



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 24-2011

**NAVIN DRAIN CROSSING: LAGIMODIERE MULTI-USE PATH
CONSTRUCTION OF CAST-IN-PLACE CONCRETE CULVERT**

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

NAVIN DRAIN CROSSING: LAGIMODIERE MULTI-USE PATH

B1.1 CONSTRUCTION OF CAST-IN-PLACE CONCRETE CULVERT

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, January 27, 2011.

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

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

B3. SITE INVESTIGATION

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

B3.2 The Bidder is advised that vehicle access to the site is restricted to existing roads and approaches.

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 website at <http://www.winnipeg.ca/matmgt/bidopp.asp>

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

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

B6. SUBSTITUTES

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

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

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

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

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

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

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

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

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

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

- B6.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.
- B6.10 Notwithstanding B6.2 to B6.9, and in accordance with B7.6 deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B15.1(a).

B7. BID COMPONENTS

- B7.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices;
 - (c) Bid Security
 - (i) Form G1: Bid Bond and Agreement to Bond, or Form G2: Irrevocable Standby Letter of Credit and Undertaking, or a certified cheque or draft;
- B7.2 Further to B7.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B6.
- B7.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely, to constitute a responsive Bid.
- B7.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.
- B7.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid.
- B7.5 Bidders are advised not to include any information/literature except as requested in accordance with B7.1.
- B7.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B15.1(a).
- B7.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B7.8 Bids shall be submitted to:
- The City of Winnipeg
Corporate Finance Department
Materials Management Division
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B8. BID

- B8.1 The Bidder shall complete Form A: Bid, making all required entries.
- B8.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his own name, his name shall be inserted;
 - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
 - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;

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

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

B8.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B8.4 Paragraph 12 of Form A: Bid shall be signed in accordance with the following requirements:

- (a) if the Bidder is a sole proprietor carrying on business in his own name, it shall be signed by the Bidder;
- (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
- (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, should be affixed;
- (d) if the Bidder is carrying on business under a name other than his own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

B8.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.

B8.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B9. PRICES

B9.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B9.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.

B9.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

B9.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B10. QUALIFICATION

B10.1 The Bidder shall:

- (a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba; and
- (b) be financially capable of carrying out the terms of the Contract; and
- (c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.

B10.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information

Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/debar.stm>

- B10.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) have successfully carried out work similar in nature, scope and value to the Work; and
 - (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
 - (c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);
- B10.4 Further to B10.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:
- (a) a valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association or by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or
 - (b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt>)
- B10.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.
- B10.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B11. BID SECURITY

- B11.1 The Bidder shall provide bid security in the form of:
- (a) a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or
 - (b) an irrevocable standby letter of credit, in the amount of at least ten percent (10%) of the Total Bid Price, and undertaking issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form included in the Bid Submission (Form G2: Irrevocable Standby Letter of Credit and Undertaking); or
 - (c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.
- B11.1.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.
- B11.1.2 All signatures on bid securities shall be original.
- B11.1.3 The Bidder shall sign the Bid Bond.
- B11.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

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

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

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

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

B12. OPENING OF BIDS AND RELEASE OF INFORMATION

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

B12.1.1 Bidders or their representatives may attend.

B12.1.2 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 website 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 website 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, or acceptable deviation there from (pass/fail);
- (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B9.4 (pass/fail);
- (c) Total Bid Price;
- (d) economic analysis of any approved alternative pursuant to B6.

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

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

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

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

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

B16. AWARD OF CONTRACT

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

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

- B16.2.1 Without limiting the generality of B16.2, the City will have no obligation to award a Contract where:
- (a) the prices exceed the available City funds for the Work;
 - (b) the prices are materially in excess of the prices received for similar work in the past;
 - (c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;
 - (d) only one Bid is received; or
 - (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.
- B16.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B15.
- B16.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

- C0.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm
- C0.2 A reference in the Bid Opportunity to a section, clause or subclause with the prefix “**C**” designates a section, clause or subclause in the *General Conditions for Construction*.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

D1.1 In addition to the *General Conditions for Construction*, these Supplemental Conditions are applicable to the Work of the Contract.

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of constructing a cast-in-place concrete culvert in the Navin Drain to act as a crossing for the proposed Lagimodiere Multi-Use Path.

