



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 579-2009

**ALBANY STREET CROSSING OF TRURO CREEK – REPLACEMENT OF EXISTING
CULVERTS AND ASSOCIATED ROAD WORK**

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 ALBANY STREET CROSSING OF TRURO CREEK – REPLACEMENT OF EXISTING CULVERTS AND ASSOCIATED ROAD WORK

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, August 18, 2009.

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

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

B3. SITE INVESTIGATION

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

B4. ENQUIRIES

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

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

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

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

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

B5. ADDENDA

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

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

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

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

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

B6. SUBSTITUTES

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

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

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

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

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

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

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

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

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

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

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

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

B7. BID COMPONENTS

B7.1 The Bid shall consist of the following components:

- (a) Form A: Bid;
- (b) Form B: Prices;
- (c) Bid Security
 - (i) Form G1: Bid Bond and Agreement to Bond, or
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or
a certified cheque or draft;

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

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

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

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

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

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

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

B7.8 Bids shall be submitted to:

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

B8. BID

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

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

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

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

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

B9. PRICES

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

B10. QUALIFICATION

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

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

B10.4 Further to B10.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

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

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

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

B11. BID SECURITY

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

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

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

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

B11.1.3 The Bidder shall sign the Bid Bond.

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

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

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

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

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

B12. OPENING OF BIDS AND RELEASE OF INFORMATION

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

B12.1.1 Bidders or their representatives may attend.

B12.1.2 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 B10 (pass/fail);
- (c) Total Bid Price;
- (d) economic analysis of any approved alternative pursuant to B6.

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

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

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

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

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

B16. AWARD OF CONTRACT

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

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

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

- (a) the prices exceed the available City funds for the Work;
- (b) the prices are materially in excess of the prices received for similar work in the past;
- (c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;

- (d) only one Bid is received; or
- (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.

B16.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B15.

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

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of the removal of two existing CMP culverts and the construction of a cast-in-place concrete box culvert in Truro Creek through Albany Street.

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

- (a) Excavation and Backfill
- (b) Removal of Existing CMP Culverts and Headwalls
- (c) Utility Identification
- (d) Cast-in-Place Concrete
- (e) Creek Flow Maintenance
- (f) Riprap
- (g) Road and Sidewalk Restoration
- (h) Fencing
- (i) Sewer Pipe Protection

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is MMM Group Limited, represented by:

Mr. Jim Lukashenko, P.Eng.
Manager, Bridges & Structures
111-93 Lombard Avenue
Winnipeg, MB R3B 3B1

Telephone No. (204) 272-2025
Facsimile No. (204) 943-4948

D3.2 At the pre-construction meeting, Mr Lukashenko 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 address or facsimile number:

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

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

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

D6. FURNISHING OF DOCUMENTS

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

SUBMISSIONS

D7. AUTHORITY TO CARRY ON BUSINESS

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

D8. SAFE WORK PLAN

D8.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least 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 at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.
- D12.2 The detailed work schedule shall consist of the following:
- (a) a critical path method (C.P.M.) schedule for the Work;
 - (b) a Gantt chart for the Work based on the C.P.M. schedule;
- all acceptable to the Contract Administrator.
- D12.3 Further to D12.2(a), the Gantt Chart shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path:
- (a) Mobilization
 - (b) Construction of cofferdams
 - (c) Utility identification
 - (d) Excavation and removal of existing CMP's
 - (e) Construction of foundation
 - (f) Construction of cast-in-place concrete box culvert
 - (g) Backfilling
 - (h) Road and sidewalk restoration
 - (i) Riprap
 - (j) Fencing
 - (k) Substantial Performance
 - (l) Site clean-up and restoration
 - (m) Total Performance

D13. WATER MANAGEMENT PLAN

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

SCHEDULE OF WORK

D14. COMMENCEMENT

- D14.1 The Contractor shall not commence any Work until he is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.
- D14.2 The Contractor shall not commence any Work on the Site until:
- (a) the Contract Administrator has confirmed receipt and approval of:
 - (i) evidence of authority to carry on business specified in D7;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the Safe Work Plan specified in D8;
 - (iv) evidence of the insurance specified in D9;

- (v) the performance security specified in D10;
 - (vi) the Subcontractor list specified in D11;
 - (vii) the Detailed Work Schedule specified in D12; and
 - (viii) the Water Management Plan specified in D13
- (b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a pre-construction meeting.
- D14.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.
- D14.3 The City intends to award this Contract by September 10, 2009
- D14.3.1 If the actual date of award is later than the intended date, the dates specified for Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D15. SUBSTANTIAL PERFORMANCE

- D15.1 The Contractor shall achieve Substantial Performance by November 30, 2009.
- 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 reinspected.
- 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 May 31, 2010.
- 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 reinspected.
- 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 Total Performance in accordance with the Contract by the day fixed herein for Total Performance, the Contractor shall pay the City Nine Hundred dollars (\$900.00) per Calendar Day for each and every Calendar Day following the day fixed herein for Total Performance during which such failure continues.
- 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.

D18. SCHEDULED MAINTENANCE

- D18.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:
- (a) Sod maintenance as specified in CW 3510-R7.
- D18.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D19. JOB MEETINGS

- D19.1 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.
- D19.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

D20. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

- D20.1 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).

D21. LAYOUT OF THE WORK

- D21.1 Further to C6, the Contract Administrator will provide the basic centrelines and an elevation of the works as shown on the Drawings.
- D21.2 The Contractor shall be responsible for the true and proper layout of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work. The Contractor shall provide all required instruments and competent personnel for performing all layouts.
- D21.3 Should any error appear or arise in location, levels, dimensions, and/or alignments during the course of the Work, the Contractor shall promptly rectify such errors to the satisfaction of the Contract Administrator, at his own expense.
- D21.4 The Contract Administrator shall be notified at least one (1) Working Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.
- D21.5 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items used in giving the basic data supplied by the Contract Administrator. Any such benchmarks or stakes removed or destroyed by the Contractor, without the consent of the Contract Administrator, shall be replaced by the Contract Administrator at the expense of the Contractor.

