests and provide such assistance and use of tools and construction equipment as is required.

(d) Quality Assurance and control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

(e) The Contractor will be required to undertake Quality Control tests, of all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed.

(f) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CSA Standard A23.1-09. An outline of the quality tests is indicated below.

E16.7.5 Concrete Testing

(a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C-09, "Slump of Concrete". If the measured slump falls outside the limits in E16.3.2 of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

(b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C-09, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E16.3.2 of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

(c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C-09, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.

(d) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-09, "Sampling Plastic Concrete".

(e) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C-09, "Making and Curing Concrete Compression and Flexure Test Specimens".

(f) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28) day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-09, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.

(g) Compressive strength tests on specimens cured under the same conditions as the concrete Works shall be made to check the strength of the in-place concrete so as to determine if the concrete has reached the minimum allowable working compressive strength as specified in Table 4 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field-cured strength

test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-09, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E16.7.6 Corrective Action

(a) If the results of the tests indicate that the concrete is not of the specified quality, the Contract Administrator shall have the right to implement additional testing, as required, to further evaluate the concrete, at the Contractor's expense. The Contractor shall, at his own expense, correct such Work or replace such materials found to be defective under this Specification in an acceptable manner to the satisfaction of the Contract Administrator.

E16.8 Measurement and Payment

E16.8.1 Reinforced Structural Concrete

(a) Construction of reinforced structural concrete including formwork, black steel reinforcement, sleeves and inserts, placing concrete, curing, finishing and related operations shall not be measured. This work shall be paid for at the Contract Lump Sum price for “Reinforced Structural Concrete”, 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.

(b) Supplying and installing all the listed materials, concrete mix design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to “Reinforced Structural Concrete”, unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E17. FEEDERMAINS

E17.1 Design Criteria

(a) Design Pressures

(i) Design Working Pressure shall be 700 KPa (100 psi).

(ii) Transient or surge pressure shall be a minimum of 50 % over working pressure specified, or the minimum pressure specified in the applicable AWWA Standard, whichever is greater.

(iii) Test Pressure shall be a minimum of 125 % times Working Pressure specified, as measured at the lowest point in the system, or the minimum pressure specified in the applicable AWWA Standard, whichever is greater.

(b) Dead Load (Buried Pipelines)

(i) Dead Load shall be based on the following:

(ii) Depth of cover of 2.75 metres, plus 0.6 metres future cover allowance.

(iii) Soil unit weight of 1900 kg/ m3 (120 #/ft3)).

(iv) Load shall be based on prism load for steel pipelines and positive projecting embankment loading for AWWA C301 pipe.

(c) Live Load

(i) Live Load for buried pipelines shall be based on AASHTO HS20 using a load distribution factor of 1.0. Impact Factor shall be applied as per AASHTO LRDF, 33 % at 0 m cover diminishing to 0 % at 2.45 m cover.

(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 and applicable AWWA specifications.

(e) Submittals

(i) Sufficient numbers of copies of all drawings and laying schedules as specified in Specification CW 1110, 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.

(ii) 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.

(iii) Modifications to plan distances to accommodate standard pipe laying lengths will be permitted on acceptance by the Contract Administrator.

(iv) The Contractor shall be responsible for the accurate details, fabrication and fit of the pipe and specials.

(v) Confirm pipeline elevations, angles and laying lengths with the Contract Administrator prior to fabrication of pipe, bends and specials.

(vi) 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. Design details to be stamped by a Professional Engineer, registered in the Province of Manitoba.

(vii) 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.

E17.2 Materials

(a) Steel Pipe to AWWA C200

(i) Minimum Wall Thickness 9.5 millimetres (0.375 inch)

(ii) Specified Minimum Yield Strength of Steel 290 MPa (42,000 psi)

(iii) Bevelled Ends for Butt welding.

(iv) Supplied lengths shall be a minimum of 12.192 metres in length. Laying lengths and pipe assembly shall be established such that field insulation kits on welds do not bear on pipe slides.

(v) Internal coating as per E17.2(j). Provide 150 mm holdback at welded ends.

(vi) External coating required for buried pipelines (insulated and non-insulated), and for all pipe requiring field insulation, as per E17.2(j)

(b) Fittings

(i) As per A.W.W.A. C208-01. Any special sections and fittings not covered by this Standard shall be thoroughly detailed on the Shop Drawings

(c) Pipe Insulation

(i) Material

(i) 50 millimetre thick polyurethane foam, Urecon U.I.P or approved equal in accordance with B6.

(ii) Density: (ASTM D 1622) 35 to 46 kg/m3 (2.2 to 3.0 lbs/ft3).

(iii) Closed cell content: (ASTM D 2856) 90%, minimum.

(iv) Water absorption: (ASTM C272) 4.0% by volume.

(v) Thermal conductivity: (ASTM C518) 0,020 to 0,026 W/m °C .

(ii) Application

(i) Prepare pipe by sandblasting prior to application of polyurethane foam

(ii) Install heat trace channel where indicated on Drawings.

(d) Pipe Cladding

(i) Atmospheric Exposure

(i) Factory applied Galvanized Cladding 1.214 millimetre (18 ga), Urecon Spiwrap or approved equal in accordance with B6.

(ii) Field Cladding 1.214 millimetre (18 Ga) galvanized sheet metal

(iii) Field Banding- 20 millimetre wide by 0.38 millimetre thick 316 Stainless Steel Band-it by IDEX Inc. or approved equal in accordance with B6.

(ii) Buried Exposure

(i) Polyethylene Jacket 2.54 millimetre thickness (100 mil), Urecon U.I.P or approved equal in accordance

(e) Heat Shrink Sleeves

(i) Cross-linked polyolefin heat shrink wrap, Canusa CPS or approved equal in accordance with B6.

(f) Pipe Slides and Saddles

(i) Acceptable Products

(i) Anvil Figure 429 C/W Figure 432 clamp

(ii) Piping Technology and Products Figure 2000 with hold down clamp

(iii) Pipe Shields Inc. Model B42000 NI

- Phone: 1-800-538-7007
- Email: pipeshields@pipingtech.com

(iv) Or Approved equal in accordance with B6.

(ii) Design

(i) Operating temperature - 40° C to 40 C°

(ii) Suitable for minimum 100 mm travel

(iii) PTFE anti-friction plates suitable to - 40° C to 40 C°

(iv) Complete with lateral and vertical guides

(v) Bolt down configuration to existing beams

(vi) Insulation support cradle suitable of suitable dimensions to adequately support pre-insulated Feedermain without deformation of insulation.

(iii) Finish

(i) Hot dip galvanized to CSA Standard G164-M92 to a retention of 610 gm/m^2

(g) Pipe Couplers – Sleeve Style AWWA C219

(i) Acceptable Products

(i) Romac Series 400

(ii) Robar Series 1906 / Baker Series 200

(iii) Or Approved Equal in accordance with B6.

(ii) Design

(i) Design as per latest version of AWWA C219

(ii) Coupler shall be designed for minimum deflection specified in AWWA C219 but in no case less than 2 degrees

(iii) Centre Sleeve shall be minimum thickness of 9.5 millimetres for sized less than 1200 millimetre nominal pipe diameter

(iv) Minimum Centre Sleeve Length 250 millimetres

(v) Length to suit pipe closure gap plus design deflection allowance

(iii) Electrical continuity bonding

(i) Coupling design shall provide for electrical continuity between all metallic parts.

(ii) Insulating boots where specified shall comply with AWWA C-219.