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

- (a) Excavation and Backfill
- (b) Supply and place reinforced cast-in-place concrete
- (c) Erosion control
- (d) Riprap
- (e) Fencing

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is GENIVAR, represented by:

Mr. Scott Minty
Project Manager
10 Prairie Way, Winnipeg, Manitoba, R2J 3J8
Telephone No. (204) 477-6650
Facsimile No. (204) 474-2864

D3.2 At the pre-construction meeting, Scott Minty 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, all notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following facsimile number:

The City of Winnipeg
Chief Financial Officer

Facsimile No.: (204) 949-1174

- 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
Legal Services Department
Attn: City Solicitor
185 King Street, 3rd Floor
Winnipeg MB R3B 1J1

Facsimile No.: (204) 947-9155

D6. FURNISHING OF DOCUMENTS

- D6.1 Upon award of the Contract, the Contractor will be provided with five (5) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him at cost.

SUBMISSIONS

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 five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.
- 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 website 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 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.

SCHEDULE OF WORK

D13. COMMENCEMENT

- D13.1 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.
- D13.2 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; and
 - (vii) the Detailed Work Schedule in D12.
- (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.

D13.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.

D13.4 The City intends to award this Contract by February 3, 2011.

D14. CRITICAL STAGES

D14.1 The Critical Stage Completion Date is March 15, 2011.

D14.2 The Work to be completed by the Critical Stage Date includes

- (a) Culvert construction
- (b) Creek works
- (c) Rough grading

D14.3 Construction of the approach slabs is not included in the Critical Stage.

D15. SUBSTANTIAL PERFORMANCE

D15.1 The Contractor shall achieve Substantial Performance by June 15, 2011.

D15.2 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 re-inspected.

D15.3 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.

D16. TOTAL PERFORMANCE

D16.1 The Contractor shall achieve Total Performance by June 30, 2011.

D16.2 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 re-inspected.

D16.3 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.

D17. LIQUIDATED DAMAGES

D17.1 If the Contractor fails to achieve Substantial or Total Performance in accordance with the Contract by the day fixed herein for same, the Contractor shall pay the City the following

amounts per Working Day for each and every Working Day following the day fixed herein for Total Performance during which such failure continues:

- (a) Substantial Performance - One thousand five hundred dollars (\$1500);
- (b) Total Performance - One thousand dollars (\$500).

D17.2 The amount specified for liquidated damages in D17.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Total Performance by the day fixed herein for same.

D17.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

CONTROL OF WORK

D18. JOB MEETINGS

D18.1 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.

D18.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

D19. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D19.1 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).

D20. LAYOUT OF THE WORK

D20.1 CULVERT

- (a) Further to C6, the Contract Administrator will provide the basic centrelines and an elevation of the works as shown on the Drawings by providing stakes at the working points and two offset stakes for each working point. This will be completed once by the Contract Administrator, should the Contractor require these points to be subsequently laid out it would be completed by the Contract Administrator at a cost of \$180 per hour to the Contractor.
- (b) 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.
- (c) 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.
- (d) 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.
- (e) 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

D21. PAYMENT

D21.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D22. WARRANTY

D22.1 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. 24-2011

NAVIN DRAIN CROSSING: LAGIMODIERE MULTI-USE PATH
CONSTRUCTION OF CAST-IN-PLACE CONCRETE CULVERT

which is by reference made part hereof and is hereinafter referred to as the "Contract".

NOW THEREFORE the condition of the above obligation is such that if the Principal shall:

- (a) carry out and perform the Contract and every part thereof in the manner and within the times set forth in the Contract and in accordance with the terms and conditions specified in the Contract;
- (b) perform the Work in a good, proper, workmanlike manner;
- (c) make all the payments whether to the Obligee or to others as therein provided;
- (d) in every other respect comply with the conditions and perform the covenants contained in the Contract; and
- (e) indemnify and save harmless the Obligee against and from all loss, costs, damages, claims, and demands of every description as set forth in the Contract, and from all penalties, assessments, claims, actions for loss, damages or compensation whether arising under "The Workers Compensation Act", or any other Act or otherwise arising out of or in any way connected with the performance or non-performance of the Contract or any part thereof during the term of the Contract and the warranty period provided for therein;

THEN THIS OBLIGATION SHALL BE VOID, but otherwise shall remain in full force and effect. The Surety shall not, however, be liable for a greater sum than the sum specified above.

