



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 859-2008

**OMAND'S CREEK CULVERT THROUGH SARGENT AVENUE – REPLACEMENT OF
EXISTING CULVERTS AND RELATED WORKS**

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 OMAND'S CREEK CULVERT THROUGH SARGENT AVENUE – REPLACEMENT OF EXISTING CULVERTS AND RELATED WORKS

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, January 7, 2009.

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

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

B3. SITE INVESTIGATION

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

B4. ENQUIRIES

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

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

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

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

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

B5. ADDENDA

B5.1 The Contract Administrator may, at any time prior to the Submission Deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.

B5.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.

B5.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at <http://www.winnipeg.ca/matmgt>.

B5.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Division internet site for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

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

B6. SUBSTITUTES

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

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

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

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

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

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

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

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

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

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

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

B7. BID COMPONENTS

- B7.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices;
 - (c) 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, may result in the Bid being determined to be non-responsive.
- B7.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B7.8 Bids shall be submitted to:
- The City of Winnipeg
Corporate Finance Department
Materials Management Division
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B8. BID

- B8.1 The Bidder shall complete Form A: Bid, making all required entries.
- B8.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his own name, his name shall be inserted;
 - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
 - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
 - (d) if the Bidder is carrying on business under a name other than his own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.
- B8.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B8.2.

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

B9. PRICES

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

B10. QUALIFICATION

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

B12.1.2 Bids determined by the Manager of Materials, or his designate, to not include the Bid security specified in B11 will not be read out.

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

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

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

B13. IRREVOCABLE BID

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

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

B14. WITHDRAWAL OF BIDS

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

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

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

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

- (a) retain the Bid until after the Submission Deadline has elapsed;

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

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

B15. EVALUATION OF BIDS

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

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

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

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

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

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

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 internet site 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 construction of a cast-in-place concrete box culvert in Omand's Creek through Sargent Avenue.

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

- (a) Excavation and Backfill
- (b) Utility Works
- (c) Cast-in-Place Concrete
- (d) Creek Flow Maintenance
- (e) Riprap
- (f) Road and Sidewalk Restoration
- (g) Fencing
- (h) Sewer Pipe Replacement
- (i) Feedermain Protection

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is Dillon Consulting Limited, represented by:
Mr. James Betke, P.Eng.
Associate
200-895 Waverley Street
Winnipeg, Manitoba R3T 5P4

Telephone No. (204) 453-2301
Facsimile No. (204) 452-4412

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

D4. CONTRACTOR'S SUPERVISOR

D4.1 At the pre-construction meeting, the Contractor shall identify his designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D5. NOTICES

D5.1 Except as provided for in C23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

D5.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D5.3,

D5.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D3.1.

D5.3 Notwithstanding C21.3, all notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following address or facsimile number:

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

D5.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following address or facsimile number:

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

D6. FURNISHING OF DOCUMENTS

D6.1 The Contractor will not be provided any additional complete sets of the Bid Opportunity upon award of the Contract. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him at cost.

SUBMISSIONS

D7. AUTHORITY TO CARRY ON BUSINESS

D7.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D8. SAFE WORK PLAN

D8.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least 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.

D8.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at <http://www.winnipeg.ca/matmgt/safety/default.stm> .

D9. INSURANCE

D9.1 The Contractor shall provide and maintain the following insurance coverage:

- (a) commercial general liability insurance, in the amount of at least two million dollars (\$2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a

cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, broad form property damage cover and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;

- (b) automobile liability insurance for owned automobiles used for or in connection with the Work in the amount of at least two million dollars (\$2,000,000.00) at all times during the performance of the Work and until the date of Total Performance;
- (c) an all risks Installation Floater carrying adequate limits to cover all machinery, equipment, supplies and/or materials intended to enter into and form part of any installation.

D9.2 Deductibles shall be borne by the Contractor.

D9.3 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract.

D9.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D10. PERFORMANCE SECURITY

D10.1 The Contractor shall provide and maintain performance security until the expiration of the warranty period in the form of:

- (a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; or
- (b) an irrevocable standby letter of credit issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form attached to these Supplemental Conditions (Form H2: Irrevocable Standby Letter of Credit), in the amount of fifty percent (50%) of the Contract Price; or
- (c) a certified cheque or draft payable to "The City of Winnipeg", drawn on a bank or other financial institution registered to conduct business in Manitoba, in the amount of fifty percent (50%) of the Contract Price.

D10.1.1 Where the performance security is in the form of a certified cheque or draft, it will be deposited by the City. The City will not pay any interest on certified cheques or drafts furnished as performance security.

D10.2 If the Bid security provided in his Bid was not a certified cheque or draft pursuant to B11.1(c), the Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D11. SUBCONTRACTOR LIST

D11.1 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 the General Conditions for the return of the executed Contract.

D12. DETAILED WORK SCHEDULE

D12.1 The Contractor shall provide the Contract Administrator with a detailed work schedule (Form L: Detailed Work Schedule) at least two (2) Business Days prior to commencement of any Work

on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract.

D13. WATER MANAGEMENT PLAN

- D13.1 The Contractor shall provide the Contract Administrator with a water management plan at least two (2) Business Days prior to commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract.
- D13.2 The Water Management Plan should be prepared and submitted in a format that clearly identifies how the Contractor will undertake dewatering activities and maintain creek flow at the Site during construction.

SCHEDULE OF WORK

D14. COMMENCEMENT

- D14.1 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.
- D14.2 The Contractor shall not commence any Work on the Site until:
- (a) the Contract Administrator has confirmed receipt and approval of:
 - (i) evidence of authority to carry on business specified in D7;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the Safe Work Plan specified in D8;
 - (iv) evidence of the insurance specified in D9;
 - (v) the performance security specified in D10;
 - (vi) the Subcontractor list specified in D11;
 - (vii) the Detailed Work Schedule specified in D12; and
 - (viii) the Water Management Plan specified in D13.
 - (b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a pre-construction meeting.

D15. WORKING HOURS AND CRITICAL STAGES

- D15.1 It is expected the Contractor will work a minimum sixteen (16) hour working day, including Saturdays, for achieving the critical stage of reopening Sargent Avenue in seven (7) weeks when the weather conditions are favourable for undertaking this Work unless specific activities being undertaken in a manner acceptable to the Contract Administrator do not allow this to be possible.
- D15.2 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:
- (a) Reopening of Sargent Avenue to vehicles and pedestrians by March 14, 2009.
 - (b) Completion of all in-stream work including riprap installation and removal of cofferdams by March 21, 2009.
- D15.3 No work will be allowed in the creek between April 1 and June 15, 2009.

D16. SUBSTANTIAL PERFORMANCE

- D16.1 The Contractor shall achieve Substantial Performance by June 19, 2009.
- D16.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for

purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

- D16.3 The date on which the Work has been certified by the Contract Administrator as being substantially performed to the requirements of the Contract through the issue of a certificate of Substantial Performance is the date on which Substantial Performance has been achieved.

D17. TOTAL PERFORMANCE

- D17.1 The Contractor shall achieve Total Performance by June 26, 2009.
- D17.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.
- D17.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D18. LIQUIDATED DAMAGES

- D18.1 If the Contractor fails to achieve Critical Stages or Total Performance in accordance with the Contract by the days fixed herein for the same, the Contractor shall pay the City the following amounts per Working Day for each and every Working Day following the days fixed herein for same during which such failure continues.
- (a) Reopening of Sargent Avenue to vehicles and pedestrians by March 14, 2009: five thousand (\$5,000.00) dollars.
 - (b) Total Performance by June 26, 2009: five hundred (\$500.00) dollars.
- D18.2 The amount specified for liquidated damages in D18.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Critical Stages or Total Performance by the days fixed herein for same.
- D18.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D19. ACCELERATED COMPLETION

- D19.1 Description
- D19.1.1 This Specification shall cover the accelerated completion of the Works of this Contract.
- D19.2 Acceleration of Work
- D19.2.1 At no risk to the City, the Contractor at his own initiative, means, and expense, may undertake to complete the Works of this Contract to facilitate the safe reopening of Sargent Avenue to traffic in advance of the Critical Stage of March 14, 2009, specified herein.
- D19.2.2 In recognition of the fact that an early completion of the Works is of benefit to the City, the City will compensate the Contractor for said early completion on a per diem unit price basis, as hereinafter set out, provided that the City will not be liable to pay for any period of acceleration in excess of ten (10) Calendar Days.
- D19.2.3 It is noted that certain delays on culvert replacement Work are normal, due to Site conditions, necessary layout and dimensional changes. The Contract Administrator will attempt to resolve the situation as soon as possible. The Contractor is advised that no extension to time will be given for events of this sort which cause construction delay and

are resolved within 48 hours of the requirement of change becoming known to both the Contractor and the Contract Administrator.

D19.3 Method of Measurement

D19.3.1 Subject to Clause D19.2 hereof, accelerated completion will be measured on a unit basis per diem. The number of days to be paid for will be the total number of Calendar Days which the entire facility is safely re-opened to vehicular and pedestrian traffic in advance of the Critical Completion Date of March 14, 2009, specified herein, with all specified Works completed acceptable to the Contract Administrator.

D19.4 Basis of Payment

D19.4.1 Subject to Clause 19.2 hereof, accelerated completion will be paid for at the Unit Price per diem specified hereinafter for "Accelerated Completion" which price will be payment in full for performing all operations undertaken and all other items incidental to the Work included in this Specification. Unit Price per diem = \$10,000.00.