MEASUREMENT AND PAYMENT

D22. PAYMENT

- D22.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D23. WARRANTY

- D23.1 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. 579-2009

ALBANY STREET CROSSING OF TRURO CREEK – REPLACEMENT OF EXISTING CULVERTS AND ASSOCIATED ROAD WORK

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 579-2009

ALBANY STREET CROSSING OF TRURO CREEK – REPLACEMENT OF EXISTING CULVERTS AND ASSOCIATED ROAD WORK

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)

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>
C340-09-01	Cover Sheet
C340-09-02	Proposed Roadworks Plan and Profile
C340-09-03	Site Plan, Test Hole Logs and General Notes
C340-09-04	General Arrangement
C340-09-05	Plan, Sections and Details
C340-09-06	Reinforcing Details

E2. SOILS INVESTIGATION REPORT

- E2.1 Further to C3.1, of the General Conditions, a geotechnical soil investigation has been carried out in the vicinity of the proposed Works to determine the character of the subsurface soil to facilitate the design of the Work. This information is considered accurate at the locations indicated and at the time of the investigation. However, considerable variations in the soil conditions may exist between test holes and fluctuations in the ground water levels can be expected seasonally. A copy of the geotechnical report dated March 9, 2009 is included in Appendix A at the end of these Specifications for the convenience of Bidders.
- E2.2 Bidders are responsible for any interpretation they place on the supplied information and are expected to make any additional investigation of the soil as they feel necessary.
- E2.3 Any test borings made by the Bidder shall be done in accordance with the requirements of the appropriate authorities of the City of Winnipeg. Bidders shall notify the Contract Administrator prior to starting any soil boring operation.

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. MOBILIZATION AND DEMOBILIZATION

E5.1 Description

E5.1.1 This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the Site, as specified herein.

E5.1.2 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.

E5.2 Materials

E5.2.1 The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification.

E5.2.2 Construction fencing shall be constructed of chain link and be 1800mm high.

E5.3 Construction Methods

E5.3.1 Site fencing shall be provided in the form of chain link fencing to delineate the construction from the non-construction area as shown on the Drawings. The Contractor shall maintain the fence for the duration of the construction and remove it when construction is complete.

E5.3.2 The Contractor's Site supervisor is required to carry, at all times, a cellular telephone with voice mail.

E5.3.3 This section also includes travel and accommodation, set-up and demobilization of Site offices, storage conveniences and other temporary facilities, construction plant, Site cleanup and other items not required to form part of the permanent works and not covered by other prices.

E5.4 Method of Measurement

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

E5.5 Basis of Payment

- (a) Mobilization and demobilization will be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization," which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.
- (b) 50% of the Mobilization and Demobilization lump sum price will be paid on the first progress payment.
- (c) The remaining 50% of the Mobilization and Demobilization lump sum price will be paid subsequent to the completion of the work, restoration and clean-up of the site.

E6. OFFICE FACILITIES

E6.1 The Contractor shall supply office facilities meeting the following requirements:

- (a) The field office shall be for the exclusive use of the Contract Administrator.
- (b) The building shall be conveniently located near the site of the Work.
- (c) The building shall have a minimum floor area of 25 square metres with two windows for cross ventilation and a door entrance with a suitable lock.
- (d) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either 16-18°C or 24-25°C.
- (e) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three wall outlets.
- (f) The building shall be furnished with one (1) desk, one (1) drafting table, one (1) table 3m X 1.2m, one (1) stool, one (1) four drawer legal size filing cabinet, and a minimum of six (6) chairs.
- (g) A portable toilet shall be located near the field office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and other personnel from the City.
- (h) The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when he deems it necessary.

E6.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities. No separate measurement or payment will be made for Office Facilities.

E6.3 The office facilities will be provided from the date of the commencement of the Work to the date the Contract is completed.

E7. PROTECTION OF EXISTING TREES

E7.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

- (a) The Contractor shall not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.
- (b) Trees identified to be at risk by the Contract Administrator are to be strapped with 25mm x 100mm x 2400mm wood planks, or suitably protected as approved by the Contract Administrator.
- (c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the

outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation.

- (d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the work required. Equipment shall not be parked, repaired or refueled, construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.
- (e) Work on-site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.

E7.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the City Forester or his designate.

E7.3 No separate measurement or payment will be made for the protection of trees.

E7.4 Except as required in clause E7.1(c) and E7.1(e), Elm trees shall not be pruned at any time between April 1 and July 31.

E8. TRAFFIC AND PEDESTRIAN CONTROL

E8.1 General

E8.1.1 The Contractor shall supply, erect, and maintain all applicable traffic control devices in accordance with the provision contained in the latest edition of the "Manual of Temporary Traffic Control in Work Areas on City Streets," issued by the City of Winnipeg.

E8.2 Construction Methods

E8.2.1 The Contractor may close Albany Street in the location of the culvert to all vehicle and pedestrian traffic for a maximum period of seven (7) consecutive weeks. Closure shall be limited to the width of the excavation mainly plus whatever space is needed for the construction "laydown and site office". The north limit of closure shall be to the limit of the roadwork shown on the Drawing and the south limit shall be north of the residence driveway immediately south of the culvert. It is intended that the Contractor laydown and site office area be north of the culvert.

E8.2.2 The Contractor shall provide and maintain flagmen in accordance with the abovementioned manual.

E8.2.3 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.

E8.2.4 Improper signing will be sufficient reason for the Contract Administrator or Inspector to immediately shut down the entire job.

E8.2.5 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.

E8.2.6 During the project, when Albany Street is closed to traffic, a temporary snow fence shall be installed across the sidewalk in the location of the culvert. The Contractor shall be responsible for maintaining the snow fence in a proper working condition.

E8.3 Method of Measurement

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

E8.4 Basis of Payment

- (a) The provision of traffic and pedestrian control will be paid for at the Contract Lump Sum Price for "Traffic and Pedestrian Control," which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E9. NIGHT WORK AND NOISE LIMITATIONS

E9.1 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.

E9.2 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 to the Noise Control By-Law No. 2480/79. Also, the Contractor, at his own cost, incidental to these Works, shall supply sufficient lighting to enable all night work to be done in a safe and efficient manner, satisfactory to the Contract Administrator.

E9.3 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.