AND IT IS HEREBY DECLARED AND AGREED that the Surety shall be liable as Principal, and that nothing of any kind or matter whatsoever that will not discharge the Principal shall operate as a discharge or release of liability of the Surety, any law or usage relating to the liability of Sureties to the contrary notwithstanding.

IN WITNESS WHEREOF the Principal and Surety have signed and sealed this bond the

_____ day of _____, 20____.

SIGNED AND SEALED
in the presence of:

(Witness as to Principal if no seal)

(Name of Principal)

Per: _____ (Seal)

Per: _____

(Name of Surety)

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

**FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)**
(See D10)

(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 24-2011

**NAVIN DRAIN CROSSING: LAGIMODIERE MULTI-USE PATH
CONSTRUCTION OF CAST-IN-PLACE CONCRETE CULVERT**

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

(Name of Contractor)

(Address of Contractor)

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

_____ Canadian dollars.

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

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

Partial drawings are permitted.

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

(Address)

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

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

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

(Date)

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

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

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

(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM L: DETAILED WORK SCHEDULE
 (See D12)
NAVIN DRAIN CROSSING: LAGIMODIERE MULTI-USE PATH

Construction of Cast-in-place Concrete Culvert

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.					
Items of Work	Percentage of Work Complete				
	Start	25%	50%	75%	100%
Mobilization					
Dewatering (if applicable)					
Excavation					
Concrete Box Culvert Construction					
Backfill					
Site Grading					
Riprap and Erosion Control Blanket Installation					
Critical Stage Date	March 15, 2011				
Approach Slab Construction					
Site Restoration					
Substantial Performance	June 15, 2011				
Total Performance	June 30, 2011				

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

E1.2 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/Spec/Default.stm>

E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.

E1.2.3 Further to C2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.3 The following are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
C378-11-01	Cover Page
C378-11-02	Navin Drain Crossing: Lagimodiere Multi-Use Path Navin Drain Crossing Location and Site Grading Plan
C378-11-03	Navin Drain Crossing: Lagimodiere Multi-Use Path Box-Culvert Plans
C378-11-04	Navin Drain Crossing: Lagimodiere Multi-Use Path Box-Culvert Elevations
C378-11-05	Navin Drain Crossing: Lagimodiere Multi-Use Path Box-Culvert Section
C378-11-06	Navin Drain Crossing: Lagimodiere Multi-Use Path Box-Culvert Section
C378-11-07	Navin Drain Crossing: Lagimodiere Multi-Use Path Box-Culvert Sections and Details

E2. SOILS INVESTIGATION REPORT

E2.1 Further to C3.1, a geotechnical investigation has been carried out for the proposed location of the Navin Drain Crossing - Lagimodiere Multi-Use Path by GENIVAR. The Geotechnical Report is included in Appendix A at the end of these Specifications for the convenience of Bidders.

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. Considerable variations in the soil conditions may exist between test holes and fluctuations in the ground water levels can be expected seasonally.

E2.3 The above Geotechnical Report was used by the Contract Administrator as a reference during the design of the proposed Works. It does not constitute part of the Contract Document and its recommendations shall not be construed as a requirement of the proposed Works.

E2.4 It is the responsibility of bidders using the information in the Geotechnical Report to ensure it is suitable for their purposes and to supplement it as they consider necessary.

- E2.5 Any test borings made by the Contractor shall be done in accordance with the requirements of the appropriate authorities of the City of Winnipeg. Contractor shall notify the Contract Administrator prior to starting any soil boring operation.

GENERAL REQUIREMENTS

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 Neighbourhood Liveability By-Law No. 1/2008. 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. The Contractor shall maintain the fence for the duration of the construction and remove it when construction is complete.

E6.3.2 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.

E6.3.4 Access Routes To Site

(a) Installation equipment for the proposed works shall not cross or travel along either side of the feedermain and/or aqueduct within a lateral distance of 5.0 meters from the centre line of the feedermain and/or aqueduct.

(b) Access to the site for construction equipment shall be on the north side of the Branch 2 Aqueduct

(c) Access to the site shall be from existing approaches only.

E6.4 The Contractor shall allow the Contract Administrator and his representative's use of the Contractor's office facilities as required for the duration of construction.

E6.5 Measurement and Payment

E6.5.1 Mobilization and Demobilization will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization" performed in accordance with this Specification and accepted by the Contract Administrator.