D20. SCHEDULED MAINTENANCE

D20.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Soil maintenance as specified in CW 3510-R7;

D20.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D21. JOB MEETINGS

D21.1 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.

D21.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

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

D22.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D23. LAYOUT OF THE WORK

D23.1 Further to C6, the Contract Administrator will provide the basic centrelines and an elevation of the works as shown on the Drawings.

D23.2 The Contractor shall be responsible for the true and proper layout of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work. The

Contractor shall provide all required instruments and competent personnel for performing all layouts.

- D23.3 Should any error appear or arise in location, levels, dimensions, and/or alignments during the course of the Work, the Contractor shall promptly rectify such errors to the satisfaction of the Contract Administrator, at his own expense.
- D23.4 The Contract Administrator shall be notified at least one (1) Working Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.
- D23.5 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items used in giving the basic data supplied by the Contract Administrator. Any such benchmarks or stakes removed or destroyed by the Contractor, without the consent of the Contract Administrator, shall be replaced by the Contract Administrator at the expense of the Contractor.

MEASUREMENT AND PAYMENT

D24. PAYMENT

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

WARRANTY

D25. WARRANTY

- D25.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

FORM H1: PERFORMANCE BOND
(See D10)

KNOW ALL MEN BY THESE PRESENTS THAT

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

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

_____ dollars (\$_____.)

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

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

BID OPPORTUNITY NO. 859-2008

OMAND'S CREEK CULVERT THROUGH SARGENT AVENUE – REPLACEMENT OF EXISTING
CULVERTS AND RELATED WORKS

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)

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 L: DETAILED WORK SCHEDULE
 (See D12)

**OMAND'S CREEK CULVERT THROUGH SARGENT AVENUE – REPLACEMENT OF EXISTING
 CULVERTS AND RELATED WORKS**

For each item of Work, indicate the cumulative percentage proposed to be completed by the end of each time period until 100% completion is achieved. Note that Critical Stages and Total Performance requirements are highlighted.					
Work Component/Milestone	Start	25%	50%	75%	100%
Mobilization					
Cofferdam Construction					
Close Sargent Avenue					
Excavation					
Sewer Works					
Concrete Box Culvert Construction					
Backfill					
Utility Works					
Concrete Roadway Construction					
Concrete Curb and Gutter Construction					
Concrete Sidewalk Construction					
Open Sargent Avenue	March 14, 2009				
Riprap Installation					
Cofferdam Removal					March 21, 2009
No Work Activity in the Creek	April 1 to June 15, 2009				
Traffic Barrier					
Chain Link Fencing					
Grading and Topsoil					
Total Performance	June 26, 2009				

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 internet site at <http://www.winnipeg.ca/matmgt>.
- E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.2.3 Further to C2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.
- E1.3 The following are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
C316-08-01	Cover Sheet
C316-08-02	Demolition, Excavation and Test Holes
C316-08-03	General Arrangement of Proposed Works
C316-08-04	Concrete Box Culvert Layout
C316-08-05	Concrete Box Culvert Details 1 of 2
C316-08-06	Concrete Box Culvert Details 2 of 2
C316-08-07	Sewer and Feedermain Profiles
C316-08-08	Roadway Reconstruction and Embankment Plan – Balanced Aluminum Barrier Layout
C316-08-09	Roadworks, Sewer/Feedermain and Embankment Details
C316-08-10	Balanced Aluminum Barrier Standard Details
D-1266	Sargent Ave. Feedermain Plan and Profile – Ingersoll St. to Empress St. – Sta. 0+00 to Sta. 9+85
D-1272	Sargent Av. Feedermain - Details of Existing Valve Pit at Sargent Av. & Empress St. and Details of Thrust Blocks
56-0148-3	24"φ Feedermain on Sargent Ave.

E2. SOILS INVESTIGATION REPORT

- E2.1 Further to C3.1, a November 2004 Geotechnical Report for the Sargent Avenue Culvert Replacement by National Testing Laboratories Limited exists and may be viewed at the office of the Contract Administrator.
- E2.2 Soil information presented in the above Geotechnical Report and on the Drawings represents subsurface conditions encountered at the time of the field investigation and may not be indicative of the actual conditions that will be encountered during the time of construction.
- E2.3 The above Geotechnical Report was used by the Contract Administrator as a reference during the design of the proposed Works. The recommendations in this report shall not be construed as a requirement of the proposed Works unless also contained in the Contract Documents.
- E2.4 Although the above Geotechnical Report and borehole information are available for Bidder's examination and review at the office of Dillon Consulting Limited, it is the responsibility of those using this information to ensure it is suitable for their purposes and to supplement it as they consider necessary.

E3. VERIFICATION OF WEIGHTS

- E3.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.
- E3.1.1 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.
- E3.1.2 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 Contractor's scales for Consumer & Corporate Affairs certification seals;
 - (b) Observing weighing procedures;
 - (c) Random checking of either gross or tare weights by having such trucks or truck/trailer(s) combinations as the Contract Administrator shall select weighed at the nearest available certified scale;
 - (d) Checking tare weights shown on delivery tickets against a current tare.
- E3.2 The Contractor shall ensure that each truck or truck/trailer(s) combination delivering Material which is paid for on a weight basis carries a tare not more than one (1) month old.
- E3.2.1 The tare shall be obtained by weighing the truck or truck/trailer(s) combination on a certified scale and shall show:
- (a) Upon which scale the truck or truck/trailer(s) combination was weighed;
 - (b) The mechanically printed tare weight;
 - (c) The license number(s) of the truck and trailer(s);
 - (d) The time and date of weighing.

E4. TRUCK WEIGHT LIMITS

- E4.1 The City shall not pay for any portion of Material which results in the vehicle exceeding the maximum gross vehicle weight allowed under *The City of Winnipeg Traffic By-Law*, unless such vehicle is operating under special permit.

E5. NIGHT WORK AND NOISE LIMITATIONS

- E5.1 Night work may have to be undertaken by the Contractor, as required by his Schedule of Work and by his actual work progress, to ensure timely completion of all Works of this Contract, all at his own cost.
- E5.2 Further to the General Conditions, the Contractor shall show that he has the approval of all applicable authorities in regard to said night work and to the anticipated/actual construction noise levels. In particular, such work shall conform with the Noise Control By-Law No. 2480/79. Also, the Contractor, at his own cost, incidental to these Works, shall supply sufficient lighting to enable all night work to be done in a safe and efficient manner, satisfactory to the Contract Administrator.
- E5.3 The Contractor is advised that possible noise level problems may limit his work activities on Sundays and at night. The Contractor must request and receive approval from the Contract Administrator at least 48 hours in advance of any Contract work to be undertaken on Sundays or at night. It will be the Contractor's responsibility to schedule work activities to minimize potential problems and/or to employ noise-reduction measures to lower the noise to an acceptable level. Time extension will not be granted on the basis of the Contractor being ordered to limit his activities at night.

E6. MOBILIZATION AND DEMOBILIZATION

E6.1 Description

E6.1.1 This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the Site, as specified herein.

E6.1.2 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 works as hereinafter specified.

E6.2 Materials

E6.2.1 The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification.

E6.2.2 Construction fencing shall be constructed of orange wood lath or plastic and be 1200 mm high.

E6.3 Construction Methods

E6.3.1 Site fencing shall be provided in the form of an orange plastic or wood snow fence to delineate the construction from the non-construction area as shown on the Drawings. The Contractor shall maintain the fence for the duration of the construction and remove it when construction is complete.

E6.3.2 The Contractor's Site supervisor is required to carry, at all times, a cellular telephone, with voice mail.

E6.3.3 This section also includes travel and accommodation, set-up and demobilization of Site offices, storage conveniences and other temporary facilities, construction plant, and other items not required to form part of the permanent works and not covered by other prices.

E6.4 Method of Measurement

E6.4.1 Mobilization and demobilization will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E6.5 Basis of Payment

E6.5.1 Mobilization and demobilization will be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization," 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.

E7. TRAFFIC AND PEDESTRIAN CONTROL

E7.1 General

E7.1.1 The Contractor shall supply, erect, and maintain all applicable traffic control devices in accordance with the provision contained in the latest edition of the "Manual of Temporary Traffic Control in Work Areas on City Streets," issued by the City of Winnipeg.

E7.2 Construction Methods

E7.2.1 The Contractor may close Sargent Avenue totally to vehicle and pedestrian traffic for a maximum period of seven (7) consecutive weeks. Closure shall be limited to the width of the excavation only plus whatever space is needed for the construction "yard". The west limit of the Sargent Avenue closure shall be east of Empress Street and the east limit shall be west of the approach entrances to the businesses on the north and south sides of Sargent Avenue. It is intended that Contractor access to the construction yard be from the east side only. Permission for access from the west side will be possible only if the Contract Administrator grants permission on a case-by-case basis. Permission will

generally not be granted in periods of high traffic at the Empress Street and Sargent Avenue intersection. Permission may be granted when supplying backfill materials to the culvert outside of the above high traffic consideration.

E7.2.2 At the end of the total closure period, all four lanes of Sargent Avenue shall be opened to traffic, including a safe sidewalk width for pedestrians on each side of Sargent Avenue. One traffic lane in each direction may be closed in the hours from 10:00 p.m. to 6:00 a.m.