E10. WATER USED BY CONTRACTOR

E10.1 Further to clause 3.7 of CW 1120-R1, the Contractor shall pay for all costs associated with obtaining water in accordance with the Waterworks By-law. Sewer charges will not be assessed for water obtained from a hydrant.

E11. SURFACE RESTORATION

E11.1 Prior to construction, inspect the grassed, pavement and gravel surfaces within and adjacent to the Site with the Contract Administrator to record the current condition. After construction and Site cleanup is complete, re-inspect the condition with the Contract Administrator.

E11.2 Restoration of grassed areas damaged as a result of construction activities will be restored in accordance with CW 3510. Restoration of grassed areas will not be measured for payment and shall be included as part of the Work being done.

E11.3 Pavement damaged as a result of construction activities will be restored in accordance with CW 3230 and CW 3410. Restoration of the pavement will not be measured for payment and shall be included as part of the Work being done.

E11.4 Gravel surfacing damaged as a result of construction activities will be restored in accordance with CW 3150. Restoration of the gravel surfacing will not be measured for payment and shall be included as part of the Work being done.

E12. CREEK FLOW MAINTENANCE

E12.1 Description

E12.1.1 This Specification shall cover the maintaining of flows in Truro Creek through Albany Street for the duration of the construction Works.

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 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.

E12.3 Construction Methods

E12.3.1 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 the suspended matter.

E12.3.2 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, and the water pumped from upstream to downstream. Water or ice elevations upstream of any type of upstream cofferdam shall not exceed 231.0 m.
- (b) The Contractor shall have on site back-up pump(s) with adequate capacity to maintain 100% of downstream flow at all times and ready to takeover pumping if the operating pump(s) fail. The pump(s) shall be continually monitored to ensure downstream flow is maintained at all times until normal flows are restored to the creek.
- (c) Cofferdams, if used, shall be constructed of non-erodible material such as sandbags. Earthen berms shall not be used as cofferdams.
- (d) Between the dates of April 1 and June 15 of any given year, 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.

E12.4 Method of Measurement

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

E12.5 Basis of Payment

- (a) The maintenance of creek flows will be paid for at the Contract Lump Sum Price for "Creek Flow Maintenance," which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E13. EXCAVATION AND OTHER REMOVALS

E13.1 Description

E13.1.1 This Specification shall cover all operations relating to the removal of existing culverts, structural concrete, pavement, fencing and riprap. It shall also include excavation for the new culvert construction works, subsurface soil drains, surface erosion control during construction, and creek bed and embankment sloping, 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 as set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E13.2.2 Excavated material shall be in accordance to CW 2030 – Excavation Bedding and Backfill, and shall include the 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 may be encountered.

E13.3 Construction Methods

E13.3.1 In general, the Work shall comprise of:

- (a) Design of the excavation for the new box culvert which shall 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) Excavation of material of whatever nature, to the limits shown on the Drawings for the box culvert.
- (d) Removal and disposal of existing egg-shaped CMP culverts, pavement, concrete wingwalls and fencing.
- (e) Prevention of frost incursion into the sidewalls or base of the excavation for the duration of the Works.
- (f) Surface erosion protection and rough grading.
- (g) Off-site disposal of surplus and unsuitable material.
- (h) To the extent that the Items of Work, "Creek Flow Maintenance" does not dewater the Site, provide dewatering of the excavation for the Works.

E13.3.2 If the Contractor chooses to support the excavation by shoring, the shoring shall be designed by a Professional Engineer registered in the Province of Manitoba in accordance with the following requirements:

- (a) Detailed design drawings and design calculations shall be submitted to the Contract Administrator for review at least five (5) business days prior to the start of construction of the shoring. The Bidders are advised that the drawings are for the Contract Administrator's review, information, and records only. The submission of the detailed drawings to the Contract Administrator shall in no way relieve the Contractor of the full responsibility for the design and proper functioning of the shoring.
- (b) The shoring shall be of a design and construction such that the Work can be properly constructed as required by the Specifications and Drawings. Sufficient clearance shall be provided within the shoring to permit all required construction activities to proceed unhindered.

- (c) The Contractor shall construct shoring in accordance with the shoring drawings. Variations from the shoring drawings will not be permitted, unless such variations are approved by the designer and the Contract Administrator is provided with the revised drawings.
- (d) Unless otherwise provided for, shoring shall be removed after the completion of the structure. Care shall be taken not to disturb or to otherwise damage the finished structure.
- (e) Shoring may be designed and installed "tight" and used as the outside form of the box culvert. If used that way, install bentonite geotextile waterproofing against the sheet piling at the joints prior to using it as a form.

E13.3.3 Specific requirements related to the excavation for the box culvert structure include:

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

E13.3.4 The Contractor shall be required to maintain the excavation sidewalls and base in a frost-free condition for the duration of the construction until the box culvert has been totally backfilled. This is required so that there will be no backfill placed on frozen earth and cause subsequent subsidence once thawed.

E13.3.5 The Contractor shall demolish and remove the following existing facilities:

- (a) Existing egg-shaped CMP culverts, concrete head walls and wingwalls, concrete pavement and sidewalks which shall be delivered to a disposal site approved by the Contract Administrator.
- (b) Existing chain-link fencing and posts which shall be delivered to the City of Winnipeg Bridge Yard and unloaded and stockpiled there by the Contractor in a location identified by the City.

E13.3.6 The Contractor shall provide rough grading to all disturbed surfaces within the construction area to the requirements of the "Preparation of Existing Grade" of Specification CW 3170. The Contractor shall be responsible to cover all unvegetated surfaces of the embankments with an erosion control blanket, erect silt fences, or use other suitable methods to prevent soil erosion into the creek, both during and after construction of the culvert up until the time of final landscaping restoration is to be done.

E13.3.7 Excavated material that is unsuitable for or surplus to the backfill requirements, shall become the property of the Contractor and shall be removed from the Site. Excavated material shall not be disposed of in a manner that will obstruct the flow of watercourses. During freezing weather, the excess material shall be disposed of before it freezes.

E13.4 Method of Measurement

- (a) Excavation and other removals will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E13.5 Basis of Payment

- (a) Excavation will be paid for at the Contract Lump Sum Price for "Excavation and Other Removals," which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E14. SUPPLYING AND PLACING REINFORCING STEEL

E14.1 Description

E14.1.1 This Specification shall cover the supply, fabrication and placement of plain reinforcing steel.