(iv) Interior and Exterior Coating
  (i) Fusion bonded epoxy coating as per AWWA C213. Minimum Dry Film Thickness 16 mils
  (ii) Coating and lining materials shall be NSF61 listed
(v) Gaskets
  (i) Gaskets shall consist of NBR (Nitrile) rubber listed under NSF61.
(vi) Installation Hardware
  (i) Type 304 passivated Stainless Steel as per ASTM F 593. Nut threads shall be coated with anti- galling compound

(h) Pipe Couplers – Split Sleeve Style AWWA C227
(i) Acceptable Products
  (i) Victaulic Depend-0-Lock
  (ii) Or Approved Equal in accordance with B6.
(ii) Design
  (i) Design as per latest version of AWWA C227
  (ii) Restrained style F x F
  (iii) Minimum thickness required for working pressure as per AWWA C219
  (iv) Minimum Body Length 250 millimetres
(iii) Electrical continuity bonding
  (i) Coupling design shall provide for electrical continuity between all metallic parts.
(iv) Interior and Exterior Coating
  (i) Fusion bonded epoxy coating as per AWWA C213. Minimum Dry Film Thickness 16 mils
  (ii) Coating and lining materials shall be NSF61 listed

(i) Expansion Joints- AWWA C221
(i) Acceptable Products
  (i) Romac Series EJ403
  (ii) Robar Series 8800 (Style 3)
  (iii) Or Approved Equal in accordance with B6.
(ii) Design
  (i) Design as per latest version of AWWA C221
  (ii) Single end Style with limit rods
  (iii) Centre Sleeve shall be minimum thickness of 9.5 millimetres for sized less than 1200 millimetre nominal pipe diameter
  (iv) Bevel ends for field welding
(iii) Electrical continuity bonding
  (i) Coupling design shall provide for electrical continuity between all metallic parts.
  (ii) Insulating boots where specified shall comply with AWWA C-219.
(iv) Interior and Exterior Coating
  (i) Fusion bonded epoxy coating as per AWWA C213. Minimum Dry Film Thickness 16 mils
  (ii) Coating and lining materials shall be NSF61 listed
(v) Installation Hardware
  (i) Type 304 passivated Stainless Steel as per ASTM F 593. Nut threads shall be coated with anti- galling compound

(j) Combination Air Valve
(i) 100 mm combination air valve will be supplied by the City of Winnipeg. Contractor shall provide all fasteners and gaskets to install the air valve.

(ii) Provide isolation butterfly valve as specified.

(k) Butterfly Valves (150 mm and less)

(i) Ductile Iron butterfly AWWA C504, Class 150B, resilient seat, complete with 316 Stainless Steel disc, shaft and hardware.

(ii) Quarter turn handles capable of locking in any of ten (10) positions - 0 degrees to 90 degrees. Handle and release trigger - ductile iron. Return spring and hinge pin: carbon steel. Latch plate and mounting hardware: cadmium plated carbon steel.

(iii) Paint as per Clause 2.3.

(l) Protective Linings and Coatings

(i) Design

(i) Pipe linings shall be in Compliance with NSF/ANSI 61 Drinking Water System Components – Health Effects

(ii) Pipe lining and coating systems including factory and field repairs, and field joint treatment shall be integrally designed to provide complete system protection. Pipe closure kits and field repairs shall be certified by the pipe supplier to function integrally with the pipe lining and coating system.

(iii) Internal Field closure and repair systems shall ensure that appropriate curing times as specified by coating manufacture, prior to Immersion, are considered in design.

(iv) Pipe Coating is required for all buried pipelines

(ii) Pipe Linings

(i) 100% solids liquid epoxy lining as per AWWA C210 and detail following:

- Conform to pipe preparation, coating application and thickness constraints as specified by the Manufacturer for immersion service.
- Holdback – 150 mm (6") minimum each end, or as specified by the pipe manufacturer.
- Angular surface profile – 3 mils, or as specified by the coating manufacturer, whichever is greater.

(ii) Acceptable products include:

- SP-7888 from Specialty Polymer Coatings, Inc.
- Devoe 233H by ICI Paints
- Amerlock 400,
- Tnemec Series 140 F Pota-Pox Plus
- Or approved Equal in accordance with B6.

(iii) Pipe Coatings

(i) 100% solids liquid epoxy coating as per AWWA C210 and detail following:

- Conform to pipe preparation, coating application and thickness constraints as specified by the Manufacturer for immersion service.
- Holdback – 150 mm (6") minimum each end, or as specified by the pipe manufacturer.

(ii) Acceptable products include:

- SP-2888 R.G. from Specialty Polymer Coatings, Inc.
- Protal 7250 from Denso North America, Inc
- Devoe Bar Rust 233H from ICI Paints

(m) Repair Coatings

(i) Coatings for girth welds and repair of external coating damage (holidays) as per NACE RP0105 and detail following:

(i) Repair coatings shall be as recommended by the primary pipe coating manufacturer, and shall be fully compatible with the primary pipe coating system and conditions of service.

(ii) Repair coatings shall be installed in accordance with the manufacturer's recommended procedures based on environmental conditions at the time of coating installation.

(iii) Only personnel that are fully trained by the manufacturer in the proper installation of the coating shall install the coating

(ii) Internal coatings containing VOC's or other solvents shall be allowed to fully cure in accordance with manufacturer recommendation prior to being immersed or placed in service.

(n) Prestressed Concrete Pressure Pipe conforming to AWWA C301

(i) Acceptable Manufacturers

(i) Hanson Pressure Pipe (Stouffville, Ont. or St. Eustache, PQ Plants)

(ii) Munro Concrete Products (Utopia, Ont)

(ii) Materials

(i) Cement

- Portland Cement for external core and mortar shall be CSA A3000 Type HS Sulphate Resistant Cement.
- External mortar coating shall contain 10 percent silica fume by weight of cement.
- Approval in writing is required if the Contractor proposed to use fly ash or pozzolan as a supplementary cementing material in conformance with AWWA C301, Section 4.4.1.
- 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.

(ii) Bell and Spigot Joint Rings

- Where indicated on the drawings, restrained joints shall be harnessed clamp joints.
- Double 'O' ring testable joints shall be used for

(iii) Fittings and Specials

(i) Configuration of Tie-ins to existing steel pipelines are unknown, but are expected to be a bell or spigot by plain end adaptor. Prior to manufacture of adaptor section, expose the existing connections to determine the diameters and configuration of the connections.

(iv) Manufacture

(i) Mortar

- Mortar coating shall be a minimum of 24 millimetres thick measured from the outside of the high tensile wire.

(v) Quality Control

(i) Absorption

- Notwithstanding the applicable AWWA standard, 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 applicable AWWA standard, no individual absorption test may exceed 10%.
- Notwithstanding applicable AWWA standard, 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. Pipe with an absorption rate in excess of 10% will not be accepted. No pipe shall be shipped until the

absorption results related to the particular shipment have been provided to the Contract Administrator, and are satisfactory.

(ii) Reports

- Provide quality control report, compiling all project quality control records, including steel tests, concrete compressive tests, mortar absorption tests, cylinder pressure tests, coating thickness tests, bell and spigot ring dimensional records and any other quality control records normally documented during the manufacture process.

(vi) Grout

(i) Cement

(ii) Portland cement shall be CSA A3000 Type HS Sulphate Resistant Cement.

(iii) Minimum 28 day strength 20 MPa.

(iv) Pumpable consistency.

E17.3 Installation

(a) Demolition and Abandonment of Existing Pipe

(i) Remove and dispose of all existing pipe, insulation, cladding, timber saddles, pipe ties and anchors from the bridge and approaches. Prevent debris from entering water courses.

(ii) Install watertight bulkheads at proposed reconnection points on the pipeline. The pipeline will not be pressurized after pipeline is cut, however, water tightness of the isolation valves off site cannot be guaranteed. Bulkheads shall be fitted with a minimum 50 mm drain valve to drain any accumulated water.

(b) Welding

(i) Join steel pipe sections by complete joint penetration (CJP) butt weld as per AWWA C206.