E7.3 Method of Measurement

E7.3.1 The provision of traffic and pedestrian control will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E7.4 Basis of Payment

E7.4.1 The provision of traffic and pedestrian control will be paid for at the Contract Lump Sum Price for "Traffic and Pedestrian Control," 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.

E8. CREEK FLOW MAINTENANCE

E8.1 Description

E8.1.1 This Specification shall cover the maintaining of flows in Omand's Creek through Sargent Avenue for the duration of the construction Works.

E8.1.2 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 works as hereinafter specified.

E8.2 Materials

E8.2.1 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.

E8.3 Construction Methods

E8.3.1 In general, the Work shall include, but not necessarily be limited to:

- (a) Design of the creek flow maintenance methods. The preparation and submission for review and approval by the Contract Administrator of a Water Management Plan comprised of detailed drawings and/or description of the maintenance methods.
- (b) Maintenance of creek flows for the duration of construction.
- (c) Removal of materials and/or equipment needed to maintain creek flows, at the end of their use.
- (d) Confinement of suspended matter in the creek water generated at the Site through excavation, etc. to the area of the Site. This may require the construction of a downstream cofferdam and floating turbidity barrier through the creek to confine that suspended matter.

E8.3.2 The Contractor's Water Management Plan shall be designed to meet the following additional conditions and requirements:

- (a) Cofferdam(s) may be constructed on either or both of the upstream or downstream ends of the Site provided natural flow quantities are maintained. Water or ice elevations upstream of any type of upstream cofferdam shall not exceed 231.5 m.
- (b) Cofferdams, if used, shall be constructed of non-erodible material such as sandbags.

- (c) Between the dates of March 15 and June 15, fish shall be afforded full access through the Site via a naturally flowing channel. In this time period, no construction activity impacting upon the creek affecting fish mobility or habitat will be permitted.

E8.4 Method of Measurement

- E8.4.1 The maintenance of creek flows will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E8.5 Basis of Payment

- E8.5.1 The maintenance of creek flows will be paid for at the Contract Lump Sum Price for "Creek Flow Maintenance," 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.

E9. EXCAVATION AND OTHER REMOVALS

E9.1 Description

- E9.1.1 This Specification shall cover all operations relating to the removal of existing culverts, structural concrete, pavement, fencing and riprap. It shall also include excavation for the new culvert construction works, creek channel riprap, subsurface soil drains, surface erosion control during construction, and creek bed and embankment sloping, as herein specified.
- E9.1.2 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 works as hereinafter specified.

E9.2 Materials

- E9.2.1 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.
- E9.2.2 Excavated material shall be unclassified excavation and shall include the excavation and satisfactory disposal of all surplus earth, gravel, sandstone, loose detached rock, cemented gravel or hard pan, disintegrated stone, rock in ledge or mass formation, and dry or all other material of whatever character that may be encountered.
- E9.2.3 The erosion control blanket shall be a 100% straw blanket stitched with one photodegradable polypropylene net. It shall have a cover factor = 0.11 on a 3:1 or 4:1 slope at 75 mm per hour rainfall or approved equal, in accordance with B6. An approved product is S31 from www.ErosionControlBlanket.com.

E9.3 Construction Methods

- E9.3.1 In general, the Work shall comprise of:
 - (a) The design of the excavation for the new box culvert to conform to the requirements of the Manitoba Department of Labour and Immigration, Workplace Safety and Health Division.
 - (b) Design, installation and subsequent removal of sheeting, shoring, and other temporary protective work as may be required.
 - (c) The excavation of material of whatever nature, to the limits shown on the Drawings for the box culvert, riprap, creek bed, and embankment trimming and subsurface soil drains.
 - (d) Removal and disposal of existing multiplate arch culverts, pavement, riprap and fencing.
 - (e) Prevention of frost incursion into the sidewalls or base of the excavation for the duration of the Works.

- (f) Surface erosion protection and rough grading.
- (g) The off-site disposal of surplus and unsuitable material.
- (h) To the extent that the Items of Work, "Creek Flow Maintenance" does not dewater the Site, provide dewatering of the excavation for the Works.

E9.3.2 If the Contractor chooses to support the excavation by shoring, the shoring shall be designed by a Professional Engineer registered in the Province of Manitoba in accordance with the following requirements:

- (a) Detailed design drawings and design calculations shall be submitted to the Contract Administrator for review at least five (5) business days prior to the start of construction of the shoring. The Bidders are advised that the drawings are for the Contract Administrator's review, information, and records only. The submission of the detailed drawings to the Contract Administrator shall in no way relieve the Contractor of the full responsibility for the design and proper functioning of the shoring.
- (b) The shoring shall be of a design and construction such that the Work can be properly constructed as required by the Specifications and Drawings. Sufficient clearance shall be provided within the shoring to permit all required construction activities to proceed unhindered.
- (c) The Contractor shall construct shoring in accordance with the shoring drawings. Variations from the shoring drawings will not be permitted, unless such variations are approved by the designer and the Contract Administrator is provided with the revised drawings.
- (d) Unless otherwise provided for, shoring shall be removed after the completion of the structure. Care shall be taken not to disturb or to otherwise damage the finished structure.
- (e) Shoring may be designed and installed "tight" and used as the outside form of the box culvert. If used that way, install bentonite geotextile waterproofing against the sheet piling at the joints prior to using it as a form.

E9.3.3 Specific requirements related to the excavation for the box culvert structure include:

- (a) The excavation shall be such that the structure may be properly constructed to the required depths and without reduction of dimensions as shown on the Drawings.
- (b) The dimensions of the excavation shall be such as to give sufficient clearances for the construction of forms and their subsequent removal and the construction of cut-off trenches and/or sumps, if required, to permit the pumping of water.
- (c) The excavation shall be dewatered and maintained dewatered so that the material is excavated in its natural state. The bottom of the excavation shall be kept free from excessive moisture or free-flowing water.
- (d) The level of any water inside the excavation shall be below the bottom of the footing elevation so that the concrete may be placed in dry conditions. Pumping water from inside the foundation enclosure shall be continued until the substructure unit is completed and backfilled or as otherwise directed by the Contract Administrator.

E9.3.4 The Contractor shall be required to maintain the excavation sidewalls and base in a frost-free condition for the duration of the construction until the box culvert has been totally backfilled. This is required so that there will be no backfill placed on frozen earth and cause subsequent subsidence once thawed. This requirement does not apply to the area upstream and downstream of the culvert on which riprap will be placed.

E9.3.5 The Contractor shall demolish and remove the following existing facilities:

- (a) Existing multiplate arch culverts, concrete pavement and sidewalk shall be delivered to a disposal site approved by the Contract Administrator.
- (b) Existing chain-link fencing and posts shall be delivered to the City of Winnipeg Bridge Yard and unloaded and stockpiled there by the Contractor in a location identified by the City.

- E9.3.6 The Contractor shall provide rough grading to all disturbed surfaces within the construction area to the requirements of the "Preparation of Existing Grade" of Specification CW 3450-R2. The Contractor shall be responsible to cover all unvegetated surfaces of the embankments with an erosion control blanket, erect silt fences or use other suitable methods to prevent soil erosion into the creek, both during and after construction of the culvert up until the time of final landscaping restoration to be done by others. Landscaping by others will be done once the Works of this Contract on the creek embankment has been completed.
- E9.3.7 Excavated material that is unsuitable for, or surplus to, the backfill requirements shall become the property of the Contractor and shall be removed from the Site. Excavated material shall not be disposed of in a manner that will obstruct the flow of watercourses. During freezing weather, the excess material shall be disposed of before it freezes.
- E9.4 Method of Measurement
- E9.4.1 Excavation will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.
- E9.5 Basis of Payment
- E9.5.1 Excavation will be paid for at the Contract Lump Sum Price for "Excavation and Other Removals," 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.

E10. SUPPLYING AND PLACING REINFORCING STEEL

- E10.1 Description
- E10.1.1 This Specification shall cover the supply, fabrication and placement of plain reinforcing steel.
- E10.1.2 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 works as hereinafter specified.
- E10.2 Materials
- E10.2.1 General
- (a) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification.
 - (b) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with the latest edition of CSA Standard CAN3-A23.1, Storage of Materials, except as otherwise specified herein.
- E10.2.2 Reinforcing Steel
- (a) All reinforcing steel shall conform to the requirements of CSA Standard G30.18, Grade 400, Billet-Steel Bars for concrete reinforcement. If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete works exhibits flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel.
 - (b) All reinforcing steel shall be straight and free from paint, oil, mill-scale, and injurious defects. Surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross section area, and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard G30.18.
- E10.2.3 Bar Accessories

- (a) Bar accessories shall be of a type approved by the Contract Administrator. They shall be made from a non-rusting material, and shall not stain, blemish, or spall the concreted surface for the life of the concrete.
- (b) Bar accessories shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices that may be approved by the Contract Administrator.

E10.2.4 Reinforcing Steel Shop Drawings

- (a) The Contractor will be responsible to produce the detailed drawings for the fabrication and placement of the reinforcing steel. The Contractor shall submit shop drawings for the supply and placement of reinforcing steel. Shop drawings shall consist of bar bending details, lists, placing drawings and mass tabulations. On placing drawings, indicate sizes, spacing, location, and quantities of reinforcement. Prepare drawings in accordance with ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures. Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated. Provide drawing in AutoCAD or other suitable electronic format.