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

E14.2 Materials

E14.2.1 General

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

E14.2.2 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 sectional area, and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard G30.18.

E14.2.3 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.

E14.2.4 Reinforcing Steel Shop Drawings

- (a) The Contractor will be responsible for producing the detailed drawings for the fabrication and placement of the reinforcing steel. The Contractor shall submit shop drawings for the supply and placement of reinforcing steel. Shop drawings shall consist of bar bending details, lists, placing drawings, and mass tabulations. On placing drawings, indicate sizes, spacing, location, and quantities of reinforcement. Prepare drawings in accordance with ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures. Detail lap lengths and bar development lengths to CSA S6-06, unless otherwise indicated. Provide three (3) sets of full-size

hard copies to the Contract Administrator. Provide drawing in AutoCAD or other suitable electronic format.

E14.3 Construction Methods

E14.3.1 Fabrication of Reinforcing Steel

- (a) Reinforcing steel shall be fabricated in accordance with CSA Standard A23.1 to the lengths and shapes as shown on the Drawings.

E14.3.2 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 so that the bars shall not be moved out of alignment during or after the depositing of concrete. The Contractor's decision in this matter shall be final.
- (b) Reinforcing steel shall be free of all foreign material in order to ensure a positive bond between the concrete and steel. The Contractor shall also remove any dry concrete, which may have been deposited on the steel from previous concrete placement, before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.
- (c) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior approval of the Contract Administrator shall be obtained where other splices are to be made. Welded splices shall conform to CSA Standard W186, and are subject to prior written approval of the Contract Administrator.
- (d) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel will not be permitted without the prior approval of the Contract Administrator. A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to placing any concrete to allow for inspection of the reinforcement.

E14.4 Quality Control

E14.4.1 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.

E14.4.2 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.

E14.4.3 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.

E14.5 Method of Measurement

- (a) 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.

E14.6 Basis of Payment

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

E15. CAST-IN-PLACE STRUCTURAL CONCRETE

E15.1 Description

E15.1.1 Notwithstanding and in addition to CW 2160 – Concrete Underground Structures and Works, this Specification shall cover the preparation of Cast-in-Place Structural Concrete for, and all concreting operations related to, the construction of the box culvert, except as amended or supplemented herein.

E15.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all works as hereinafter specified.

E15.2 Materials

E15.2.1 General

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

E15.2.2 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.

E15.2.3 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.

E15.2.4 Bonding Agents

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

E15.2.5 Curing Compound

- (a) If permitted for use, curing compound shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309 and the proposed standard ASTM P198. Rate of application shall be 1.5 times the rate specified by the manufacturer.
- (b) Curing compounds shall be resin-based and white-pigmented.
- (c) No curing compound shall be applied to the culvert roof slab.

E15.2.6 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 one (1) part cement to two (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.

E15.2.7 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 40MPa.

E15.2.8 Formwork

- (a) Formwork materials shall conform to CSA Standard 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-M, a minimum of 20mm thick.
- (d) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-M. 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 50mm 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 50mm x 150mm.
- (i) Walers shall be spruce or pine, with minimum dimensions of 100mm x 150mm.
- (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.

E15.2.9 Permeable Formliner

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

E15.2.10 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 = 35MPa
 - (iii) 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 (2) 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.

E15.2.11 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 5mm 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.

E15.2.12 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 CI 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.

E15.2.13 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.

E15.2.14 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.

E15.2.15 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.

E15.2.16 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.

E15.2.17 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.

- E15.2.18 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.
- E15.2.19 Benchmark
- (a) Benchmark plugs as supplied by the City of Winnipeg.
- E15.2.20 Waterproofing
- (a) Waterproofing shall be Bituthene 3000 as distributed by Grace Construction Products, or equal in accordance with B6.
- E15.2.21 Waterstop
- (a) Waterstop shall be 150mm wide by 10mm thick vinylex ribbed-center bulb or approved equal in accordance with B6.
- E15.2.22 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.
- E15.2.23 Protection Board
- (a) The Contractor shall supply insulating fibreboard to CAN/CSA-A247, Type II, 12mm thick or approved equal in accordance with B6.
- E15.3 Equipment
- E15.3.1 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.
- E15.3.2 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 have standby vibrators available at all times during the pour.
- E15.3.3 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.
- E15.4 Construction Methods
- E15.4.1 General
- (a) The Works involving Cast-in-Place Concrete include the construction of:
 - (i) Box Culvert.
 - (ii) Headwalls.
 - (iii) Apron Slab and Approach Slab.
 - (iv) Wingwalls

E15.4.2 Concrete Working Base

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

E15.4.3 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) 20mm plywood: studding - 450mm centre to centre
 - (ii) walers - 760mm 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 50mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 25mm in diameter.
- (e) All exposed edges shall be chamfered 25mm 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 (2) directions and diagonally in the same two (2) vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.
- (j) The loads and lateral pressures outlined in Part 3, Section 102 of "Recommended Practice for Concrete Formwork," (ACI 347) and wind loads as specified by the National Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.
- (k) Formwork shall have sufficient strengths and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
- (l) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.
- (m) Forms shall be constructed and maintained so that the completed Work is within minus 3mm or plus 6mm of the dimensions shown on the Drawings.
- (n) Formwork shall be cambered, where necessary to maintain the specified tolerances, to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads.

- (o) Forms shall be sufficiently tight to prevent leakage of grout or cement paste.
- (p) Form panels shall be constructed so that the contact edges are kept flush and aligned.
- (q) All form lumber, studding, etc. becomes the property of the Contractor when the Work is finished and it shall be removed from the concrete and the Site by the Contractor after the concrete is set, free of extra charge, and the entire Site left in a neat and clean condition.
- (r) It shall be permissible to use the forms over again where possible, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and his decision shall be final regarding the use of them again.