E7. TRAFFIC AND PEDESTRIAN CONTROL

E7.1 Description

- (a) The Work covered under this item shall cover specific traffic and pedestrian control requirements.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E7.2 Notification

- E7.2.1 The Contractor shall notify the City of Winnipeg Customer Service at 986-5640, forty-eight hours in advance of any traffic lane closures. This call is necessary so that the public can be notified of impending lane closures.

E7.3 Construction Methods

E7.3.1 General

- (a) The Contractor will be responsible for pedestrian and traffic control at the Site acceptable to the Contract Administrator.
- (b) For traffic control in the immediate Work area, the Contractor shall 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.
- (c) The Contractor shall provide and maintain flagmen in accordance with the above mentioned manual.
- (d) If any pedestrian traffic is disrupted or rerouted at the site, the Contractor shall be responsible for supplying and installing all necessary signs and protection to the satisfaction of the Contract Administrator.
- (e) The Contractor shall take all other safety measures necessary to cope with any peculiar or unusual circumstances that have not been set out in the above-mentioned manual and shall, at all times, ensure that maximum protection is afforded to the road user and that his operations in no way interfere with the safe operation of traffic.
- (f) Improper signing will be sufficient reason for the Contract Administrator to immediately shut down the entire job.
- (g) Barricades shall be supplied and installed by the Contractor and include the telephone number(s) at which he can be reached twenty-four (24) hours per day, seven (7) days per week.
- (h) During the hours when the Contractor is not working, equipment and stockpiled materials shall be left in such a location so as not to interfere with or present hazard to motorists or pedestrians.

E7.3.2 Further to clause 3.7 of CW 1130:

- (a) Maintain a minimum of one lane in each direction of traffic on Lagimodiere Blvd, during construction;
- (b) No lane closures of Lagimodiere Blvd will be permitted during peak traffic hours
- (c) Where left turn lanes exist, an additional lane to accommodate the left turn storage lane shall be maintained at all times.
- (d) Traffic at all intersections must be maintained during construction to allow for one lane of traffic in each direction to go straight through and another lane in each direction to turn left. When no work is being performed in the intersection and providing it is safe for vehicles, lane closures in the intersection will not be permitted.
- (e) Intersecting street and private approach access shall be maintained at all times.

- (f) Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, he shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.

E7.4 Measurement and Payment

- E7.4.1 Traffic and Pedestrian Control will not be measured and is incidental to the work.

E8. CREEK FLOW MAINTENANCE

E8.1 Description

- E8.1.1 This Specification shall cover the maintaining of flows in Navin Drain at the Lagimodiere Multi-Use Path crossing for the duration of the construction Works.
- E8.1.2 A hydraulic investigation has been carried out for the Navin Drain Crossing at the Lagimodiere Multi-Use Path by Bruce Harding Consulting. The Hydraulic Report is included in Appendix B at the end of these Specifications for the convenience of Bidders.
- E8.1.3 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 the obvert of upstream culverts.
 - (b) Cofferdams, if used, shall be constructed of non-erodible material such as sandbags.
 - (c) Between the dates of April 1 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.
 - (d) Construction activities within the drain shall not take place between April 1 and June 15 of any given year.

E8.4 Measurement and Payment

- E8.4.1 The maintenance of creek flows will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Creek Flow Maintenance" performed in accordance with this Specification and accepted by the Contract Administrator.

E9. EXCAVATION

E9.1 Description

- E9.1.1 Specification shall cover all operations relating to the excavation for the new culvert construction works, channel riprap, surface erosion control during construction, drain bed and embankment sloping as noted on the Drawings.
- 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 as per E16.

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, drain bed and embankment trimming.
 - (d) Prevention of frost incursion into the sidewalls or base of the excavation for the duration of the Works.
 - (e) Surface erosion protection and rough grading.
 - (f) The off-site disposal of surplus and unsuitable material.
- E9.3.2 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.

E9.3.3 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.

E9.3.4 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. 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 drain, 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 drain embankment has been completed. The erosion control blanket is to be supplied, placed, measured and paid for in accordance with E16 and silt fences are to be supplied, placed, measured and paid for in accordance with E13.

E9.3.5 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 Measurement and Payment

E9.4.1 Excavation will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Excavation" performed in accordance with this Specification and accepted by the Contract Administrator.

E10. SUPPLY AND PLACE REINFORCING STEEL

E10.1 Description

E10.1.1 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 400W, 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) Shop drawings are to be submitted by the Contractor not less than 5 days prior to construction for review and approval by the Contract Administrator.
- (b) Reinforcing steel shall be detailed in accordance with the latest ACI Detailing Manual.