E10.3 Construction Methods

E10.3.1 Fabrication of Reinforcing Steel

- (a) Reinforcing steel shall be fabricated in accordance with CSA Standard G30.18 to the lengths and shapes as shown on the Drawings.

E10.3.2 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 to that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contractor'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 may have been deposited on the steel from previous concrete placement, 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 approval of the Contract Administrator shall be obtained where other splices are to be made. Welded splices shall conform to CSA Standard W186, and are subject to prior written approval of the Contract Administrator.
- (d) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel will not be permitted without the prior approval of the Contract Administrator. A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to placing of any concrete to allow for inspection of the reinforcement.

E10.4 Quality Control

E10.4.1 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 approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works that are not in accordance with the requirements of this Specification.

E10.4.2 Access

- (a) The Contract Administrator shall be afforded full access for the inspection and quality control testing of reinforcing steel; both at the Site of Work and at any plant used for fabrication of the reinforcing steel, to determine whether the reinforcing steel is being supplied in accordance with this Specification.

E10.4.3 Quality Testing

- (a) Quality control testing will be used to determine the acceptability of the reinforcing steel supplied by the Contractor.
- (b) The Contractor shall provide, without charge, the samples of reinforcing steel required for quality control tests and provide such assistance and use of tools and construction equipment, as is required.

E10.5 Method of Measurement

- E10.5.1 Supplying and placing reinforcing steel will be measured on a mass basis. The mass to be paid for shall be the total number of kilograms of reinforcing steel installed in accordance with this Specification, acceptable to the Contract Administrator, as computed from the approved reinforcing layout shown on the Drawings, excluding the mass of bar accessories.

E10.6 Basis of Payment

- E10.6.1 Supplying and placing reinforcing steel will be paid for at the Contract Unit Price per kilogram for the "Supply and Place Reinforcing Steel – Plain", measured as specified herein, which price will be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

E11. STRUCTURAL CONCRETE

E11.1 Description

- E11.1.1 This Specification shall cover the preparation of Portland Cement Structural Concrete for, and all concreting operations related to, the construction of Portland Cement Structural Concrete Works as specified herein.
- E11.1.2 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 works as hereinafter specified.

E11.2 Materials

E11.2.1 General

- (a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

E11.2.2 Handling and Storage of Materials

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

E11.2.3 Testing and Approval

- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall be approved by the Contract Administrator at least seven (7) days before any construction is undertaken. 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 materials shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E11.2.4 Bonding Agents

- (a) The Contractor shall identify the product(s) and submit product information to the Contract Administrator for review and approval.

E11.2.5 Curing Compound

- (a) If permitted for use, curing compound shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309 and the proposed standard ASTM P198. Rate of application shall be 1.5 times the rate required to meet the requirements of ASTM P198 for the texture of concrete to which the curing compound is being applied.
- (b) Curing compounds shall be resin-based and white-pigmented.

E11.2.6 Patching Mortar

- (a) The patching mortar shall be made of the same cementitious 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 and placing.

E11.2.7 Non-Shrink Cementitious Grout

- (a) Where non-shrink cementitious grout is used, it shall be Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, Meadows CG-86, or equal as accepted by the Contract Administrator. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E11.2.8 Formwork

- (a) Formwork materials shall conform to CSA Standard CAN/CSA-A23.1, and American Concrete Publication SP:4, "Formwork for Concrete".
- (b) No "stay-in-place" formwork or falsework is permitted.
- (c) 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.
- (d) 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".
- (e) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.
- (f) 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.
- (g) Forms for exposed concrete surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.
- (h) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand distortion from all the forces to which the forms will be subjected. Minimum dimensions shall be 50 mm x 150 mm.
- (i) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm.
- (j) All forms are incidental to these Works and must be removed by the Contractor once adequate strength and curing of the concrete has been achieved.

E11.2.9 Permeable Formliner

- (a) Formliner shall be Hydroform, Texel Drainform or equal as approved in accordance with B6.

E11.2.10 Concrete

(a) General

- (i) Concrete repair material shall be compatible with the concrete substrate.
- (b) The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this specification. Either ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with CSA A23.1-04:
 - (i) Class of Exposure: C-1
 - (ii) Compressive Strength @ 28 days = 35 MPa
 - (iii) Water / Cementing Materials Ratio = 0.4
 - (iv) Air Content: Category 1 per Table 4 of CSA A23.1-04
- (c) Mix design for ready mix concrete shall be submitted to Contract Administrator at least two weeks prior to concrete placing operations.
- (d) The workability of each concrete mix shall be consistent with the Contractor's placement operations. Self compacting concrete may be used for abutment and pier cap repairs.
- (e) Any proposed proprietary repair mortar shall be subject to the approval of the Contract Administrator and must meet or exceed the properties of the ready mix concrete.
- (f) The temperature of all types of concrete shall be between 15°C and 25°C at discharge. Temperature requirements for concrete containing silica fume shall be between 10°C and 18°C at discharge unless otherwise approved by the Contract Administrator.
- (g) Concrete materials susceptible to frost damage shall be protected from freezing.

E11.2.11 Aggregates

- (a) The Contractor shall be responsible for testing the fine and coarse aggregates to establish conformance to these specifications, and the results of these tests shall be provided to the Contract Administrator if requested. All aggregates shall comply with CSA A23.1.
- (b) Coarse Aggregate
 - (i) The maximum nominal size of coarse aggregate shall be sized to suit the Contractor's mix design. Gradation shall be in accordance with CSA A23.1, Table 11, Group 1. The coarse aggregate shall satisfy the Standard Requirements specified in CSA A23.1, Table 12, "Concrete Exposed to Freezing and Thawing".
 - (ii) 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; and shall have an absorption not exceeding 2.25%.
 - (iii) 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, and excess of thin particles or any other extraneous material.
 - (iv) Coarse aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.
 - (v) Tests of the coarse aggregate shall not exceed the limits for standard for requirements prescribed in CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

- (c) Fine Aggregate
 - (i) Fine aggregate shall meet the grading requirements of CSA A23.1, Table 10, Gradation FA1.
 - (ii) 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.
 - (iii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1, Table 12.

E11.2.12 Cementing Materials

- (a) Cementing materials shall conform to the requirements of CSA A3001.
- (b) Silica Fume
 - (i) Should the Contractor choose to include silica fume in the concrete mix design, it shall not exceed 8% by mass of cement.
- (c) Fly Ash
 - (i) Fly ash shall be Type C1 or Type F and shall not exceed 25% 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 formation of lumps shall not be used in the Work.

E11.2.13 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.
- (d) Appropriate low range water reducing and/or superplasticizing admixtures shall be used in concrete containing silica fume. Approved retarders or set controlling admixtures may be used for concrete containing silica fume.
- (e) An aminocarboxylate based migrating corrosion inhibitor admixture shall be used in concrete that will be used as a repair material that will either be in contact with or adjacent to reinforcing steel in existing concrete. Proposed admixtures shall be subject to the approval of the Contract Administrator.

E11.2.14 Water

- (a) Water to be used for mixing and curing concrete or grout and saturating substrate shall conform to the requirements of CSA A23.1 and shall be free of oil, alkali, acidic, organic materials or deleterious substances.

E11.2.15 Concrete Supply

- (a) Concrete shall be proportioned, mixed, and delivered in accordance with the requirements of CSA A23.1, except that the transporting of ready mixed concrete in non-agitating equipment will not be permitted unless prior written approval is received from the Contract Administrator.
- (b) Unless otherwise directed by the Contract Administrator, the discharge of ready mixed concrete shall be completed within 120 minutes after the introduction of the mixing water to the cementing materials and aggregates.
- (c) The Contractor shall maintain all equipment used for handling and transporting the concrete in a clean condition and proper working order.

E11.2.16 Flexible Joint Sealant

- (a) Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non-staining grey polyurethane, approved by the Contract Administrator and applied in strict accordance with the manufacturer's instructions, including appropriate primers. Approved products are Vulkem 116 by Mameco; Sonolastic NP1 by Sonneborne; RC-1 by Permapol; and Sikaflex by Sika; or equal in accordance with B6.

E11.2.17 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, or equal in accordance with B6.

E11.2.18 Expanding Joint Filler

- (a) Expanding joint filler shall be compressed to 20 percent of its expanded width and be a polyurethane foam, impregnated throughout with a latex modified asphalt. An approved product is "Emseal," by Emseal Corporation. Expanding joint filler to be installed as per Manufacturer's instructions.

E11.2.19 Benchmark

- (a) Benchmark plugs as supplied by the City of Winnipeg.

E11.2.20 Waterproofing

- (a) Waterproofing shall be Bituthene 3000 as distributed by Grace Construction Products, or equal in accordance with B6.

E11.2.21 Miscellaneous Materials

- (a) The Contractor shall supply all materials, as approved by the Contract Administrator, to ensure the satisfactory completion of the concrete repair works.

E11.3 Equipment

E11.3.1 General

- (a) All equipment shall be of a type accepted by the Contract Administrator. The equipment shall be in good working order, kept free from hardened concrete or foreign materials, and shall be cleaned at frequent intervals.
- (b) The Contractor shall have sufficient standby equipment available on short notice at all times.