E15.4.4 Formliner

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

E15.4.5 General Curing

- (a) The use of curing compound will not be allowed on concrete areas that are to receive additional concrete or waterproofing.
- (b) Unformed concrete surfaces shall be covered and kept moist by means of wet polyester blankets for seven (7) consecutive days immediately following finishing operations or otherwise approved by the Contract Administrator and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter. Construction joints shall only be covered and kept saturated by means of wet polyester curing blankets for the curing period.
- (c) If permitted for use, curing compounds shall be applied at the rate of not less than 1.5 times the rate specified by the manufacturer. The compound must be applied uniformly and by roller. Spraying of the compound will not be permitted.
- (d) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four (24) 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 any one (1) hour period or 20° in any twenty-four (24) 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 6mil 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.

E15.4.6 Placing Concrete

- (a) The Contract Administrator must be notified at least twenty-four (24) hours prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, expansion joints, and related works. Placement without required prior notification will not be allowed.
- (b) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms.

- (c) Concrete shall be conveyed from the mixer to the place of final deposit by methods that will prevent segregation and a marked change in consistency. The deck slab shall be placed by pumping methods.
- (d) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete and any mortar splashed upon the reinforcement or forms shall be removed.
- (e) Placing of concrete, when started, shall be continuous. No concrete shall be placed against concrete that has sufficiently hardened to cause the formation of seams or "cold joints" within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as approved.
- (f) Concrete shall be placed as nearly as possible to its finish position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (g) The maximum drop of free concrete into the forms shall not be greater than 1.5m; otherwise, rubber tubes or pouring ports spaced not more than 1.2m vertically and 2.5m 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 300mm to 900mm). 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.

E15.4.7 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.

E15.4.8 Form Removal

- (a) All forms shall remain in place for a minimum of seven (7) days. The Contract Administrator must be notified at least twenty-four (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 20MPa, with the added provisions that the member shall be of sufficient strength to safely carry its own weight, together with superimposed construction loads, and that the forms shall stay in place a minimum of three (3) 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.

E15.4.9 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 50mm from the surface before patching.
- (c) Minor surface defects caused by honeycomb, air pockets greater than 5mm 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 (1) 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.

E15.4.10 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) The Contract Administrator will advise the Contractor, in writing, as to the degree of heating of water and aggregates.
- (c) Supplementary equipment, as required below, shall be at the job Site if concrete is likely to be placed in cold weather.
- (d) Formwork and reinforcing steel shall be heated to at least 5°C before concrete is placed.
- (e) The temperature of the concrete shall be maintained at not less than 10°C for seven (7) days, or 15°C for five (5) days, or 20°C for three (3) days after placing. The concrete shall be kept above freezing temperature for at least a period of seven (7) days. In no case shall the heating be removed until the concrete has reached a minimum compressive strength, which will be specified by the Contract Administrator for Work under construction, and as determined from compressive strength tests for specimens secured under the same conditions as the concrete works in question.
- (f) Aggregates shall be heated to a temperature of not less than 20°C and not more than 55°C. Water shall be heated to a temperature between 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.
- (g) When the mean daily temperature falls below 5°C, a complete hoarding of the Work, together with supplementary heat, shall be provided.

- (h) When the ambient temperature is below -15°C , the hoarding shall be constructed so as to allow the concrete to be placed without the hoarding having to be opened. If the mixing is done outside of the hoarding, the concrete shall be placed by means of hoppers installed through the hoarding. The hoppers are to be plugged when not in use.
- (i) When the ambient temperature is equal to or above -15°C , the Contractor will be permitted to open small portions of the hoarding for a limited time to facilitate the placing of the concrete.
- (j) Before depositing any of the concrete, the Contractor shall show that enough heating equipment is available to keep the air temperature surrounding the forms within the specified range. This shall be accomplished by bringing the temperature inside of the hoarding to the specified 20°C , at least 12 hours prior to the start of the concrete placing.
- (k) The Contractor shall supply all required heating apparatus and the necessary fuel. When dry heat is used, a means of maintaining atmospheric moisture shall be provided. The relative humidity within the heated enclosure shall be maintained at a minimum of 40 percent during concrete placing and finishing operations. Following finishing operations, exposed concrete surfaces shall be protected from excessive drying by applying curing compound, covering the surfaces with polyethylene, or providing water curing.
- (l) Sufficient standby heating equipment must be available to allow for any sudden drop in outside temperatures and any breakdowns that may occur in the equipment.
- (m) Combustion-type heaters may be used if their exhaust gases are vented outside the enclosures and not allowed to come into contact with concrete surfaces. Fire extinguishers must be readily at hand wherever combustion-type heaters are used. Heating and hoarding shall be considered incidental to this specification and no separate measurement and payment will be made.
- (n) The Contractor shall keep a curing record of each concrete pour. The curing record shall include: date and location of the pour, mean daily temperature, hoarding relative humidity, temperatures above and below the concrete surface at several points, and notes regarding the type of heating, enclosure, unusual weather conditions, etc. This record shall be available for inspection by the Contract Administrator at the end of the concrete operations.

E15.4.11 Construction Joints

- (a) Construction joints shall be located only where shown on the Drawings or as otherwise approved in writing by the Contract Administrator. Construction joints shall be at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints. Bevelled shear keys 38mm x 89mm as shown on the Drawings or approved by the Contract Administrator, shall be provided at all joints.
- (b) 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.

E15.4.12 Benchmarks and Structure Identification

- (a) Benchmarks
 - (i) The Contractor shall install benchmark plugs supplied by the Contract Administrator at locations as directed by the Contract Administrator, all incidental to the Work of this Specification.
- (b) Structure Identification Date
 - (i) The Contractor shall indent into the exposed concrete a structure identification date at the location shown on the Drawings in accordance with the detail shown on the Drawings or as otherwise directed by the Contract Administrator, all incidental to the Work of this Specification.

E15.4.13 Clean Up

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

E15.5 Quality Control

E15.5.1 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.

E15.5.2 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.

E15.5.3 Materials

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

E15.5.4 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 25MPa.

E15.5.5 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.

E15.6 Method of Measurement

E15.6.1 Structural Concrete

- (a) Supplying and placing structural concrete will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres of structural concrete supplied and placed in accordance with this Specification, acceptable to the Contract Administrator, as computed from the Drawing dimensions. No deductions will be made for chamfers, reinforcing steel, structural steel, bolts or voids of 75mm 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.