(ii) Welding locations on the bridge structure shall be minimized, and where on bridge welding is required, protect bridge structure and environment from weld splatter, overheating and other conditions that could damage bridge of coatings. Repair any areas of the structure damaged by welding activities

(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.

(iv) Repair all internal coatings as per E17.2(m).

(c) Field Installation of Pipe Insulation and Cladding

(i) Where indicated on the Drawings, or otherwise required, install field applied insulation and pipe cladding;

(i) At locations of all field welds

(ii) At location of bends and specials

(iii) At pipe couplings and expansion joints

(d) Field Insulation

(i) For field welds, including bends, insulation shall be foamed in place polyurethane

(ii) For couplers and expansion joints, insulation shall be preformed half-shells kits.

(e) Pipe Installation – Aerial Installation

(i) Assembly

(i) No piping shall be installed on the bridge until all repairs, coating and strengthening of the bridge are completed and accepted by the Contract Administrator.

(ii) Confirm pipeline elevations, angles and laying lengths with the Contract Administrator prior to fabrication of pipe, bends and specials.

(iii) Assemble pipelines by welding, or by pipe couplers where indicated.

(iv) Pipes shall be lifted by pipe slings to ensure;

- Pipe insulation and cladding is not damages, compressed of deformed
- Pipe does not bend or deflect longitudinally in excess of strain limits or allowable handling radius of the pipe or cladding.

(v) Provide temporary support, slides, rollers or other suitable means of launching assembles sections across the bridge. Launching systems shall be designed such that pipe cladding and insulation are not damaged during installation.

(vi) Assemble pipe sections such that field insulation kits on pipe joints do not bear on pipe slides.

(ii) Pipe Slides

(i) Install pipe slides and shoes by bolting to floor beams. Welding to floor beams will not be permitted. Ensure base bolting patterns maintain minimum hole edge distances from edge of beam flanges as approved by the Contract Administrator. Ensure all bolt holes are repaired and coated constant with structural bridge coatings. Carefully align pipe slides in the centre of the bridge, on a straight and true alignment.

(ii) Pipe slides shall be set in place on their base such that the slide is centred on the base at zero degrees Celsius. Setting the slide shall take into account pipeline temperature at time of installation and location of the slide from the fixed and moving ends of the pipeline.

(b) Pipe expansion Joint

(i) Install pipe expansion joint as per manufacturer written instructions.

(ii) Expansion joint gap shall be set according to joint gap on the drawings, in consideration of pipeline ambient temperature at time of setting the gap.

(f) Pipe installation – AWWA C301 Pipe

(i) Excavation and Backfill

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

(ii) Installation of Pipe in a Trench

(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 compacted 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 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) 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.

(v) Pipe shall be installed utilizing trench methods except where coring is required as shown on the Drawings.

(iii) 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.

(iv) Steel Split Ring Closures

(i) Buried pipe closures shall be accurately measured, cut and installed. Welded Split Sleeve closures shall be installed as recommended by the manufacturer.

(ii) 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. Pipe closures shall be encased in a minimum of 75mm thick grout coating. Ensure encasement of all pipe and coupler components.

(v) Frost Conditions

(i) 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.

(ii) 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).

(iii) 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.

E17.4 Measurement and Payment

E17.4.1 Supply and Installation of Feedermain

(a) Supply and Installation of Feedermain 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 "Main Line Piping- Supply and Install". Measurement shall be made along the laid centreline of the pipe, through all fittings and appurtenances, as computed by measurements made by the Contract Administrator. The length measured and paid will be from the connection to existing and change points of materials and installation. Payment for feedermain 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 and commissioning 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 Install 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 and commissioning of the pipe.

E17.4.2 Connection to Existing Piping

(a) Connections to Existing Piping will be measured and paid 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 bulkheads and couplers and supply and installation of couplers as listed in Form B Prices "Connect to Existing Piping".

E17.4.3 Installation of Temporary Bulkheads

(a) Installation of temporary bulkheads will be measured and paid on a unit basis. The price paid for the connection shall be the total number of temporary bulkheads supplied and installed, in accordance with this specification and shall include all

excavations, backfill, connections to existing pipelines including any couplers required as listed in Form B Prices "Supply of Temporary Bulkheads".

E17.4.4 Construction of Thrust Blocks

(a) Construction of Thrust Blocks will be measured and paid 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".

E18. HYDROSTATIC PRESSURE TEST

E18.1 Further to CW 2125, hydrostatic leakage test will be required for steel pipelines. Further to CW 2125, the test pressure will be 1.25 times design pressure of 875 KPa.

E18.2 Further to CW 2125, the allowable apparent leakage shall be 0.0347 litres per metre per hour for 900 millimetre nominal pipe diameter, in accordance to AWWA Manual 11 – A Guide for Steel Pipe Design and Installation. In all cases, visible leakage at any point in the system is unacceptable and must be repaired.

E18.3 For AWWA C301 pipelines, testing shall be completed by means of double 'O' ring testable joints. Joint Testing shall be conducted with compresses air, at a test pressure of 1.5 times the maximum operating pressure for the line.

E18.4 Test Procedure – Testable Joint

(a) All testing to be conducted in the presence of the Contract Administrator

(b) Initial testing shall be conducted as pipe is laid, after initial haunching is placed. If initial test fails, the Contractor shall disassemble the joint, inspect bell, spigot and 'O' rings, and reassemble joint.

(c) Final testing shall be conducted after pipe is backfilled.

(d) Remove steel plug and 'O' Ring

(e) Connect air supply and slowly pressurize joint cavity to specified test pressure (Maximum 380 KPa). Close off air supply.

(f) Hold test for five (5) minutes. Maximum loss in pressure is thirty five (35) KPa.

(g) On successful pressure test, remove test assembly, reinsert steel plug and 'O' ring. Grout joint ant test plug.

E18.5 Closure Joints

(a) All joints assembled during pipe closure shall remain exposed and visually inspected for leakage after filling of mains.

E18.6 Measurement and Payment

(a) Hydrostatic Pressure Test will be measured and paid on a Lump Sum basis, as indicated on Form B: Prices, and shall include supply and installation of all test bulkheads, temporary bracing, filling, test apparatus, disinfection, and testing and reporting in accordance to CW 2125

E19. DISINFECTION OF WATERMAINS

E19.1 Disinfection of watermains and feedermains shall be completed in accordance with CW 2125 except initial flushing will not be required.

E19.2 Further to CW 2125, disinfection of closure segments of Feedermains shall be completed by swabbing as outline in Section 3.3.16 of CW 2125.

E19.3 In accordance with Section 4.3 of AWWA Standard 651, the Contractor shall take all preventative and corrective measures during construction to prevent debris from entering the

pipeline. Further, the Contractor shall flush the pipeline with sanitized pipeline cleaning equipment prior to the commencement of disinfection operations.

E19.4 Upon completion of disinfection, chlorinated water shall be pumped from the pipeline at the lowest point in the system, or continually flushed until chlorine residuals reach levels indicated in CW 2125. 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:

(a) Discharged into a waste water sewer;

(b) Be de-chlorinated using sodium ascorbate, Vita-D-ChlorTM by Integra Chemical , or approved equal;

(c) Contained on Site until chlorine has dissipated to acceptable limits (non-detect).

E19.5 The pipeline shall be refilled with potable water and water samples for health tests taken in accordance to CW 2125.

E19.6 Measurement and Payment

(a) Disinfection of Watermains will not be measured for payment. Cost of disinfection shall be included in the Price paid of Pressure Testing and Disinfection as indicated on Form B: Prices.

E20. SOIL AMENDMENT

E20.1 This Specification covers the following:

(a) Soil Amendment (100 mm depth) growing medium for grasses

E20.2 This specification amends and supplements City of Winnipeg Standard Specification CW 3540 “Topsoil and Finish Grading for Establishment of Turf Areas” and shall cover supply of materials for and preparation amending existing clay soils for seeding.