E11.3.2 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 use rubber coated vibrators for consolidating concrete containing epoxy-coated reinforcing steel.
- (c) The Contractor shall have standby vibrators available at all times during the pour.

E11.3.3 Miscellaneous Equipment

- (a) The Contractor shall provide all miscellaneous equipment as required to properly and thoroughly execute and complete all operations related to the supply and placement of structural concrete.

E11.4 Construction Methods

E11.4.1 General

- (a) The Works involving Structural Concrete include the construction of:
 - (i) Culverts.
 - (ii) Headwalls.
 - (iii) Apron Slab and Cut-off Wall.
 - (iv) Wingwalls

E11.4.2 Concrete Working Base

- (a) Upon completion of all excavation, the bottom of the excavation shall be inspected by the Contract Administrator. Concrete working base shall be installed where shown on the Drawings. Under no circumstances shall the Contractor place the concrete working base without the prior approval from the Contract Administrator. The supply and installation of working base will be considered incidental to the work of backfilling, and no separate payment will be made.

E11.4.3 Form Work and Shoring

- (a) Formwork shall be designed, erected, braced, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete.
- (b) As a maximum, the following spacings shall apply, for studding and whaling:
 - (i) 20 mm plywood: studding - 450 mm centre to centre
 - (ii) walers - 760 mm centre to centre
- (c) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against adsorption of moisture from the concrete by a field-applied form coating or a factory-applied liner.
- (d) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be a commercially manufactured type. 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.
- (e) All exposed edges shall be chamfered 25 mm unless otherwise noted on the Drawings.
- (f) 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 structural drawings without the prior approval of the Contract Administrator.
- (g) Shores shall be provided with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.
- (h) 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 settlements during or after concreting. Shores must not be placed on frozen ground.
- (i) Brace shores 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.
- (j) 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.
- (k) Formwork shall have sufficient strengths and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
- (l) 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.

- (m) 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.
- (n) Formwork shall be cambered, where necessary to maintain the specified tolerances, to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads.
- (o) Forms shall be sufficiently tight to prevent leakage of grout or cement paste.
- (p) Form panels shall be constructed so that the contact edges are kept flush and aligned.
- (q) 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, free of extra charge, and the entire Site left in a neat and clean condition.
- (r) It shall be permissible to use the forms over again where possible, 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.

E11.4.4 Formliner

- (a) Formliners shall be used on all exposed formed surfaces, except soffit surfaces.

E11.4.5 General Curing

- (a) The use of curing compound will not be allowed on concrete areas that are to receive additional concrete or waterproofing.
- (b) Unformed concrete surfaces shall be covered and kept moist by means of wet polyester blankets for seven (7) consecutive days immediately following finishing operations or otherwise approved by the Contract Administrator and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter. Construction joints shall only be covered and kept saturated by means of wet polyester curing blankets for the curing period.
- (c) If permitted for use, curing compounds shall be applied at the rate of not less than 4 m²/L. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.
- (d) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.
- (e) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3° in anyone hour period or 20° in any twenty-four hour period.
- (f) Formed surfaces shall receive, immediately after stripping and patching, the same application of curing compound as finished surfaces.
- (g) After completing the finishing of unformed surfaces, where curing compound is not permitted, the surfaces shall be promptly covered with a minimum of a single layer of clean, damp polyester curing blanket and 6 mil polyethylene.
- (h) 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.

E11.4.6 Placing Concrete

- (a) The Contract Administrator must be notified at least 24 hours prior to concrete placement so that an adequate inspection may be made of formwork, shoring,

reinforcement, expansion joints, and related works. Placement without required prior notification will not be allowed.

- (b) 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.
- (c) Concrete shall be conveyed from the mixer to the place of final deposit by methods that will prevent segregation and a marked change in consistency. The deck slab shall be placed by pumping methods.
- (d) 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.
- (e) Placing of concrete, when started, shall be continuous. No concrete shall be placed against concrete that 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 approved.
- (f) Concrete shall be placed as nearly as possible to its finish position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (g) The maximum drop of free 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.
- (h) All concrete, during and immediately after deposition, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of the forms; eliminating all air or stone pockets that may cause honeycombing, pitting or planes of weakness. Mechanical vibrators, when immersed, shall have a minimum frequency of 7,000 revolutions per minute.
- (i) 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. Spare vibrators in working condition shall be kept on the job Site during all placing operations.
- (j) Concrete shall not be placed in rain or snow, unless adequate protection is provided for formwork and concrete surfaces.

E11.4.7 Finishing of Unformed Surfaces

- (a) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straight edge along wood or metal strips or form edges that have been accurately set at required elevations.
- (b) 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.
- (c) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. The surface shall then be consolidated with hand floats. Concrete surfaces after floating shall have a uniform, smooth, granular texture.
- (d) The surface of the roadway shall be given a transverse broom finish.

E11.4.8 Form Removal

- (a) All forms shall remain in place for a minimum of seven (7) days. The Contract Administrator must be notified at least 24 hours prior to any form removal. The Contractor must receive approval from the Contract Administrator prior to beginning Work.

- (b) The minimum strength of concrete in place for safe removal of soffit forms for horizontal or inclined members, as well as vertical forms shall be 20 MPa, with the added provisions that the member shall be of sufficient strength to carry safely its own weight, together with superimposed construction loads, and that the forms shall stay in place a minimum of three days unless otherwise approved by the Contract Administrator.
- (c) Field-cured test specimens, representative of the in-place concrete being stripped, may be tested to verify the concrete strength.

E11.4.9 Patching of Formed Surfaces

- (a) Immediately after forms have been removed, but before any repairing or surface finishing is started, the concrete surface 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) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.
- (c) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement, shall be thoroughly brushed onto the area to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the adjacent surface and left for one hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.
- (d) All objectionable fins, projections, offsets, streaks, or other surface imperfections shall be removed by approved means to the Contract Administrator's satisfaction. Cement washes of any kind shall not be used.
- (e) Concrete shall be cast against forms that will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects that will impair the texture of concrete surfaces shall not be used. All fins on the concrete surfaces shall be removed.

E11.4.10 Cold Weather Concreting

- (a) The requirements of this section shall be applied to all concreting operations during cold weather; i.e., if the mean dally temperature falls below 5°C during placing or curing.
- (b) The Contract Administrator will advise the Contractor, in writing, as to the degree of heating of water and aggregates.
- (c) Supplementary equipment, as required below, shall be at the job Site if concrete is likely to be placed in cold weather.
- (d) Formwork and reinforcing steel shall be heated to at least 5°C before concrete is placed.
- (e) The temperature of the concrete shall be maintained at not less than 10°C for seven days or 15°C for five days or 20°C for three days after placing. The concrete shall be kept above freezing temperature for at least a period of seven days. In no case shall the heating be removed until the concrete has reached a minimum compressive strength, which will be specified by the Contract Administrator for Work under construction, and as determined from compressive strength tests for specimens secured under the same conditions as the concrete works in question.
- (f) Aggregates shall be heated to a temperature of not less than 20°C and not more than 55°C. Water shall be heated to a temperature between 55°C and 55°C. The

temperature of the concrete at the time of placement shall be within the range specified in CSA Standard CAN/CSA-A23.1 for the thickness of the section being placed.

- (g) When the mean daily temperature may fall below 5°C, a complete hoarding of the Work, together with supplementary heat, shall be provided.
- (h) When the ambient temperature is below -15°C, the hoarding shall be constructed so as to allow the concrete to be placed without the hoarding having to be opened. If the mixing is done outside of the hoarding, the concrete shall be placed by means of hoppers installed through the hoarding. The hoppers are to be plugged when not in use.
- (i) When the ambient temperature is equal to or above -15°C, the Contractor will be permitted to open small portions of the hoarding for a limited time to facilitate the placing of the concrete.
- (j) Before depositing any of the concrete, the Contractor shall show that enough heating equipment is available to keep the air temperature surrounding the forms within the specified range. This shall be accomplished by bringing the temperature inside of the hoarding to the specified 20°C, at least 12 hours prior to the start of the concrete placing.
- (k) The Contractor shall supply all required heating apparatus and the necessary fuel. When dry heat is used, a means of maintaining atmospheric moisture shall be provided. The relative humidity within the heated enclosure shall be maintained at a minimum of 40 percent during concrete placing and finishing operations. Following finishing operations, exposed concrete surfaces shall be protected from excessive drying by applying curing compound, covering the surfaces with polyethylene, or providing water curing.
- (l) Sufficient standby heating equipment must be available to allow for any sudden drop in outside temperatures and any breakdowns that may occur in the equipment.
- (m) Combustion-type heaters may be used if their exhaust gases are vented outside the enclosures and not allowed to come into contact with concrete surfaces. Fire extinguishers must be readily at hand wherever combustion-type heaters are used.
- (n) The Contractor shall keep a curing record of each concrete pour. The curing record shall include: date and location of the pour, mean daily temperature, hoarding relative humidity, temperatures above and below the concrete surface at several points, and notes regarding the type of heating, enclosure, unusual weather conditions, etc. This record shall be available for inspection by the Contract Administrator at the end of the concrete operations.