E10.3 Construction Methods

E10.3.1 Fabrication of Reinforcing Steel

- (a) Reinforcing steel shall be fabricated in accordance with CSA Standard S6 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 Contract Administrator's decision in this matter shall be final.
- (b) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete, which 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 re-bent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel 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.
- (e) Concrete cover to reinforcing steel shall be in accordance with CSA A23.1-04, Table 17.

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 Measurement and Payment

- 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. This item of work will be paid at the Contract Unit Price per kilogram for the "Supply and Place Reinforcing Steel" performed in accordance with this Specification and accepted by the Contract Administrator.

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. Rate of application shall be 1.5 times the rate specified by the Manufacturer for the texture of concrete to which the curing compound is being applied.
- (b) Curing compounds shall be resin-based and clear-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 CSA S269.3.
- (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, 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. 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 Drainaform 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.
- (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 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) Cut-off Wall.
 - (iv) Wingwalls
 - (v) Retaining Walls

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.
- (b) Working base shall be Class S-2 Concrete of minimum compressive strength of 20 MPa.
- (c) 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) 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.
- (k) 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.
- (l) 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.
- (m) 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.
- (n) Forms shall be sufficiently tight to prevent leakage of grout or cement paste.
- (o) Form panels shall be constructed so that the contact edges are kept flush and aligned.

- (p) 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.
- (q) 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 uniformly 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°C in anyone hour period or 20°C 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.
- (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, unless otherwise accepted by the Contract Administrator. 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 25 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 daily temperature falls below 5°C during placing or curing.
- (b) Supplementary equipment, as required below, shall be at the job Site if concrete is likely to be placed in cold weather.
- (c) Formwork and reinforcing steel shall be heated to at least 5°C before concrete is placed.
- (d) 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.
- (e) 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 20°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.
- (f) When the mean daily temperature may fall below 5°C, a complete hoarding of the Work, together with supplementary heat, shall be provided.
- (g) 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.
- (h) 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.
- (i) 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.

- (j) 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.
- (k) 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.
- (l) 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.
- (m) 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 Hot Weather Concreting

(a) General

- (i) The requirements of this section shall be applied during hot weather; i.e. air temperatures above 25°C during placing.
- (ii) Concrete shall be placed at as low a temperature as possible, preferably below 15°C, but not above 22°C. Aggregate stockpiles may be cooled by watersprays and sunshades.
- (iii) Ice may be substituted for a portion of the mixing water, providing it has melted by the time mixing is completed.
- (iv) Form and conveying equipment shall be kept as cool as possible before concreting, by shading them from the sun, painting their surfaces white, and/or the use of watersprays.
- (v) Sunshades and wind breaks shall be used as required during placing and finishing.
- (vi) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints."
- (vii) The Contract Administrator's approval is necessary before the Contractor may use admixtures, such as retardants, to delay setting or water-reducing agents to maintain workability and strength, and these must then appear in the Mix Design Statement submitted to the Contract Administrator.
- (viii) Curing shall follow immediately after the finishing operations.

(b) Hot Weather Curing

- (i) When the air temperature is at or above 25°C, curing shall be accomplished by water spray or by using saturated absorptive fabric, in order to achieve cooling by evaporation. Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20°C, in order to minimize the temperature rise of the concrete.

(c) Job Preparation

- (i) When the air temperature is at or above 25°C, or when there is a probability of its rising to 25°C during the placing period, facilities shall be provided for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, as defined in E3.4.14(b), the

formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by fogging and evaporation.

(d) Concrete Temperature

- (i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than that shown below for the indicated size of the concrete section.

Thickness of Section (m)	Temperatures, °C	
	Minimum	Maximum
Less than 0.3	10	35
0.3 to 1.0	10	30
1.0 to 2.0	5	25

E11.4.12 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.

E11.4.13 Structure Identification

- (a) 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.

E11.4.14 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 Measurement and Payment

E11.6.1 Structural Concrete

- (a) Supplying and placing structural concrete will be measured on a volume basis. The volume to be measured 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. This item of work will be paid for at the Contract Unit Price per cubic metre for "Structural Concrete" performed in accordance with this Specification and accepted by the Contract Administrator.