E20.3 Quality Control

E20.3.1 Testing and Samples:

(a) Submit to the Contract Administrator analyses of amended riverbank soil to be used in creating growing medium, obtained for at least three separate samples taken from each area of the riverbank. The analysis shall be carried out by a qualified soil testing laboratory and shall include the percentage of organic material by weight, as well as recommendations for fertilizers and/or other soil ameliorants.

(b) Soil testing shall be by a laboratory approved by the Contract Administrator and shall determine N, P, K, Na, Cl, Ca, Mg, organic matter, C.E.C., pH, bulk density and C/N ratio of the Amended Soil for the purpose of recommending fertilizer for the Native Grasses and Wildflowers and Trees, Shrubs and Herbaceous Material.

E20.4 Materials

E20.4.1 Peatmoss for soil amendment shall be derived from partially decomposed species of Sphagnum Mosses, elastic and homogenous, brown in colour; free of decomposed colloidal residue, wood, sulphur and iron or other deleterious material which could affect healthy plant growth; containing a minimum 60% organic matter by weight, and moisture content not exceeding 15%. Shredded particles may not exceed 5 mm in size. Minimum pH value of peat, 4.5; maximum, 7.0.

E20.4.2 Sand shall be medium to coarse textured predominantly siliceous or quartz sand to CSA A82.56-M1976, well washed and free of impurities, clay, silt shale, chemicals or organic matter.

E20.5 Construction Methods

E20.5.1 Preparation of Existing Grade: CW 3540-R5 9.2.

E20.5.2 Soil Amendment (100 mm depth) - Growing Medium for Native Seed Mix

(a) Growing medium for native seed mix shall consist of a mix of peat moss and sand roto-tilled into the top 100 mm of riverbank soil at the following rates:

(i) Peat Moss - 0.035 cubic meters per square meter of area to be amended

(ii) Sand - 0.015 cubic meters per square meter area to be amended

(b) Cross-cultivate the entire area of riverbank soil that is to receive soil amendments to a depth of 100 mm. Redo areas where equipment used for hauling and spreading has re-compacted sub-grade

(c) Spread peat moss and sand over the area at the specified rates, roto-till or disc the peat moss and sand into the top 100 mm of soil and mechanically roll to obtain a level surface.

(d) Grade to eliminate rough spots and low spots and to maintain positive drainage.

(e) Consolidate seedbed to required bulk density using equipment approved by the Contract Administrator. Leave surfaces smooth, uniform and firm against deep foot-printing.

E20.5.3 Contractor shall complete test areas, of approximately 100 square metres each of 100 mm depth amendment, for review and approval of Contract Administrator prior to completing the areas.

E20.6 Measurement and Payment

E20.6.1 Soil amendment to depths of 100 mm shall be measured on an area basis for the number of square metres (s. m.) of soil amended with peat moss and sand in accordance with the Drawings and this Specification, and accepted by the Contract Administrator, as computed by the Contract Administrator.

E20.6.2 Soils amendment will be paid for at the Contract Unit Prices for items listed below, which shall be considered compensation in full for supplying all materials and performing all operations herein specified, and all other items incidental to the Work of this Specification.

(a) “Soil Amendment (100 mm depth)”

E21. TREES AND SHRUBS

E21.1 This Specification shall deal with the supply and installation of trees and shrubs in areas as indicated on the Drawings, including: preparation, digging, transport and planting.

E21.2 General

E21.2.1 Nomenclature of specified nursery stock and collected plantings shall conform to the International Code of Nomenclature for Cultivated Plants and shall be in accordance with the approved scientific names given in the latest edition of Standardized Plant Names. The names of varieties not named therein are generally in conformity with the names accepted in the nursery trade.

E21.2.2 Source Quality Control:

(a) All plant material specified within this project shall be either containerized nursery stock and/or collected field-potted native stock. All plants shall be from the Winnipeg area and the Oak-Aspen Forest Eco-region.

(b) All nursery stock supplied shall be nursery grown and of species and sizes as indicated on the Drawings. Stock shall be No. 1 Grade material in accordance with the current edition of Landscape Canada’s “Guide Specifications for Nursery Stock”.

(c) Any nursery stock dug from native stands, wood lots, orchards, or neglected nurseries, which have not received proper cultural maintenance, shall be designated

as “collected plants”. Material sources are to be approved by Contract Administrator prior to ordering or collecting. The Contractor shall provide all of the necessary nursery certificates to ensure that the plant species comply with this specification.

(d) Notify Contract Administrator of source of plant material at least 7 days in advance of shipment.

(e) Acceptance of plant material at source does not prevent rejection of same plant material on site prior to or after planting operations.

(f) The Contract Administrator retains the right to delete one or more of the specified containerized/potted plant materials to facilitate the completion of the contract.

E21.2.3 Shipment and Pre-Planting Care:

(a) Coordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.

(b) Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire, which would damage bark, break branches or destroy natural shape of plant. Give full support to root balls during movement.

(c) Cover plant foliage with tarpaulin, and protect bare roots by means of dampened straw, peat, saw dust or other acceptable material to prevent loss of moisture during transit and storage.

(d) Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 50 mm diameter with wound dressing.

(e) Keep roots moist and protected from sun and wind. Heel-in trees and shrubs which cannot be planted immediately in shaded areas and water well.

E21.2.4 During the one year period following completion of planting operations, the Contractor shall remove and replace from site plants which have died or failed to grow satisfactorily, as determined by the Contract Administrator.

(a) The Contractor shall warranty 85% of plantings are alive and healthy at the end of the one-year maintenance period.

E21.3 Materials

E21.3.1 Water shall be potable and free of minerals which may be detrimental to plant growth.

E21.3.2 Fertilizer shall be slow release organic. Fertilizer shall contain N-P-K in ratio as recommended by soil test results.

E21.3.3 Root ball burlap shall be 150 g Hessian burlap.

E21.3.4 Anti-desiccant shall be wax-like emulsion to provide film over plant surfaces reducing evaporation but permeable enough to permit transpiration.

E21.3.5 Wound dressing shall be horticultural accepted non-toxic, non-hardening emulsion.

E21.3.6 Planting soil mixture

(a) Soil to supplement soil in root ball to be mixture of sand, peat and existing clay prepared for Soil Amendment specified in E15.

(b) Bonemeal shall be raw bonemeal, finely ground with a minimum analysis of 3% nitrogen and 20% phosphoric acid, added to planting soil at a rate of 3 kg per cubic meter of planting soil mixture.

E21.3.7 Fertilizer: chemical fertilizers shall have N-P-K compositions as recommended by an agricultural soil testing laboratory, approved by the Contract Administrator, for horticultural trees, shrubs and herbaceous material with growing medium.

E21.3.8 Plant Material:

(a) Comply with “Guide Specification for Nursery Stock”, Latest Edition of Canadian Nursery Trades Association (Landscape Canada), referring to quality, size and development of plant material and root ball.

(b) All nursery stock shall be measured when branches are in their natural position. Height and spread dimensions specified in the Plant List on the Drawings refer to the main body of the plant, and not from branch tip to root base or from branch tip to branch tip.

(c) Use trees and shrubs of No. 1 grade.

(d) All trees shall have one, only, sturdy, reasonably straight and vertical trunk, and a well-balanced crown with fully developed leader, unless designated “multi-stem”.

(e) Use trees and shrubs with structurally sound, strong fibrous root systems, and free of disease, insects, defects or injuries, including rodent damage, sun scald, frost cracks, abrasions or scars to the bark. Plants must have been root pruned regularly, but not later than one growing season prior to arrival on site.

(f) All parts of the nursery stock shall be moist and show live, green cambium tissue when cut.