E15.7 Basis of Payment

E15.7.1 Structural Concrete

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

E16. BACKFILL

E16.1 Description

- E16.1.1 This Specification shall cover all operations related to supply, placement and compaction of backfill materials as herein specified.
- E16.1.2 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.

E16.2 Materials

E16.2.1 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.

E16.2.2 Suitable Site Backfill

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

E16.2.3 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 50mm maximum aggregate size conforming to CW 3110 may be used.

E16.2.4 Crushed Limestone Base Course Material

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

E16.2.5 Free Draining Granular Backfill Material

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

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

(b) In addition to the above granular material, the drainage material specified in Section 2.6 of CW 3120 is also approved for this project.

E16.2.6 Clay Borrow Material

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

E16.2.7 Polystyrene Insulation

(a) Polystyrene insulation shall be 50mm thick Styrofoam SM to ASTM C518 and ASTM D1621 standards or approved equal in accordance with B6.

E16.2.8 Working Base

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

E16.2.9 Low Density Foam Board

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

E16.2.10 Concrete Roadway

(a) Concrete construction materials as per Section 5 of CW 3310, and shall be 72 hour early opening concrete as per Item 6.4 of CW 3310.

(b) Polypropylene fibres are to be used and shall consist of 100% virgin polypropylene as supplied by Grace (Microfibre) or Master Builders (Fibre Mesh MD), or equal in accordance with B6. The minimum dosage rate shall be 1.5kg/m³.

E16.3 Construction Methods

E16.3.1 General

(a) The Work shall comprise of supply and placement of:

- (i) A 300mm thick free draining granular base for the culvert.
- (ii) A 75mm thick concrete working base.
- (iii) Granular backfill of the culvert.
- (iv) A 75mm thick base course for the overlying concrete roadway surface, approach slab and sidewalk.
- (v) A 150mm thick reinforced concrete pavement slab as per SD-216.
- (vi) A 300mm thick reinforced concrete approach slab.
- (vii) Backfill as required to produce embankment slopes as shown on the Drawings.
- (viii) Polystyrene insulation over the top of the existing 450mm concrete sewer pipe which crosses under the culvert.

(b) The Work shall also include:

- (i) Erosion control.

E16.3.2 Free Draining Granular Culvert Base

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

E16.3.3 Working Base Concrete

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

E16.3.4 Culvert Backfill

- (a) All backfill of the culvert is to be unfrozen granular backfill and placed on unfrozen base. Place the backfill in accordance with the preparation of sub-base in Specification CW3110. That is in layers not exceeding 150mm in compacted thickness and to a minimum of 98% Maximum Standard Proctor Density.
- (b) Place the backfill up to the elevation of the underside of the base course for the concrete pavement or concrete sidewalk, or to the underside of topsoil, as applicable.

E16.3.5 75mm Thick Base Course

- (a) Place a 75mm thick or greater layer of base course as per E16.2.4 beneath the roadway and sidewalk on the granular backfill of the culvert to the grades indicated on the Drawings or as indicated in the field by the Contract Administrator. The base course shall be compacted to 100% Maximum Standard Proctor Density.
- (b) This base course layer will provide the substructure for the 150mm concrete roadway that will constitute the roadway surface.

E16.3.6 Asphalt Cold Mix

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

E16.3.7 Embankment Slope Backfill

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

E16.3.8 Clay Plugs

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

E16.3.9 Erosion Control

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

E16.4 Method of Measurement

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

E16.5 Basis of Payment

- (a) Backfill will be paid for at the Contract Lump Sum Price for "Backfill", which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E17. UTILITY WORKS

E17.1 Description

E17.1.1 This Specification shall cover all operations relating to the work necessary to maintain the various utilities functional during and after construction, as herein specified.

E17.1.2 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.

E17.2 Materials

E17.2.1 The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

E17.3 Construction Methods

E17.3.1 General

- (a) The Work shall be comprised of the maintaining of service of the following utilities:
 - (i) MTS Cable and Conduit
- (b) The Work shall also involve the temporary removal of the following utilities for replacement by others after the construction and backfilling of the culvert:
 - (i) Central Gas Pipe
 - (ii) Light Standard Cable

E17.3.2 Identification of Utilities

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

E17.3.3 MTS Cable and Conduit

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

- (e) Ensure that MTS is notified of each critical stage of work and that they are afforded full access for inspection.

E17.3.4 Central Gas Pipe & Light Standard

- (a) The Contractor shall contact Manitoba Hydro to temporarily relocate the natural gas line and light standard prior to excavation. Sometime following backfill of the structures and before the Contractor places the concrete roadway and sidewalk, the Contractor shall arrange for Manitoba Hydro to reinstall the natural gas line. Payment for this work shall be considered incidental to Utility Works. Any damage to the natural gas line by the Contractor shall be repaired at the Contractor's expense.

E17.4 Method of Measurement

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

E17.5 Basis of Payment

- (a) Utility works will be paid for at the Contract Lump Sum Price for "Utility Works", which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E18. RIPRAP

E18.1 General

- E18.1.1** Riprap shall be random stone riprap and supplied and installed in accordance with Specification CW 3615-R2, except as specified herein.

E18.2 Materials

E18.2.1 Geotextile Fabric

- (a) Geotextile fabric shall be non-woven and conform to the requirements of CW 3120-R2 Section 2.5.

E18.2.2 Rock

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

E18.3 Construction Methods

- E18.3.1** 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.

- E18.3.2** Place the random rock riprap carefully on the geotextile fabric so that it does not tear. The 600mm diameter rock shall be placed where shown on the Drawings or as otherwise approved by the Contract Administrator.

E18.4 Method of Measurement

- (a) Supplying and placing riprap and geotextile fabric will be paid for on a Lump Sum basis, as accepted by the Contract Administrator, and no measurement will be made for this Work.

E18.5 Basis of Payment

- (a) Random stone riprap and geotextile fabric will be paid for at the Contract Lump Sum Price for "Grouted Stone Rip Rap and Geotextile", which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E19. CHAINLINK FENCING

E19.1 Description

- E19.1.1 The Work covered under this item shall include all operations relating to supply and installation of new chainlink fencing as specified herein.
- E19.1.2 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.