E11.4.11 Construction Joints

- (a) Construction joints shall be located only where shown on the Drawings or as otherwise approved in writing by the Contract Administrator. Construction joints shall be at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints. Bevelled shear keys, as shown on the Drawings or approved by the Contract Administrator, shall be provided at all joints.
- (b) In lieu of shear keys, the Contractor may roughen the surface as follows. The surface shall be rough, with a minimum amplitude of 6 mm. Acceptable procedures to obtain this rough surface are as follows:
 - (i) By removing the mortar from between the larger aggregate particles with a water jet and soft brush when the concrete is in a semi-hardened state (green-cut).
 - (ii) By first applying a chemical retarder to the surface and then removing the mortar from the larger aggregate particles with a water jet and brush.
- (c) The face of joints shall be cleaned of all laitance and dirt, after which the cementitious grout or an approved bonding agent shall be applied. Forms shall be retightened, and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.

E11.4.12 Benchmarks and Structure Identification

(a) Benchmarks

- (i) The Contractor shall install benchmark plugs supplied by the Contract Administrator at locations as directed by the Contract Administrator, all incidental to the Work of this Specification.

(b) Structure Identification Date

- (i) The Contractor shall indent into the exposed concrete a structure identification date at the location shown on the Drawings in accordance with the detail shown on the Drawings or as otherwise directed by the Contract Administrator, all incidentally to the Work of this Specification.

E11.4.13 Clean Up

- (a) The Contractor shall maintain the Sites of Work in a tidy condition and free from the accumulation of waste and debris.

E11.5 Quality Control

E11.5.1 Inspection

- (a) All workmanship and 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 the Work, 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 approval 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.

E11.5.2 Access

- (a) The Contract Administrator shall be afforded full access for the inspection and control of 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.

E11.5.3 Materials

- (a) All materials supplied under this Specification shall be subject to testing and approval by the Contract Administrator.

E11.5.4 Concrete Quality

- (a) Quality control tests will be used to determine the acceptability of the concrete supplied by the Contractor.
- (b) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for quality control tests and provide such assistance and use of tools and construction equipment as is required.
- (c) The frequency and number of concrete quality control tests shall be in accordance with the requirements of CSA Standard CAN/CSA-A23.1.
- (d) Compressive strength tests on specimens cured under the same conditions as the concrete works will be made to check the strength of the in-place concrete and the adequacy of curing. Backfilling or subsequent concreting operations will not be allowed until the in-place concrete has achieved a compressive strength of 25 MPa.

E11.5.5 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.

- (b) The Contractor shall, at his own expense, correct such work or replace such materials found to be defective under this Specification in an approved manner to the satisfaction of the Contract Administrator.

E11.6 Method of Measurement

E11.6.1 Structural Concrete

- (a) Supplying and placing structural concrete will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres of structural concrete supplied and placed in accordance with this Specification, acceptable to the Contract Administrator, as computed from the Drawing dimensions. No deductions will be made for chamfers, reinforcing steel, structural steel, bolts or voids of seventy-five (75) mm in diameter or less. All accessories like inserts are incidental to the supply and placement of structural concrete and no payment will be made for this work.

E11.6.2 Heating and Hoarding

- (a) Heating and hoarding of concrete will be measured on a Lump Sum basis as accepted by the Contract Administrator and no measurement will be made for this Work.

E11.7 Basis of Payment

E11.7.1 Structural Concrete

- (a) Supplying and placing structural concrete will be paid for at the Contract Unit Price per cubic metre for the "Supply and Place Structural Concrete", measured as specified herein, which price will be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

E11.7.2 Heating and Hoarding

- (a) Heating and hoarding of concrete will be paid for at the Contract Lump Sum Price per for "Heating and Hoarding", measured as specified herein, which price will be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

E12. BACKFILL

E12.1 Description

E12.1.1 This Specification shall cover all operations related to supply, placement and compaction of backfill materials as herein specified.

E12.1.2 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 works as hereinafter specified.

E12.2 Materials

E12.2.1 General

- (a) 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.

E12.2.2 Suitable Site Backfill

- (a) Suitable Site backfill material shall be of a type approved by the Contract Administrator.

E12.2.3 Granular Backfill

- (a) Granular backfill material shall be sound, free from organic material, and meet the following gradation requirements:

Canadian Metric Sieve Size	Percent Total Dry Weight Passing
50,000	100%
20,000	75%-100%
5,000	45%-85%
2,500	35%-55%
315	15%-35%
160	5%-20%
80	0%-7%

- (b) In lieu of the above granular backfill, in the winter, crushed limestone of 50 mm maximum aggregate size conforming to CW 3110-R10, may be used.

E12.2.4 Crushed Limestone Base Course Material

- (a) Crushed limestone base course material shall be supplied in accordance with City of Winnipeg Specification CW 3110-R10 with maximum 20 mm size.

E12.2.5 Free Draining Granular Backfill Material

- (a) Free draining granular backfill shall consist of hard crushed stone, free from organic material meeting the following gradation requirements (concrete coarse aggregate) or approved equal.

Canadian Metric Sieve Size	Percent Total Dry Weight Passing
40,000	95%-100%
20,000	35%-70%
10,000	10%-30%
5,000	0%-5%

- (b) In addition to the above granular material, the drainage material specified in Section 5.2 of CW 3120 is also approved for this project.

E12.2.6 Clay Borrow Material

- (a) Clay borrow material shall be of a type approved by the Contract Administrator.

E12.2.7 Polystyrene Insulation

- (a) Polystyrene insulation shall be Styrofoam HI60 or approved equal, in accordance with B6.

E12.2.8 Working Base

- (a) Working base shall be concrete of minimum compressive strength of 20 MPa.

E12.2.9 Low Density Foam Board

- (a) Low density foam board shall be constructed of expanded foam.

E12.2.10 Concrete Roadway

- (a) Concrete construction materials as per Section 5 of CW 3310-R12. 72 hour early opening concrete as per Item 6.4 of CW 3310-R12.
- (b) Polypropylene fibres are to be used and shall consist of 100% virgin polypropylene as supplied by Grace (Microfibre) or Master Builders (Fibre Mesh MD), or equal in accordance with B6. The minimum dosage rate shall be 1.5 kg/m³.

E12.3 Construction Methods

E12.3.1 General

- (a) The Work shall comprise of supply and placement of:
 - (i) A 300 mm thick free draining granular base for the culvert.
 - (ii) A 75 mm thick concrete working base.
 - (iii) Granular backfill of the culvert.
 - (iv) A 150 mm thick base course for the overlying concrete roadway surface and sidewalk.
 - (v) A 200 mm thick reinforced concrete pavement slab as per SD-216.
 - (vi) Backfill as required to produce embankment slopes as shown on the Drawings.
 - (vii) Polystyrene insulation over the top of the new 600 mm concrete sewer pipe and the existing feedermain which cross under the culvert.
 - (viii) Low density foamboard over the sewer and feedermain.
- (b) The Work shall also include:
 - (i) Erosion control.

E12.3.2 Free Draining Granular Culvert Base

- (a) Supply and place a 300 mm thick layer of free draining granular material below the working base of the culvert. Place to a minimum of one hundred percent (100%) Maximum Standard Proctor Density.

E12.3.3 Working Base Concrete

- (a) Following approval of the granular culvert base, place a 75 mm thick concrete working base.

E12.3.4 Culvert Backfill

- (a) All backfill of the culvert is to be unfrozen granular backfill and placed on unfrozen base. Place the backfill in accordance with the preparation of sub-base in Specification CW3110-R10. That is in layers not exceeding 150 mm in compacted thickness and to a minimum of 100% Maximum Standard Proctor Density.
- (b) Place the backfill up to the elevation of the underside of the base course for the concrete pavement or concrete sidewalk, or to the underside of topsoil, as applicable.

E12.3.5 150 mm Thick Base Course

- (a) Place a 150 mm thick or greater layer of base course as per E12.2.4 beneath the roadway and sidewalk on the granular backfill of the culvert to the grades indicated on the Drawings or as indicated in the field by the Contract Administrator. The base course shall be compacted to 100% Maximum Standard Proctor Density.
- (b) This base course layer will provide the substructure for the 200 mm concrete roadway that will constitute the roadway surface.

E12.3.6 Asphalt Cold Mix

- (a) Asphalt cold mix shall be supplied and installed around the barrier posts in accordance with CW-3650.

E12.3.7 Embankment Slope Backfill

- (a) Backfill the embankment slopes where required producing the embankment grades shown on the Drawings. Use suitable Site backfill or clay backfill compacted to a minimum of 98% Maximum Standard Proctor Density.

E12.3.8 Clay Plugs

- (a) Place clay plugs of one (1) metre width (north-south direction) for the full width of the excavation to act as a barrier to prevent possible future washout of the backfill material from around the culvert. Place the clay in an unfrozen condition and compact to 98% Maximum Standard Proctor Density.

E12.3.9 Erosion Control

- (a) The Contractor shall perform the following erosion control works:
 - (i) Exposure of soils along creek slopes shall be kept to a minimum practical amount, acceptable to the Contract Administrator.
 - (ii) Areas that are heavily disturbed and vulnerable to erosion or gullying shall be diked to redirect runoff around the area prior to spring runoff.
 - (iii) Sediment control fencing, or other such erosion control structures, shall be employed whenever construction activity increases the potential for runoff to carry sediment into a drainage channel or other watercourse. The Contractor shall inspect all such structures daily during heavy construction activity in the areas of the structures and after heavy rainfall to ensure their continued integrity.
 - (iv) The loss of topsoil and the creation of excessive dust by wind during construction shall be prevented by the addition of temporary cover crop, water or tackifier, if conditions so warrant.
 - (v) Within the limits of construction and where slopes are bare and erodible, the surface water runoff into the creek is to be intercepted by cut-off trenches constructed near the creek's edge to reduce the deposition of sediments in the creek.
 - (vi) All creek work including placement of riprap shall be undertaken in the winter when the ground is frozen to reduce the impact from erosion to a minimum.
 - (vii) All erosion control necessary due to runoff from the roadway/sidewalk and embankment areas.