(g) At least one (1) plant of each variety supplied shall bear a tag showing both the botanical and common name of the plant.

(h) Additional Plant Material Qualifications:

(i) Approval required for plant material which has been held in cold storage

(ii) Container-grown stock acceptable if containers large enough for root development. Trees and shrubs must have grown in container for minimum of one growing season but not longer than two. Root system must be able to hold soil when removed from container. Plants that have become root-bound are not acceptable. Container stock must have been fertilized with slow releasing fertilizer.

(iii) Balled and burlap deciduous trees must have been dug with firm ball. Root balls must include 75% of fibrous and feeder root system. Secure root balls with burlap, heavy twine and rope.

(iv) Substitutions to plant material as indicated on the Plant List will not be permitted unless written approval has been obtained as to type, variety and size prior to Award of Contract. Plant substitutions must be of similar species and of equal size to those originally specified.

E21.4 Construction Methods

E21.5 Staking and laying out of the tree and shrub location and locations for groupings of shrubs shall be co-ordinated between the Contractor and the Contract Administrator prior to planting.

E21.5.1 Workmanship

(a) Obtain approval prior to excavating for plantings.

(b) No excavation is to take place without the clearance of all utility components with respect to underground lines located in the areas to be excavated.

(c) Apply anti-desiccant in accordance with material manufacturer's instructions.

(d) Co-ordinate operations. Keep site clean and planting holes drained. Immediately remove soil or debris spilled onto pavement.

E21.5.2 Planting Times:

(a) Plant deciduous plant material during dormant period, before buds have broken. Plant material noted for spring planting only must be planted in dormant period.

(b) When permission has been obtained to plant deciduous plant material after buds have broken, spray plants with anti-desiccant to slow down transpiration prior to transplanting.

(c) When permission has been obtained, trees, shrubs and ground covers growing in containers may be planted throughout growing season.

(d) Plant only under conditions that are conducive to health and physical conditions of plants.

(e) Provide planting schedule. Extending planting operations over long period using limited crew will not be accepted.

E21.5.3 Excavations:

(a) Excavations for shrubs to be a minimum of 500 mm deep by 500 mm diameter holes backfilled with planting soil mixture.

(b) Trees: excavate to depth of at least 200 mm deeper than height of root ball/roots, with width of three times the diameter. Backfill with planting soil mixture.

(c) Remove water which enters excavations prior to planting. Ensure source of water is not ground water.

(d) If planting in areas of Erosion Control Blanket, carefully cut blanket to make excavations and plant. Replace and re-secure blanket around plants.

E21.5.4 Planting:

(a) Loosen bottom of planting hole to depth of 150 to 200 mm. Cover bottom of each excavation with minimum of 150 mm of planting soil mixture.

(b) Plant trees and shrubs vertically, with roots placed straight out in hole, orient to provide the best aspect as seen from the top of bank.

(c) Place plant material to depth equal to depth they were originally growing in nursery.

(d) With ball and burlap root balls, loosen burlap and cut away minimum top 1/3 without disturbing root ball. Do not pull burlap from under root ball. With container stock, remove entire container without disturbing root ball. Non biodegradable wrappings must be removed.

(e) Tamp planting soil around root system in layers of 150 mm eliminating air voids. Frozen or saturated planting soil is unacceptable. When 2/3 of planting soil has been placed, fill hole with water. After water has completely penetrated into soil, complete backfilling.

(f) Build 100 mm deep saucer around outer edge of hole to assist with maintenance watering.

(g) When planting is completed apply slow release organic fertilizer at minimum rate of 12 kg/100 m for shrub beds or 50 g/mm of caliper for trees, or as recommended by the soil analysis. Mix fertilizer thoroughly with top layer of planting soil and water in well.

E21.5.5 Prune trees and shrubs after planting. Employ clean sharp tools and make cuts flush with main branch, smooth and sloping as to prevent accumulation of water. Remove dead and injured branches and branches that rub causing damage to bark. Trim trees and shrubs without changing their natural shape. Do not damage lead branches or remove smaller twigs along main branches. Treat cuts in excess of 50 mm diameter and damaged parts with application of wound dressing.

E21.5.6 Standards

(a) All roots shall be cleanly cut; split roots not acceptable.

(b) Branches and stems shall be tied and protected; broken or abraded branches or stems not acceptable.

(c) Planting shall be protected from drying conditions; desiccated material not acceptable.

(d) All plants to be free of insects and disease: galls, blight and other manifestations of insect infestation or disease not acceptable.

E21.6 Maintenance for Establishment

E21.6.1 Water plant material to prevent desiccation. Assume that watering will be required once a week for first four weeks following installation; thereafter, once every second week for the remainder of the maintenance period for establishment. Ensure adequate moisture in root zone at freeze-up.

E21.6.2 Keep mulched shrub beds and tree saucers free from weeds by manually removing undesirable plants during the maintenance period for establishment.

E21.6.3 Spray plants as required to combat pests and diseases. Use organic chemicals approved by Agriculture Canada.

E21.6.4 Make adjustments requested by the Contract Administrator, including straightening trees and adding protection from animals.

E21.7 Maintenance Period for Establishment

E21.7.1 Maintain plant material for a minimum period of two months (60 days) following completion of planting operations, or until such time that live growth is evident.

E21.8 Method of Measurement and Basis of Payment

E21.8.1 Supply and Installation of Trees and Shrubs

(a) Supply and installation of trees and shrubs will be measured on a unit price basis for each tree and shrub listed on the Plant List, installed in accordance with this Specification and accepted by the Contract Administrator.

(b) Supply and installation of trees and shrubs will be paid for at the Contract Unit Price for each species and size shown on the Plant List, measured as specified herein, which price shall be payment in full for supply of all materials and performing all operations herein described and all other items incidental to the Work included in this Specification.

E21.8.2 Supply and installation of fertilizer for plant material will be incidental to the Work of this Contract.

E22. SEEDING

E22.1 This specification shall amend and supplement CW 3520 "Seeding" and shall provide for supply and installation of naturalized seed mixes in the areas indicated on the Drawings and determined by the Contract Administrator on site.

E22.2 Approvals

E22.2.1 Provide the Contract Administrator with Certificates of Analysis and mix compositions for all seed mixes at least five (5) working days prior to commencing the Work. Include supplier’s name and telephone contact information, and percentages of each species and cultivar in each mix.

E22.2.2 Obtain Contract Administrator’s approval for any proposed adjustments to the seed mix species or cultivars.

E22.3 Materials

E22.3.1 Native Seed Mixes

(a) Seed mixes for naturalization on the North Upper and Mid Bank and the South Upper and Mid Bank (by weight) are listed on the Drawings.

(b) Use seed mixes that are free of disease, weed seeds and other foreign materials.

E22.3.2 Grass species that may be substituted in varying percentages (no greater than 15%).

(a) Western Wheatgrass *Agropyron smithii*

(b) Streambank Wheatgrass *Agropyron riparium*

E22.3.3 Use Annual ryegrass as a cover crop (nurse crop) in all areas to be seeded.

E22.3.4 Hydro-mulch: mulch, water and tackifier shall be in accordance with CW 3520.

E22.3.5 Fertilizer: chemical fertilizers shall have N-P-K compositions as recommended by an agricultural soil testing laboratory approved by the Contract Administrator, provided for Native Grasses.

E22.3.6 Herbicides and insecticides shall be in accordance with CW3520.

E22.4 Construction Procedures

E22.4.1 Native seed mix areas:

(a) Prepare seed bed in accordance with E20.

(b) Maintain positive drainage.

(c) Seeding and hydro mulching shall be in accordance with CW 3520.

(d) Sow native seed mixes at 0.5 kg/100 square metres.

(e) Sow Sideoats Grama at 0.4 kg/100 square metres.

(f) Sow cover crop at 0.6 kg/100 square metres.