E19.2 Materials

E19.2.1 Fence Post Grouting

Non-shrink cementitious grout for grouting the fence post 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 40MPa.

E19.2.2 Base Plate and Anchors

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

E19.2.3 Chain Link Fence

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

E19.3 Construction Methods

E19.3.1 Chain Link Fence

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

E19.4 Method of Measurement

- (a) Supplying and placing chainlink fencing will be measured on a linear basis. The length to be paid for shall be the total number of linear metres of chainlink fencing supplied and placed in accordance with this Specification, acceptable to the Contract Administrator, as computed from the Drawing dimensions. All accessories are incidental to the supply and placement of chainlink fencing and no separate payment will be made for this work.

E19.5 Basis of Payment

- (a) Supplying and placing chainlink fencing will be paid for at the Contract Unit Price per metre for "Chainlink Fence – 1.8m High", measured as specified herein, which price will be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

E20. SODDING

E20.1 Description

- E20.1.1 The Contractor shall be responsible for grading and sodding in accordance with Specification CW 3510, except as amended herein. Topsoil shall be placed over all granular and soil backfill that is to be sodded.

E20.1.2 Place a minimum thickness of 100mm topsoil except 150mm over granular backfill.

E20.2 Method of Measurement

E20.2.1 Supply, placement and maintenance of sod will be paid for on an area basis. The area to be paid for shall be the total number of square metres placed and maintained in accordance with this Specification and accepted by the Contract Administrator, as computed from measurement made by the Contract Administrator. No payment will be made for sod placed outside of the limits of placement as shown on the Drawings and as directed by the Contract Administrator.

E20.3 Basis of Payment

E20.3.1 Supply, placement and maintenance of sod will be paid for at the Contract Unit Price per square metre for "Sodding – Width > or = 600mm", measured as specified herein, which price will be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

75% of the quantity will be paid for following supply and placement, while the remaining 25% will be paid for on completion of the maintenance period.

E21. SILT FENCE

E21.1 DESCRIPTION

E21.1.1 This specification covers the erection of temporary silt fencing, which shall be installed and maintained at the locations shown on the Drawings, to control runoff and minimize the release of detrimental silt loadings to watercourses. The scope of work included in this specification is as follows:

- (a) Supply and Install temporary silt fencing at locations as indicated, in accordance with the Drawings provided, prior to undertaking any other activities on the site where silt fencing is required.
- (b) Maintain the silt fencing in serviceable condition throughout the entire duration of activities at the site where silt fencing is required, including final restoration and cleanup of the construction site.
- (c) Remove the sediment trapped by silt fencing.
- (d) Remove the silt fencing and restore the area where the fencing was installed, without further disturbing the area and without releasing any deleterious substances to the adjacent watercourse.

E21.2 MATERIALS

E21.2.1 Fence Posts

- (a) Posts for the temporary silt fence shall be constructed of wood or steel.
- (b) Wooden posts for the temporary silt fence shall be untreated fir or pine, minimum 34mm x 40mm in section and have a minimum length of 1.2 m. One end of the post shall be pointed.
- (c) Steel posts for the temporary silt fence shall have a "U", "T", "L" or other cross sectional shape that can resist failure by lateral loads will be accepted. Steel posts shall have a minimum mass per length of 1.1kg/m and a minimum length of 1.2m. One end of the steel posts shall be pointed and the other end shall be capped with an orange or red plastic safety cap which fits snugly to the steel post. The Contractor shall submit to the Contract Administrator for review a sample of the capped steel post prior to installation.

E21.2.2 Filter Fabric

- (a) Filter Fabric Shall be a woven geotextile material specifically designed for silt fence applications, meeting the following minimum requirements:

Property	Test Method	Value
Grab Tensile Strength	ASTM D 4632	0.55KN
Grab Tensile Elongation	ASTM D 4632	15%
Mullen Burst	ASTM D 3786	2060KPa
Puncture	ASTM D 4833	0.285KN
Trapezoid Tear	ASTM D 4533	0.285KN
UV Resistance	ASTM D 4355	80% @ 500 hrs
Appearance Opening Size (AOS)	ASTM D 4751	0.60mm
Flow Rate	ASTM D 4491	405 l/min/m ²

(b) Acceptable Product: "Amoco 2130 Silt Fence Fabric" or approved equal.

E21.2.3 Wire Mesh

(a) Wire mesh shall be galvanized or plain metal with wire gauge = 3.0mm, wire spacing @ 150mm o/c.

E21.2.4 Fencing Material Fasteners

(a) Staples or wire ties of sufficient strength and spacing to withstand a 530N (120lbf) pull test at any point on the wire mesh.

E21.3 Construction Methods

E21.3.1 Ensure that no deleterious substances are discharged into the adjacent watercourse at any time during construction activities

E21.3.2 Silt Fence Installation

- (a) Excavate 150mm x 150mm anchor trench along alignment of silt fence as indicated. Install fence posts as indicated. Ensure that fence posts are firmly driven into undisturbed soil or are completely and firmly backfilled if installed via auger methods. Attach wire mesh as support backing for silt fence filter fabric with fasteners. Attach silt fence filter fabric on top of wire mesh in similar fashion. Overlap any fence seams (wire mesh or filter fabric) by 450mm minimum. Ensure that wire mesh and filter fabric are installed on the upslope side of the post and are fully laid in anchor trench as shown.
- (b) Install and compact impermeable excavated materials into anchor trench and slope as indicated. Compact to 95% of maximum dry density (ASTM D-698).
- (c) Nails shall be used to fasten the silt fence fabric to wooden posts and tie wire or locking plastic fasteners shall be used to fasten the silt fence fabric to steel posts, in accordance with the manufacturer's recommendations. Maximum spacing of fasteners shall be 200mm along the length of the steel post.
- (d) The maximum spacing between the posts shall be 2.5m.

E21.3.3 Silt Fence Maintenance

- (a) Inspect silt fence daily, prior to starting any other construction activities. If fence posts are found loose or not upright, repair in accordance with installation procedure as specified in E21.3.2. If silt fence is found to be loose or torn, repair or replace as necessary to comply with E21.3.2.
- (b) If silt deposition at the fence is 300mm or more in depth, carefully remove and dispose of silt offsite without disturbing silt fence.