E12.4 Method of Measurement

E12.4.1 Backfill will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E12.5 Basis of Payment

E12.5.1 Backfill will be paid for at the Contract Lump Sum Price for "Backfill", 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.

E13. SEWER WORKS

E13.1 Description

E13.1.1 This Specification shall cover all operations relating to the work necessary to replace the existing 750 mm sewer pipe with a new 600 mm concrete pipe in the vicinity of the new box culvert and shall revise, amend and supplement Standard Construction Specifications, as herein specified.

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 works as hereinafter specified.

E13.2 Materials

E13.2.1 600 mm Sewer Pipe

- (a) 600 mm Sewer Pipe shall be ASTM C76 Class IV precast concrete pipe in accordance with CW 2130 R11.

E13.2.2 Bedding and Backfill

- (a) Bedding and backfill in accordance with CW 2030 R11 and SD-001.

E13.3 Construction Methods

E13.3.1 600 mm Sewer Pipe

- (a) 600 mm sewer pipe to be installed in accordance with CW 2130 R11.
- (b) Post-installation inspection of the sewer works in accordance with CW 2145 R3

E13.3.2 Bedding and Backfill

- (a) Bedding and backfill to be placed and compacted in accordance with CW 2030 R11 and SD-001.

E13.4 Method of Measurement

E13.4.1 Sewer works will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E13.5 Basis of Payment

E13.5.1 Sewer works will be paid for at the Contract Lump Sum Price for "Sewer Works", 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.

E14. FEEDERMAIN PROTECTION

E14.1 Description

E14.1.1 This Section details operating constraints and protection requirements for all work to be carried out in close proximity to the Sargent Avenue Feedermain. Close proximity shall be deemed to be any construction activity within a 5 m offset from the centreline of the feedermain.

E14.2 General Considerations for Work in close proximity to the Sargent Avenue Feedermain

E14.2.1 The Sargent Avenue Feedermain is a critical component of the City of Winnipeg Regional Water Supply System and work in close proximity to the pipeline shall be undertaken with an abundance of caution. The pipe cannot be taken out of service to facilitate construction and inadvertent damage caused to the pipe would likely have catastrophic consequences.

E14.2.2 Work around the Feedermain shall be planned and implemented to minimize the time period that work is carried out in close proximity to the pipe and to ensure that the pipeline is not subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement.

E14.2.3 The Sargent Avenue Feedermain is constructed in an inverted siphon configuration under the existing culverts, with vertical bends and thrust blocks immediately west and east of the Site. The pipeline is composed of Asbestos-Cement (A-C) pipe immediately below and west of the proposed Site. Immediately east of the proposed Site, it consists of Prestressed Concrete Cylinder Pipe (PCCP) conforming to AWWA Standard C301. The Sargent Avenue Feedermain was manufactured and installed in 1974.

E14.2.4 Both A-C and PCCP pipe have limited ability to withstand increased earth and live loading. Therefore, every precaution must be undertaken to ensure that applied loading during all phases of construction is within accepted loading parameters.

E14.2.5 A-C pipe has very limited ability to withstand longitudinal bending loads and can be prone to transverse cracking.

E14.2.6 Record Drawings D-1266 and D-1272 are provided as reference drawings.

E14.3 Submittals

E14.3.1 Submit proposed construction equipment specifications to the Contract Administrator for review seven (7) calendar days prior to construction. Submittal shall include;

- (a) Equipment operating weight and dimensions including wheel or track base, track length or axle spacing, track widths or wheel configurations
- (b) Payload weights

(c) Load distributions in the intended operating configuration

E14.3.2 Submit a Construction Method Statement with proposed construction plan including haul routes, excavation equipment locations, loading positioning and base construction sequencing to the Contract Administrator for review seven (7) calendar days prior to construction. Do not commence construction until the Construction Method Statement has been reviewed and accepted by the Contract Administrator.

E14.4 Protection of the Sargent Avenue Feedermain During Construction

E14.4.1 The feedermain will be exposed across the excavation for the installation of the new cast in place box culverts at Omand's Creek. There is approximately 4.88m (16') of existing cover on the pipe at this location as the feedermain bends below the existing arch culverts. The cover will be reduced to less than 0.3m (1.0') during construction, based on Record Drawings. Final clearance between the top of the feedermain and the bottom of the box culvert will be 0.39m (1.3').

E14.4.2 The pipeline was exposed immediately east of the existing arch sections prior to construction, by hydroexcavation methods and surveyed to verify the elevation in the construction area. The pipeline elevations recorded are approximately 0.12 metres higher than those reported on Record Drawings. Variations in pipe alignment and elevation can occur within the excavation and the Contractor shall carefully expose and confirm elevations prior to construction to confirm pipe elevation throughout the construction area.

E14.4.3 Contractors carrying out repair work or working in close proximity to the Feedermain shall meet the following conditions and technical requirements:

(a) Pre-work, Planning and General Execution

- (i) No work shall commence at the Site until the Construction Method Statement has been accepted and the Feedermain location has been clearly delineated in the field.
- (ii) Work shall only be carried out with equipment that has been reviewed and quantified in terms of its loading implications by the Contract Administrator.
- (iii) No construction equipment will be permitted to cross the Feedermain where there is less than 2 metres of cover, during construction. The feedermain shall be adequately marked to ensure no equipment operates within 2.5m of the centerline of the feedermain.
- (iv) For construction work activities either longitudinally or transverse to the alignment of the Feedermain, work only with equipment and in the manner stipulated in the accepted Construction Method Statement and the supplemental requirements noted herein.
- (v) Granular material, construction material, soil or other material shall not stockpiled on the pipelines or within 5 metres of the pipe centerline.
- (vi) Stage construction such that the Feedermain is not subjected to significant asymmetrical loading at any time.
- (vii) Where work is in proximity to the Feedermain, utilize construction practices and procedures that do not impart excessive vibration loads on the Feedermain or that would cause settlement of the subgrade below the Feedermain.

(b) Shoring

- (i) Shoring for installation of the arch culvert shall not impart any lateral or vertical load on the feedermain
- (ii) Shoring piles shall not be any closer to the outside of the feedermain than 300 mm clear. The feedermain shall be exposed to confirm exact location prior to installing any shoring
- (iii) Where piles are installed adjacent to the feedermain, they shall be pre-bored past feedermain invert. Where sheet piles are installed, a guide rail shall be used adjacent to the feedermain to prevent lateral displacements.

(c) Excavation and Demolition

- (i) Existing concrete must be saw cut and removed within 3m of the centerline of the feedermain. No concrete breakers are permitted within 3m of the centerline of the feedermain.
- (ii) Removal of the existing arch culverts within 3 metres of the centre of the Feedermain shall be completed by disassembly or cutting of the steel arch sections and carefully lifting the pipe out of the excavation. No ripping, shearing or crushing of the pipe within this zone will be permitted.
- (iii) Excavation within 1.5 metres vertically of the feedermain, or below the level of the existing arch culvert invert, shall utilize only smooth edged excavation buckets, soft excavation or hand excavation techniques. When there is less than 1.0 metres of earth cover, the Contractor shall expose the feedermain by hand or hydroexcavation methods.
- (iv) Excavation for footings adjacent to the Feedermain shall be completed by hand or hydroexcavation.
- (v) Where there is less than 2.5 m of cover over the feedermain, offset backhoe or excavation equipment from feedermain, a minimum of 2.5 m from feedermain centerline, to carry out excavation.
- (vi) The Contractor shall note that the pipeline rises sharply east and west of the proposed culvert, at an approximate rate of 4.1H:1V and 2.3H:1V east and west of the Site, respectively. The Contractor shall make himself familiar with the pipeline locations and grades throughout the worksite.

(d) Feedermain Protection

- (i) The Feedermain will be in service during course of construction. At all times when cover over the Feedermain is less than 1.5 metres, the Feedermain and ground surrounding the main shall be protected from freezing by insulation, heating or hoarding.
- (ii) Whenever the Feedermain is exposed, or has less than 300 mm of cover, it shall be protected from inadvertent mechanical damage with appropriate cribbing and sheeting.

(e) Foundation Preparation

- (i) Excavate over and adjacent to the Feedermain to the lines and grades shown on the drawings. The Contractor shall not that the subgrade adjacent to and over the Feedermain may be soft and wet, and unsuitable for base construction. Where directed by the Contract Administrator, remove unsuitable foundation material and replace with CW 2030 Type 2 material compacted to 95% SMPDD, with small vibratory plate tampers.
- (ii) Excavation and backfill shall proceed such that there is no more than 300 mm differential elevation across the pipe.