E22.4.2 Fertilizer:

(a) Where soil analysis and recommendation for fertilizer is unavailable apply 11-52-0 at a rate of 0.75 kg per 100 square metres.

E22.4.3 Maintenance for Establishment

(a) Maintain seeded areas for growth establishment for a period of ninety days following completion of seeding and hydro-mulching operations.

(b) The Contractor shall water seeded and hydro-mulched areas as required to obtain optimum soil moisture levels for germination and continued growth of grasses and flowers. Control the watering to prevent seed washouts.

(c) The Contractor shall mow native seed mix areas once, preferably in October, removing cut material that would smother seeded plants.

(d) Additional mowing to a height of 125 mm shall be completed as directed by the Contract Administrator in order to remove extensive weed growth and/or to maintain healthy growth of grasses and wildflowers.

E22.4.4 Chemical Weed Control: the Contractor shall use chemical weed control, Roundup, 2-4 D or Diacamba, only as required to spot remove weeds in localized areas. Do not treat large areas seeded with wildflowers with chemical weed control agents.

E22.4.5 The maintenance period will terminate after the following criteria have been met:

(a) Certified seed that has been sowed meets the requirements of CW 3520 and this specification

(b) Seeded grasses show healthy, vigorous growth

(c) The seeded area has a firm, uniform and even surface

(d) The seeded area is free of debris, including leaves

(e) The seeded area has sufficient growth density that bare spots do not exceed 5% of total surface area

(f) The area has less than 10 noxious weeds per 50 square metres

(g) Seeded areas are free of damaging insects

E22.5 Method of Measurement and Basis of Payment

E22.5.1 Native Seed Mixes

(a) The North Upper and Mid Bank Seed Mix and the South Upper and Mid Bank Seed Mix shall be measured on an area basis for each type of seed mix. The total area to be paid for each type of seed mix shall be the number of square metres seeded and maintained in accordance with this specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

(b) No measurement shall be made for seed placed outside the limits of placement unless directed by the Contract Administrator.

(c) Supply, placement and maintenance of native grasses seed mixes will be paid for at the Contract Unit Prices for the following items, which prices shall be payment in full for supplying all materials and performing all operations herein specified, and all other items incidental to the Work in accordance with this specification and CW3520, and maintaining all seeded areas during the Contractor's warranty period:

(i) Supply and Placement of Upper Bank Seeding

(ii) Supply and Placement of Mid Bank Seeding

(iii) Supply and Placement of "Sideoats Grama Seed"

E22.5.2 Nurse or Cover Crop Seeding: there will be no separate measurement for nurse or cover crop seeding. Seeding of a nurse crop will be incidental to other seeding operations.

E22.5.3 Herbicides and Insecticides: there will be no separate measurement for materials, equipment and operations related to the use of herbicides and insecticides.

E23. MAINTENANCE OF PLANT MATERIAL

E23.1 Description

E23.1.1 This specification shall cover the maintenance of trees and shrubs and seeded areas, for one year following completion of all Maintenance for Establishment purposes. An estimated period of scheduled maintenance for the year shall be from April 15 to October 15 (6 months).

E23.2 Materials

E23.2.1 The Contractor shall provide all necessary materials and equipment including: additional topsoil, soil amelioration, mulch, sod, seed, fertilizers and pesticides, and tractors, mowers, hand mowers, trimmers, fertilizer spreaders pruning tools, water trucks, hoses, water metres and any other items necessary for the maintenance of the areas indicated in this specification.

E23.2.2 Further to the above, the Contractor shall supply, install, and maintain any required fencing or other means to protect the planted areas from public traffic or damage from animals during the maintenance period. The locations of fences shall be limited to within the defined Work area.

E23.2.3 Chemical Herbicide: Roundup, 2-4D, Diacamba or similar chemical herbicides approved by Agriculture Canada. Use only with the approval of the Contract Administrator.

E23.3 Personnel

E23.3.1 The Contractor shall provide all necessary personnel for the ongoing scheduled maintenance operations.

E23.3.2 Personnel should have at least one year of experience in landscape maintenance and should be under the direction of a foreman, in all cases, with not less than five years of experience with similar maintenance operations.

E23.3.3 At a minimum, the maintenance foreman shall be familiar with native plantings and plant identification techniques.

E23.4 Timing

E23.4.1 Maintain plantings and planting beds and seeded areas for a period of one (1) year from the completion of the Maintenance for Establishment period, as determined by the Contract Administrator.

E23.4.2 Provide the Contract Administrator a Schedule of Maintenance Activities for the one year scheduled maintenance period, based on the requirements outlined herein. The scheduled maintenance period shall not commence until the schedule has been reviewed by the Contract Administrator.

E23.4.3 The Contractor shall provide a detailed maintenance log, including but not limited to the following: hours of labour undertaken, number of personnel and equipment used. The log will itemize watering, spraying and any other maintenance Work. Contractor shall submit logs monthly, during the growing season, at regularly scheduled meetings with the Contract Administrator. Maintenance logs will be incidental to the maintenance Work.

E23.5 Maintenance Methods

E23.5.1 Maintenance of Trees and Shrubs (1 year): to include but not be limited to:

(a) Watering:

(i) Contractor shall determine the need for watering by taking soil tests weekly with a one inch auger. Take a test sample from both the planting soil mix and from tree root balls by drilling to a minimum depth of 600 mm. The soil shall contain enough moisture to hold together when compressed in the hand, but shall not be muddy.

(ii) Testing shall be undertaken at a minimum of 2 sites per week. The installed plant material shall not be allowed to dry out to the detriment of the viability of the plant material. Contractor shall monitor and submit testing results in maintenance logs. Contractor shall water-in plant material each fall at the end of annual scheduled maintenance.

(iii) The maintenance logs recording watering dates and areas watered shall be submitted to the Contract Administrator at least once per year at the end of each growing season.

(b) Fertilizing, Pruning and Spraying of Trees and Shrubs:

(i) A qualified local arborist shall undertake all fertilizing, pruning and spraying of trees and plant material.

(ii) Where chemicals are used to control weed growth refer to E18.

(c) Pruning: prune out damaged limbs or deadwood to standard nursery practices.

(d) Cultivation/Weed Growth:

(i) Contractor shall cultivate only as required to reconstruct tree saucers, or to remove significant weed growth.

(ii) Contractor shall not cultivate around plants with a shovel or spade. Cultivate with a hoe or similar tool to a maximum depth of 50 mm. Maintain natural elevation of the surrounding area when cultivating and create a gentle saucer to contain water around the plant.

(iii) Carefully replace wood chip mulch when cultivation has been completed.

(iv) Weed by hand a minimum of once per month, or as otherwise determined by the Contract Administrator, to remove competition to installed plant material by undesirable plant material. Dispose of undesirable material off-site.

(v) The Contractor shall be responsible for any fines or weed control notices issued for the planting areas. All such notices shall be dealt with by the Contractor in a timely fashion. Copies of any fines and notices shall be provided to the Contract Administrator within five (5) working days of their receipt by the Contractor.

(e) Spraying:

(i) Spot spray plant material to control insect pests and diseases, using horticultural compounds approved by Agriculture Canada which are specific for the problem to be contained.

(ii) Contractor shall be responsible for obtaining any permits required for spraying in proximity to the Red River.

(f) Straightening: straighten trees and shrubs as required or as directed by the Contract Administrator.

(g) Mulching: add mulch to tree saucers and planting beds as required to maintain a 75mm cover. Contractor shall, in addition to hand weeding, lightly rake mulched area periodically.

E23.5.2 Maintenance of Native Seed Mix Areas (1 year)

(a) Repair and re-seed dead or bare spots to the satisfaction of the Contract Administrator.

(b) Schedule mowing in mid-October, to a height of 125mm and remove excess thatch.