E11.6.2 Cold Weather Concreting

- (a) Cold Weather Concreting will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Cold Weather Concreting", performed in accordance with this Specification and accepted by the Contract Administrator.

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-R13, may be used.

E12.2.4 Crushed Limestone Sub-Base Course Material

(a) Crushed limestone base course material shall be supplied in accordance with City of Winnipeg Specification CW 3110-R13 with maximum 20 mm size.

E12.2.5 Crushed Limestone Base Course Material

(a) Crushed limestone base course material shall be supplied in accordance with City of Winnipeg Specification CW 3110-R13 with maximum 20 mm size.

E12.2.6 Clay Borrow Material

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

E12.2.7 Low Density Foam Board

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

E12.3 Construction Methods

E12.3.1 General

- (a) The Work shall comprise of supply and placement of:
- (i) A 600 thick granular base for the culvert.
 - (ii) A 75 mm thick concrete working base.
 - (iii) Granular backfill of the culvert.

(iv) Backfill as required to produce embankment slopes as shown on the Drawings.

(b) The Work shall also include:

(i) Erosion control.

E12.3.2 Granular Culvert Base

- (a) Supply and place a 600 mm thick layer of granular material below the working base of the culvert, consisting of a 300mm thick layer of Crushed Limestone Base Course Material on a 300 thick layer of Crushed Limestone Sub-Base Course Material
- (b) Place to a minimum of one hundred percent (98%) 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 CW 3110-R13. 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 asphalt pavement or to the underside of topsoil, as applicable.

E12.3.5 Embankment Slope Backfill

- (a) Backfill the embankment slopes where required producing the embankment grades shown on the Drawings. Use Granular Backfill compacted to a minimum of 98% Maximum Standard Proctor Density.
- (b) Embankment slope backfill shall include a 150mm thick clay cap as directed by the Contract administrator.

E12.3.6 Erosion Control

- (a) The Contractor shall perform the following erosion control works:
 - (i) Exposure of soils along drain 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 gulying 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. Sediment control fencing shall be supplied, placed, measured and paid for as per E13 Silt Fence Barrier. 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 drain is to be intercepted by cut-off trenches constructed near the drain's edge to reduce the deposition of sediments in the drain.
 - (vi) All drain work including placement of riprap shall be undertaken in the winter when the ground is frozen, where possible, 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 Measurement and Payment

- E12.4.1 Backfill will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Backfill" performed in accordance with this Specification and accepted by the Contract Administrator.

E13. SILT FENCE BARRIER

E13.1 Description

- E13.1.1 This Specification shall cover all operations relating to the work necessary for the supply, installation and maintenance of silt fence barriers, 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 The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.
- E13.2.2 The silt fence fabric shall be proposed by the Contractor and approved by the Contract Administrator.
- E13.2.3 The stakes shall be of sufficient strength to satisfy silt fence barrier performance and maintenance requirements. The stakes shall be a minimum of 1.2 metres in length with a maximum spacing of 2.5 metres between stakes.

E13.3 Construction Methods

- E13.3.1 The locations of the reinforced silt fence barriers are shown on the Plans, but the final locations of the silt fence barriers will be dependent on site conditions, the Contractor's activities and methods of construction and on direction of the Contract Administrator.
- E13.3.2 The different types of reinforced silt fence barriers are required under the following conditions:
- (a) The sandbag reinforced silt barrier (frozen ground conditions) is required to isolate all works at or near the waterway during freezing/ice conditions.
 - (b) The chained reinforced silt barrier.
- E13.3.3 Sandbag Reinforced Silt Barrier
- (a) Sandbags shall be filled with a type of sand as recommended by the sandbag supplier. When lying flat the filled sandbags shall measure not less than 250mm (width) by 450mm (length) by 180mm (height).
- E13.3.4 Chained reinforced silt barrier
- (a) Posts shall be spaced a maximum of 2.5 m apart, and shall be driven vertically into the ground to a minimum depth of 600 mm.
 - (b) A trench measuring approximately 200 mm wide by 200 mm deep shall be excavated along the entire line of stakes. The trench shall be on the side of the stakes where grading work is to be conducted.
 - (c) The geotextile from the silt fence shall extend into the trench a minimum of 300 mm. The prefabricated silt fence shall be installed without sags and have an overlap of 450 mm wherever its length is extended.
 - (d) The trench shall be backfilled and tamped to existing grade so as to hold the base of the geotextile firmly in place. The completed silt fence barrier shall have a minimum height of 600 mm above the ground surface.