(f) Backfill

- (i) Backfill compaction to a depth of 2.0 metres over the Feedermain and adjacent to the culvert shall be limited to light weight plate compaction equipment. Compaction of backfill above this level shall be completed with static compaction methods and only with equipment that are well within the rated loading superimposed loading capacity of the Feedermain. Compaction with smaller vibratory equipment such as hand held plate packers or smaller walk behind roller equipment may be permitted subject to review and approval by the Contract Administrator.

E14.4.4 The Contractor shall ensure that all work crew members understand and observe the requirements of this specification. Prior to commencement of on-site work, the Contractor shall jointly conduct an orientation meeting with the Contractor Administrator with all superintendents, foremen and heavy equipment operators to make sure all workers on-site are fully cognizant of the limitations of altered loading on the Feedermain, the ramifications of inadvertent damage to the pipelines, the constraints associated with work in close proximity to the Feedermain and the specific details of the Construction Method Statement in instances where a Construction Method Statement is in effect.

E14.4.5 Employees of the Contractor or any Subcontractor that fail to comply with the conditions for working in close proximity to the Feedermain shall be promptly removed from the Site.

E14.5 Method of Measurement

E14.5.1 Operating constraints and protection requirements will be paid for on a Lump Sum basis, as accepted by the Contract Administrator and no measurement will be made for this Work.

E14.6 Basis of Payment

E14.6.1 Operating constraints and protection requirements will be paid for at the Contract Lump Sum Price for "Feedermain Protection", 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.

E15. UTILITY WORKS

E15.1 Description

E15.1.1 This Specification shall cover all operations relating to the work necessary to maintain the various utilities functional during and after construction, as herein specified. This section does not include the sewer pipe replacement or feedermain protection works.

E15.1.2 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 works as hereinafter specified.

E15.2 Materials

E15.2.1 The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

E15.3 Construction Methods

E15.3.1 General

(a) The Work shall be comprised of the maintaining of service of the following utilities:

(i) MTS Cable and Conduit

(b) The Work shall also involve the temporary removal of the following utilities for replacement by others after the construction and backfilling of the culvert:

(i) Centra Gas Pipe

(ii) Traffic Signals Cable

E15.3.2 Identification of Utilities

(a) The Drawings show various utilities and their locations. The Contract Administrator takes no responsibility for the locations shown on the Drawings. They have been located with the best information available at the time of design and may or may not be correct. Further to CW 1120-R1, the Contractor shall verify what utilities are in the construction project and their location.

E15.3.3 MTS Cable and Conduit

- (a) The Contractor shall support the existing MTS cable and conduit across the excavation to maintain service for the duration of the project.
- (b) If required, because the cable and/or conduit is too low and encroaches on the culvert, raise the cable and/or conduit sufficiently to clear the top of the new culvert.
- (c) Prepare drawings and procedure notes showing in detail how the support will be done. Submit five (5) copies of these temporary works drawings and notes to the Contract Administrator for review at least five (5) working days before the Work is to take place. These drawings and notes will be reviewed by both the Contract Administrator and MTS.
- (d) Restore the cable and conduit to the satisfaction of MTS and the Contract Administrator.
- (e) Ensure that MTS is notified of each critical stage of work and that they are afforded full access for inspection.

E15.3.4 Centra Gas Pipe

- (a) The Contractor will be required to remove and dispose of the abandoned steel gas pipe of approximately 16 m length. Sometime following backfill of the structures and before the Contractor places the concrete roadway, the utility owner will replace the natural gas line near its original location.

E15.3.5 Traffic Signals Cable

- (a) The Contractor shall contact the City of Winnipeg Traffic Signals department to temporarily relocate the traffic signals cable prior to excavation. Sometime following backfill of the structures and before the Contractor places the concrete roadway and sidewalk, the City will reinstall the traffic signals cable.

E15.4 Method of Measurement

- E15.4.1 Utility works will be paid for on a Lump Sum basis, as accepted by the Contract Administrator and no measurement will be made for this Work.

E15.5 Basis of Payment

- E15.5.1 Utility works will be paid for at the Contract Lump Sum Price for "Utility Works", 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. RIPRAP

E16.1 General

- E16.1.1 Riprap shall be random stone riprap and supplied and installed in accordance with Specification CW 3615-R2, except as specified herein.

E16.2 Materials

E16.2.1 Geotextile Fabric

- (a) Geotextile fabric shall be non-woven and conform to the requirements of CW 3120_R2 Section 2.5.

E16.2.2 Rock

- (a) Further to CW 3615-R2, some of the rock shall be 600 Ø.

E16.3 Construction Methods

- E16.3.1 Place a layer of the geotextile fabric under the riprap and anchor the upstream and downstream ends of rock filled trenches as shown on the Drawings.

E16.3.2 Place the random rock riprap carefully on the geotextile fabric so that it does not tear. The 600 Ø rock shall be placed where shown on the Drawings or as otherwise approved by the Contract Administrator.

E16.4 Method of Measurement

E16.4.1 Random stone riprap and geotextile fabric will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E16.5 Basis of Payment

E16.5.1 Random stone riprap and geotextile fabric will be paid for at the Contract Lump Sum Price for "Random Stone Rip Rap and Geotextile", 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.

E17. CHAINLINK FENCING

E17.1 Description

E17.1.1 The Work covered under this item shall include all operations relating to supply and installation of new chainlink fencing as specified herein.

E17.1.2 The Work to be done by the Contractor under this Section 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 the Work as hereinafter specified.

E17.2 Materials

E17.2.1 Fence Post Inserts

- (a) The fence post inserts shall be fabricated and installed in accordance with the details provided on the Drawings. The post inserts shall be hot-dip galvanized.
- (b) Non-shrink cementitious grout for grouting the fence post inserts shall be Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, Meadows CG-86, or equal in accordance with B6. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E17.2.2 Base Plate and Anchors

- (a) The base plate shall be fabricated and installed in accordance with the details provided on the Drawings. The base plate shall be hot-dip galvanized.
- (b) Anchors to be Hilti HVU adhesive anchors c/w stainless steel threaded HAS rods, nuts and washers.

E17.2.3 Chain Link Fence

- (a) Chain link fencing to be supplied in accordance with CW 3550-R2
- (b) Further to CW3550-R2, 43 O.D. bottom rails shall be used.

E17.3 Construction Methods

E17.3.1 Fence Post Inserts

- (a) Core or form holes for the post inserts in the sidewalk curb to the sizes shown on the Drawings. Grout posts using non-shrink grout in accordance with this Specification.
- (b) Supply and installation of fence post inserts shall be considered incidentally to the Works of this Specification and no additional payment will be made.

E17.3.2 Base Plates and Anchors

- (a) Base plates to be anchored to the existing concrete wing wall at the locations shown on the Drawings with 12.7 mm diameter Hilti HVU adhesive anchors c/w stainless steel threaded HAS rods, nuts and washers.
- (b) Hilti anchors to be installed in accordance with Manufacturer's specifications.
- (c) Supply and installation of base plates and anchors shall be considered incidental to the Works of this Specification and no additional payment will be made.

E17.3.3 Chain Link Fence

- (a) New chain link fence to be installed to the limits shown on the Drawings in accordance with CW3550-R2.

E17.4 Method of Measurement

- E17.4.1** Chainlink fencing will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E17.5 Basis of Payment

- E17.5.1** Chainlink fencing will be paid for at the Contract Lump Sum Price for "Chainlink Fencing", 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.

E18. TRAFFIC BARRIER

E18.1 Description

- E18.1.1** The Work covered under this item shall include all operations relating to the removal, temporary storage and reinstallation of the existing balanced aluminum barrier as specified herein.
- E18.1.2** The Work to be done by the Contractor under this Section 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 the Work as hereinafter specified.

E18.2 Materials

E18.2.1 Asphalt Cold Mix

- (a) Asphalt cold mix shall be supplied and installed around the barrier posts in accordance with CW-3650.

E18.3 Construction Methods

E18.3.1 Aluminum Barrier

- (a) The existing aluminum barrier railing shall be removed, temporarily stored and reinstalled as directed by the Contract Administrator to maintain the necessary height above the new concrete roadway curb and sidewalk.
- (b) The Contractor shall replace any broken hardware resulting from his removal and reinstallation operations.
- (c) Aluminum railing shall be stored in a protected location as approved by the Contract Administrator.
- (d) The barrier posts and aluminum barrier railing shall be re-installed along the new barrier alignment as shown on the Drawings.
- (e) Asphalt cold mix shall be placed and compacted around the base of the barrier posts as shown on the Drawings.

E18.4 Method of Measurement

E18.4.1 Removal and reinstallation of the traffic barrier will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E18.5 Basis of Payment

E18.5.1 Removal and reinstallation of the traffic barrier will be paid for at the Contract Lump Sum Price for "Traffic Barrier", 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.

E19. GRADING AND TOPSOIL

E19.1 General

E19.1.1 Grading and topsoil shall be constructed in accordance with Specification CW 3540-R5, except as amended herein. Topsoil shall be placed over all granular and soil backfill that is to be revegetated. Revegetation will be by others. The Contractor is responsible for erosion protection works until the revegetation is commenced by others.

E19.1.2 Place a minimum thickness of 100 mm to topsoil except 150 mm over granular backfill.

E19.2 Method of Measurement

E19.2.1 Grading and topsoil placement will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E19.3 Basis of Payment

E19.3.1 Grading and topsoil placement will be paid for at the Contract Lump Sum Price for "Grading and Topsoil", 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.