(c) Mow localized areas, only, as required to control noxious weeds.

(d) Typically eliminate weeds by hand or chemical means. Spot-treat localized weedy areas, only, with Roundup, 2-4D or Diacamba.

(e) Water native seeded mix areas as required for establishment of healthy grasses and for maintenance in periods of severe drought.

(f) Control damaging insects, as required, with environmentally friendly chemical agents approved by Agriculture Canada.

(g) Standard: at the end of the required maintenance period grasses must be well-established in all native seed mix areas or re-seeding will be required at the Contractor's expense and to the satisfaction of the Contract Administrator.

(i) Scattered bare spots, none of which is larger than 100 mm square will be allowed up to a maximum of five (5) percent of any area.

(ii) Re-seed areas with unacceptable native cover.

(iii) Any areas re-seeded after September of the final year of the maintenance period shall have the additional 60-day maintenance period commence on May 15th of the following year or such date as mutually agreed upon by all parties, at which time all native seed mix areas must show an even stand of live growth.

E23.5.3 General Cleanup

(a) Cleanup garbage and debris throughout site throughout the three year maintenance period.

(b) Remove soil or grass clippings from pavement areas.

(c) Dispose of collected garbage and clippings at a recognized solid waste disposal site.

(d) Clean-up shall include removal of all debris deposited by floods.

E23.6 Acceptance Criteria

E23.6.1 On an annual basis, during the growing season, typically in late June, the Contractor and Contract Administrator shall inspect the works to determine plant material survival rates.

E23.6.2 All plant material that does not survive or appear viable during the annual inspection will be replaced to meet the following standards on a bed by bed basis:

(a) All potted planting material shall be guaranteed to an overall survival rate of 85 percent.

E23.6.3 Plant material which has died or which has failed to thrive will be promptly removed from the site following each annual inspection at the Contractor's expense. The Contractor will

be responsible for the cost of replacing any non-viable/dead plant material as required to meet the acceptance criteria.

E23.6.4 The Contract Administrator shall have the discretion to add additional plant material at the appropriate Contract Unit Prices.

E23.7 Method of Measurement and Basis of Payment

E23.7.1 General Maintenance and Watering of Trees, Shrubs and Native Seed Mix Areas

(a) General maintenance, including: watering all areas as required, fertilizing, pruning, spraying, cultivation/weed control, tightening of guy wires, straightening, mulching for trees and shrubs; native seed mix areas will be measured on an annual basis for the one year of scheduled maintenance.

(b) General maintenance, clean-up and watering will be paid for at the Contract Unit Price for "General Plant Material Maintenance", which prices will include supply of all labour, equipment and materials and performing all operations herein described, and all other items incidental to the Work included in this specification.

E24. PLANTING SOIL

E24.1 Description

E24.1.1 This specification shall cover supply, preparation and placement of planting soil, including fertilizer application.

E24.2 Materials

(a) Peatmoss

(i) Peat moss shall be decomposed plant material, fairly elastic and homogenous, free of colloidal residue, wood, sulphur and iron; containing a minimum of 60% organic material by weight, with moisture content not exceeding 15%. Shredded particles shall not exceed 6 mm in size. Minimum pH value of peat shall be 4.5; maximum 6.0.

(b) Sand

(i) Sand shall be hard, granular, sharp sand to CSA A82.56-M1976, well-washed and free of impurities, chemicals and organic matter.

(c) Bonemeal

(i) Bonemeal shall be raw, finely ground with a minimum chemical analysis of 3% nitrogen and 20% phosphoric acid.

(d) Wood Chip Mulch

(i) Wood chip mulch shall be chipped ash, maple, poplar, birch and other deciduous trees. Mulch shall be chipped to sizes ranging from 50mm to 100mm. Mulch may NOT contain stringy twigs and seed, free of non-organic material, wood preservatives or diseased wood. The mulch shall contain no more than 5% of the following materials in total: soil, sawdust, peatmoss, coniferous wood and needles.

(ii) The Contractor shall supply a wood chip mulch sample to the Contract Administrator for approval prior to installation.

(e) Fertilizer

(i) Chemical fertilizers shall have N-P-K compositions as recommended by an agricultural soil-testing laboratory approved by the Contract Administrator provided for each of the following:

(i) Sod (City Specification) with imported topsoil;

(ii) Horticultural trees and shrubs with planting soil mix; and

(iii) Native Seed Mix with soil amendments.

(f) Chemical Application

(i) Roundup or similar chemical herbicides approved by Agriculture Canada shall be used only with the approval of the Contract Administrator.

E24.3 Construction Methods

(a) Planting Soil Mixture for Trees and Shrubs

(i) Planting soil mixture shall be a mix of 75% topsoil and 20% peatmoss, loose by volume. Incorporate 5% sand, or as required, to improve soil texture. Incorporate bonemeal at 3 kg/cubic metre of planting soil mixture.

(b) Construction of Planting Beds

(i) Excavate planting beds to a depth of 500 mm.

(ii) Install planting soil mixture, loosely compacted, 500 mm deep in planting beds with a smooth top surface to match surrounding contours. Level planting soil mixture by hand around existing and newly planted trees and shrubs.

(iii) Install 100 mm wood chip mulch in all beds following planting operations.

E24.4 Method of Measurement

(a) Planting Soil Mixture

(i) Construction of planting beds, and supply and installation of planting soil mixture shall be measured on an area basis for the number of square metres of 500 mm depth planting bed constructed, complete with 500 mm depth planting soil mixture (depth is allowing for settlement), all in accordance with the Drawings and this specification, and accepted by the Contract Administrator, as computed by the Contract Administrator.

(ii) There will be no separate measurement for planting soil mixture used in planting individual trees and shrubs that are not planted in beds.

(b) Wood Chip Mulch

(i) Supply and installation of wood chip mulch shall be measured on an area basis for the number of square metres of 100 mm wood chip mulch installed in planting beds in accordance with the Drawings and this specification, and accepted by the Contract Administrator, as computed by the Contract Administrator.

(ii) There will be no separate measurement for wood chip mulch used in individual trees saucers.

E24.5 Basis of Payment

(a) Planting Soil Mixture

(i) Construction of planting beds and supply and installation of planting soil mixture will be paid for at the Contract Unit Price for “Planting Beds (500mm depth)”, which price shall be payment in full for supplying all materials and performing all operations herein specified, and all other items included in the work of this specification.

(b) Wood Chip Mulch

(i) Supply and installation of wood chip mulch will be paid for at the Contract Unit Price for “Wood Chip Mulch (100mm depth)”, which price shall be payment in full for supplying all materials and performing all operations herein specified, and all other items included in the work of this specification.

E25. WOODEN BOLLARDS

E25.1 General

E25.1.1 This specification covers the supply and installation of wooden bollards in areas indicated on the Drawings.

E25.1.2 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other

things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E25.2 Delivery and Storage

E25.2.1 Store units in a protected location, immediately upon arrival on the site.

E25.2.2 Remove from site any units which have been damaged during transportation and replace.

E25.3 Materials

E25.3.1 Materials for the wooden bollards shall be as specified on the Drawings.

E25.4 Construction Method

E25.4.1 Wooden bollards shall be installed in locations and in the manner indicated on the Drawings.

E25.5 Measurement and Payment

E25.5.1 Bollards will be measured on a per unit basis. Payment shall be at the Contract Unit Price for “Supply and Install Wooden Bollard”.

E26. REMOVAL, STORAGE AND RE-PLANTING OF EXISTING TREES

E26.1 This Specification shall deal with the removal, storage and re-planting of existing trees as indicated on the Drawings.

E26.2 General

E26.2.1 Removal:

(a) The trees to be removed, stored and replanted within this project shall be either containerized (field-potted) or balled and burlapped by proper cultivating practices in compliance with “Guide Specification for Nursery Stock”, Latest Edition of Canadian Nursery Trades Association (Landscape Canada).