E13.4 Maintenance

- E13.4.1 All silt fences shall be inspected immediately after runoff event and at least daily during prolonged rainfall or runoff. Any required repairs shall be made immediately. The silt fence barriers shall be maintained in place, without gaps, and without undermining, so as to prevent sediment passage through or under the barrier. Silt fence barriers shall be maintained vertical without tears and without sagging and maintain a 450 mm overlap on seams.
- E13.4.2 Accumulated sediment shall be removed at the direction of the Contract Administrator in a manner that avoids escape to the downstream side of the barriers. Sediment shall be removed to the level of the grade existing at the time of barrier installation and shall conform to the following:
- (a) accumulated sediment shall be removed when it reaches a depth of one-half the height of the silt fence barrier;
 - (b) accumulated sediment shall be removed as necessary to perform maintenance repairs;
 - (c) accumulated sediment shall be removed immediately prior to the removal of the silt fence.

E13.5 Removal

- E13.5.1 Removal of the silt fence barrier shall be completed as directed by the Contract Administrator.

E13.6 Measurement and Payment

- E13.6.1 Supplying, placing and removal of silt fence barrier will be measured per lineal metre. The length to be measured shall be the total number of metres of silt fence barrier supplied, placed and removed in accordance with this Specification, acceptable to the Contract Administrator, as computed from field measurements. This item of work will be paid for at the Contract Unit Price per metre for "Silt Fence Barrier" performed in accordance with this Specification and accepted by the Contract Administrator.

E14. RIPRAP

E14.1 General

- E14.1.1 Riprap shall be random stone riprap and supplied and installed in accordance with Specification CW 3615-R2, except as specified herein.

E14.2 Materials

- E14.2.1 Geotextile Fabric
- (a) Geotextile fabric shall be non-woven and conform to the requirements of CW 3120-R3 Section 2.5.

E14.3 Construction Methods

- E14.3.1 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.
- E14.3.2 Place the random rock riprap carefully on the geotextile fabric so that it does not tear.

E14.4 Measurement and Payment

- E14.4.1 Riprap will be measured per cubic metre. This item of work will be paid for at the Unit Price for "Random Stone Riprap" performed in accordance with this Specification and accepted by the Contract Administrator.

E15. CHAIN LINK FENCING

E15.1 Description

- E15.1.1 The Work covered under this item shall include all operations relating to supply and installation of new chain link fencing as specified herein.
- E15.1.2 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.

E15.2 Materials

E15.2.1 Fence Post Holes

- (a) The fence post holes shall be cored in accordance with the details provided on the Drawings.
- (b) Non-shrink cementitious grout for grouting the fence posts 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.

E15.2.2 Chain Link Fence

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

E15.3 Construction Methods

E15.3.1 Fence Posts

- (a) Core holes for the posts in the box culvert headwalls and wingwalls to the sizes and locations shown on the Drawings. Grout posts using non-shrink grout in accordance with this Specification.

E15.3.2 Chain Link Fence

- (a) New chain link fence to be installed to the limits shown on the Drawings in accordance with CW 3550.

E15.4 Measurement and Payment

- E15.4.1 Chain Link Fencing will not be measured. This item of work will be paid for at the Contract Lump Sum Price for "Chain Link Fencing" performed in accordance with this Specification and accepted by the Contract Administrator.

E16. EROSION CONTROL BLANKET (ECB)

E16.1 DESCRIPTION

- E16.1.1 This Specification covers the supply, installation, and maintenance of erosion control blanket to be installed on areas disturbed during construction and as directed by the Contract Administrator.

E16.2 MATERIALS

E16.2.1 Erosion Control Blanket(ECB)

- (a) Erosion Control Blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut blanket with a functional longevity of up to 24 months. Suitable products include SC 150 Extended Term manufactured by North American Green, or approved equivalent.
- (b) The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the

topside with heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and a maximum 159mm x 159mm mesh and on the bottom side with a lightweight photodegradable polypropylene netting with a maximum 127mm x 127mm mesh. The blanket shall be sewn together on 381mm centres (maximum) with degradable thread.

(c) ECB shall have the following properties:

- (i) Matrix 70% Straw Fibre (0.19kg/m²) and 30% Coconut Fibre (0.08kg/ m²).
- (ii) Netting top side heavyweight photodegradable with UV additives (1.47kg/100 m²).
- (iii) Bottom side lightweight photodegradable minimum netting weight (0.73 kg/100 m²).
- (iv) Degradable thread.

E16.2.2 Submittals

E16.2.3 The Contractor shall submit all manufacturers' product specifications and recommended installation methods for the proposed erosion control blankets and associated materials to the contract administrator a minimum of 14 days before construction.

E16.2.4 Construction Methods

E16.2.5 The Contractor shall supply all ECB materials required and store them on site. The installation and maintenance of all ECM will be as directed by the Contract Administrator. The installation will be required only if the outer coffer dam upstream of the culvert is going to be over topped.

E16.2.6 Actual alignment and location of the ECB may be adjusted in the field by the Contract Administrator.

E16.2.7 Erosion Control Blanket – Drainage Channel Installation

- (a) In general excavate a trench 150mm deep by 150mm wide at the upstream end of the drainage channel and leave 300mm of ECB beyond the upslope portion of the trench. Anchor blanket with 200mm long staples in trench as shown on the Drawings. Staples shall be a minimum of 300mm apart. Backfill trench with soil and compact. Apply seed to compacted soil. Fold remaining portion of blanket over sodded soil and secure with staples spaced 300mm (minimum) apart across width of blanket. Starting with the blanket on bottom of drainage channel, roll blanket out in direction of water flow. Securely fasten blanket against soil surface with staples. There shall be a minimum of 0.8 staples per square metre. Place blankets end over end in the downstream direction and secure overlaps with a double row of staples, staggered 10cm (minimum) apart. There shall be a minimum 10cm to 15cm overlap between blankets in the downstream direction. The City of Winnipeg Specifications
- (b) Repeat with blankets along the side slopes of the drainage channel. The overlap between adjacent blankets in the channel side slope direction shall be 50mm to 125mm (depending of blanket type). At the top of the side slope the full length edge of the blanket shall be anchored into a 150mm deep by 150mm wide anchor trench with staples spaced 300mm apart (minimum). The anchor trench shall be backfilled and compacted upon completion of stapling.
- (c) Secure downstream edges of ECB as per manufacturer's specifications and detail drawings.

E16.3 Maintenance

E16.3.1 The areas covered with ECB shall be regularly inspected especially after severe rainfall or storm events, to check for blanket separation or breakage.

E16.3.2 Any damaged or poorly performing areas as the result of storm events shall be replaced/repared immediately. Re-grading of the slope by hand methods may be required in the event of rill or gully erosion.

- E16.3.3 Should the Contract Administrator determine that the Contractor has not maintained the erosion control blankets properly or has damaged the blankets from construction activities resulting in sediment releases beyond the work area, the Contractor shall retrieve all sediment that has left the construction area, to the fullest extent possible, at his own cost. As a minimum, the Contractor shall remove all deltas and sediment deposited in drainage ways and re-grade and/or reseed the areas where sediment removal results in exposed soil. The removal and restoration shall take place within 5 working days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and restoration must take place within 5 working days of obtaining access. The Contractor is responsible for contacting all local, regional, provincial, and federal authorities before working in surface waters and for obtaining applicable permits. The Contractor's restoration work to restore property outside of the designated work area shall be at his own cost.

E16.4 Measurement and Payment

- E16.4.1 Supplying and placing Erosion Control Blanket will be measured on a square metre basis. The area to be measured shall be the total number of square metres of Erosion Control Blanket supplied and placed in accordance with this Specification, acceptable to the Contract Administrator, as computed from the Drawing dimensions. This item of work will be paid for at the Contract Unit Price per square metre for "Supply and Install Erosion Control Blanket" performed in accordance with this Specification and accepted by the Contract Administrator.

E17. WORK ADJACENT TO THE AQUEDUCT OR FEEDERMAIN

- E17.1 For proposed work in close proximity to a aqueduct or feedermain the Water and Waste Department requires that:
- E17.1.1 The contractor contact the departments construction services coordinator at 986-3823 7 days prior to arrange for an inspection.
 - E17.1.2 Any construction either crossing over or under an aqueduct or feedermain must be performed by a trench less method.
 - E17.1.3 The contractor expose the aqueduct or feedermain by a soft dig method prior to any construction to confirm depth and location.
 - E17.1.4 The contractor not operate heavy or vibratory equipment over or within 5.0 meters of centre line of feedermain and/or aqueduct.