(b) Balled and burlap deciduous trees must have been dug with firm ball. Root balls must include 75% of fibrous and feeder root system. Secure root balls with burlap, heavy twine and rope.

E26.2.2 On-Site or Off-Site Storage:

(a) Coordinate removal of trees with shipping/storage of plants to ensure minimum time lapse between removal and storage.

(b) Tie branches of trees securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire, which would damage bark, break branches or destroy natural shape of plant. Give full support to root balls during movement.

(c) Cover plant foliage with tarpaulin, and protect bare roots by means of dampened straw, peat, saw dust or other acceptable material to prevent loss of moisture during transit and storage.

(d) Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 50 mm diameter with wound dressing.

(e) For long term storage keep roots moist and protected from sun and wind. Heel-in trees in shaded areas and water well.

(f) Approval required for plant material to be held in cold storage.

E26.3 Materials

E26.3.1 Water shall be potable and free of minerals which may be detrimental to plant growth.

E26.3.2 Fertilizer shall be slow release organic. Fertilizer shall contain N-P-K in ratio as recommended by soil test results.

E26.3.3 Root ball burlap shall be 150 g Hessian burlap.

E26.3.4 Anti-desiccant shall be wax-like emulsion to provide film over plant surfaces reducing evaporation but permeable enough to permit transpiration.

E26.3.5 Wound dressing shall be horticultural accepted non-toxic, non-hardening emulsion.

E26.3.6 Planting soil mixture

(a) Soil to supplement soil in root ball to be mixture of sand, peat and existing clay prepared for Soil Amendment specified in E15.

(b) Bonemeal shall be raw bonemeal, finely ground with a minimum analysis of 3% nitrogen and 20% phosphoric acid, added to planting soil at a rate of 3 kg per cubic meter of planting soil mixture.

E26.3.7 Fertilizer: chemical fertilizers shall have N-P-K compositions as recommended by an agricultural soil testing laboratory, approved by the Contract Administrator, for horticultural trees, shrubs and herbaceous material with growing medium.

E26.4 Construction Methods

E26.4.1 Plant in accordance with construction methods for Trees and Shrubs E21.

E26.5 Maintenance for Establishment

E26.5.1 Water plant material to prevent desiccation. Assume that watering will be required once a week for first four weeks following installation; thereafter, once every second week for the remainder of the maintenance period for establishment. Ensure adequate moisture in root zone at freeze-up.

E26.5.2 Keep mulched tree saucers free from weeds by manually removing undesirable plants during the maintenance period for establishment.

E26.5.3 Spray plants as required to combat pests and diseases. Use organic chemicals approved by Agriculture Canada.

E26.5.4 Make adjustments requested by the Contract Administrator, including straightening trees and adding protection from animals.

E26.6 Maintenance Period for Establishment

E26.6.1 Maintain plant material for a minimum period of two months (60 days) following completion of planting operations, or until such time that live growth is evident.

E26.7 Method of Measurement and Basis of Payment

E26.7.1 Removal, protection and re-planting of existing trees will be paid for items listed below, which shall be considered compensation in full for supplying all materials and performing all operations herein specified, and all other items incidental to the Work of this Specification.

(a) Removal, storage and re-planting of existing Amur Maples

E26.7.2 Supply and installation of fertilizer for plant material will be incidental to the Work of this Contract.

E27. WOODEN STEPS

E27.1 Description

E27.1.1 This Specification shall cover all operations relating to the construction of Wooden Steps, as specified herein and as shown on the Drawings.

E27.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E27.2 Related Sections

E27.2.1 Granular Sub-base and Base

E27.3 Scope of Work

E27.3.1 The Work under this Specification shall involve the following works:

(a) Supply and Install Wooden Steps.

E27.4 Materials

E27.4.1 All materials shall be in accordance with the following:

(a) Steps: No. 2 or better Western Red Cedar.

(b) Metal Fasteners: all hardware bolts, nails, ardox spikes and screws to be hot-dipped galvanized.

(c) Anchoring Rods: reinforcing bars hot-dipped galvanized after fabrication.

E27.5 Construction Method

E27.5.1 Install wooden steps on top of granular sub-base (refer to Granular Sub-base and Base section) complete with specified accessories as indicated securely in place, rigid, plumb, square and level as indicated on the Drawings.

E27.5.2 Firmly anchor bottom course of wooden steps with reinforcing rods which extend a minimum of 900mm below bottom timber.

E27.5.3 Use single full-length timbers to result in minimum amount of joints.

E27.5.4 Countersink visible spikes or other anchors, plates, fasteners bolts or nuts flush with wood surface

E27.6 Measurement and Payment

E27.6.1 Wooden Steps will be measured on a per unit basis. Payment shall be at the Contract Unit Price for “Supply and Placement of Wooden Steps”.

E28. ELECTRICAL WORK

E28.1 The Contractor shall:

(a) Perform all Work in accordance with the Plans, Specifications and the latest edition of the City of Winnipeg Electrical Code.

(b) Arrange and pay for all required electrical permits, inspections, fees required.

E28.2 Scope

(a) Supply and install custom control panel as indicated on Drawings.

(b) Supply and install temperature sensors, including all conduit, trenching and backfilling.

(c) Supply and install heat trace cabling, including all conduit, trenching and backfilling.

(d) Setup and calibration of temperature sensors.

(e) Commissioning.

E28.3 Submittals

(a) Submit shop drawings for the following:

(i) Custom control panel and all components.

(ii) Temperature transmitters.

E28.4 Quality Assurance

(a) Qualifications: electrical work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.

E28.5 Permits, Fees and Inspection

(a) Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of Work.

(b) Pay associated fees.

(c) Contract Administrator will provide Drawings and Specifications required by Electrical Inspection Department and Supply Authority at no cost.

(d) Notify Contract Administrator of changes required by Electrical Inspection Department prior to making changes.

(e) Furnish Certificates of Acceptance from authorities having jurisdiction on completion of Work to Contract Administrator.

E28.6 System Start-up

(a) Instruct Contract Administrator and operating personnel in operation, care and maintenance of systems, system equipment and components.

(b) Arrange and pay for services of Manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

(c) Arrange and pay for services of an instrumentation technician to check, adjust, balance and calibrate components and instruct operating personnel.

(d) Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

E28.7 Materials and Equipment

(a) Material and equipment to be CSA certified.

(b) Material and equipment shall be new and free from all defects.

(c) Factory assembled control panels and component assemblies.

E28.8 Grounding

(a) Ground and bond all equipment in accordance with the Manitoba Electrical Code.

(b) All above ground conductors shall be green insulated.

E28.9 Cabling

(a) Instrumentation Cable: 16 awg, twisted pair, braided shield, 300V insulation. Armoured, direct burial rated.

(b) Power Cable: Minimum #12 awg, stranded copper, 300V insulation. Armoured, direct burial rated.

E28.10 Custom Control Panel

(a) Manufactured by Manco Control Systems or Celco Control Systems.

(b) Panel as indicated on Plans.

(c) Provide shop drawings including panel layout, component cutsheets, etc.

(d) Terminal blocks shall be Weidmuller W Series.

(e) Identification of terminal strips and wiring.

(f) All field wiring shall be labelled and terminated on terminal strips.

E28.11 Temperature Transmitters

(a) Temperature transmitter, complete with integral display.

(b) 4-20 mA output.

(c) Calibrated -10 to +40 Celsius.

(d) Manufactured by: Endress and Hauser, Rosemount

E28.12 Measurement and Payment

(a) Electrical Work shall be measured and paid for on a lump sum basis and shall include the supply and installation of all wiring, cabling, conduit, control panels, temperature transmitters, permits ,fees, setup and calibration of temperature transmitters, and commissioning.