E21.3.4 Sediment Removal During Construction

- (a) During construction, the Contractor shall remove sediment from the silt fences when the sediment reaches 300mm, or replace, or supplement the device as directed by the Contract Administrator.
- (b) Excavated sediment shall be disposed of within the designated disposal area, or as directed by the Contract Administrator.

- (c) Sediment removal shall occur within 24 hours of discovery or as soon as field conditions allow access and no sediment removal shall be performed without authorization from the Contract Administrator.

E21.3.5 Silt Fence Removal

- (a) Following completion of all site construction activities (including final restoration and cleanup), remove all fence posts, wire mesh, fabric and fasteners from site.
- (b) Restore disturbed areas without releasing any deleterious substances to the adjacent watercourse.

E21.3.6 Method of Measurement

- (a) Silt fence will be paid for on a linear basis. The length to be paid for shall be the total number of linear metres placed and maintained in accordance with this Specification and accepted by the Contract Administrator, as computed from measurement made by the Contract Administrator. No payment will be made for silt fence placed outside of the limits of placement as shown on the Drawings and as directed by the Contract Administrator.

E21.3.7 Basis of Payment

- (a) Supplying and placing silt fencing will be paid for at the Contract Unit Price per metre for "Silt Fence". The amount to be paid for shall be the total number of lineal metres of silt fence installed and removed in accordance with this specification, accepted and measured by the Contract Administrator. No measurement or payment shall be made for sediment removal or silt fence maintenance during or after construction.

E22. EROSION CONTROL BLANKET (ECB)

E22.1 DESCRIPTION

- E22.1.1 This Specification covers the supply, installation, and maintenance of erosion control blanket to be installed on areas shown on the Drawings and as directed by the Contract Administrator.

E22.2 MATERIALS

E22.2.1 Type 1 Erosion Control Blanket

- (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 top side with heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and a maximum 1.59cm x 1.59cm mesh and on the bottom side with a lightweight photodegradable polypropylene netting with a maximum 1.27cm x 1.27cm mesh. The blanket shall be sewn together on 3.81cm centres (maximum) with degradable thread.
- (c) Type 1 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.

E22.2.2 Type 2 Erosion Control Blanket

- (a) Erosion Control Blanket shall be a machine-produced mat of 100% coconut fibre with a functional longevity of up to 36 months. Suitable products include LANDLOK C2 manufactured by Propex Geosynthetics, or approved equivalent.
- (b) The blanket shall be of consistent thickness with the fibre evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with UV stabilized polypropylene netting with mesh openings approximately 16mm x 16mm. The blanket shall be sewn together on 51mm centres (maximum) with UV stabilized polypropylene thread.
- (c) Type 2 ECB shall have the following properties:
 - (i) Matrix 100% Coconut Fibre (0.298kg/m²).
 - (ii) Thickness 7.6mm.
 - (iii) UV stabilized polypropylene thread.

E22.2.3 Type 3 Turf Reinforcement Mat (TRM)

- (a) Type 3 Turf Reinforcement Mat shall be machine-produced of polypropylene monofilament yarns forming a pyramid matrix. The TRM shall have a functional longevity of at least 24 months. Suitable products include LANDLOK 300 manufactured by Propex Geosynthetics, or approved equivalent.
- (b) Type 3 TRM shall have the following properties:
 - (i) Matrix 100% polypropylene monofilament yarns.
 - (ii) Thickness 7.6mm.
 - (iii) UV stabilized polypropylene.

E22.3 Submittals

- E22.3.1 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.

E22.4 Construction Methods

- E22.4.1 The Contractor shall supply all ECB/TRM materials required and store them on site. The installation and maintenance of all ECM/TRM 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.

- E22.4.2 Actual alignment and location of the ECB / TRM may be adjusted in the field by the Contract Administrator.

E22.4.3 Erosion Control Blanket – Drainage Channel Installation

- (a) In general excavate a trench 15cm deep by 15cm wide at the upstream end of the drainage channel and leave 30cm of ECB beyond the upslope portion of the trench. Anchor blanket with 20cm long staples in trench as shown on the Drawings. Staples shall be a minimum of 30cm 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 30 cm (minimum) apart across width of blanket.
- (b) 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
- (c) Repeat with blankets along the side slopes of the drainage channel. The overlap between adjacent blankets in the channel side slope direction shall be 5cm to 12.5cm (depending of blanket type). At the top of the side slope the full length edge of the blanket shall be anchored into a 15cm deep by 15cm wide anchor trench with staples

spaced 30cm apart (minimum). The anchor trench shall be backfilled and compacted upon completion of stapling.

- (d) Secure downstream edges of ECB / TRM as per manufacturer's specifications and detail drawings.

E22.5 Maintenance

E22.5.1 The areas covered with ECB / TRM shall be regularly inspected especially after severe rainfall or storm events, to check for blanket separation or breakage.

E22.5.2 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.

E22.5.3 Damaged areas may require re-sodding. Those areas requiring re-sodding as directed by the Contract Administrator will not be re-measured and no additional payment will be made for this work.

E22.5.4 No re-measurement or payment will be made for those areas damaged and requiring re-sodding and reinstallation due to faulty installation of the erosion control blanket.

E22.5.5 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.

E22.6 Measurement and Payment

- (a) Erosion Control Blanket will be measured and paid for on an area basis. The area to be paid for shall be the total number of square metres placed and maintained in accordance with this Specification and accepted by the Contract Administrator, as computed from measurement made by the Contract Administrator. No payment will be made for silt fence placed outside of the limits of placement as shown on the Drawings and as directed by the Contract Administrator.

E22.7 Basis of Payment

- (a) Erosion Control Blanket will be paid for at the Contract Unit Price per square metre for "Supply and Install Erosion Control Blanket – Type 1 or Type 3". The amount to be paid for shall be the total number of square metres of erosion control blanket supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator. No separate measurement or payment will be made for overlap at joints, maintenance and any other items considered incidental to the supply and installation of the erosion control blanket.

E23. HOT POURED RUBBERIZED ASPHALT WATERPROOFING

E23.1 Description

E23.1.1 The Work covered under this item shall include all operations relating to supply and installation of hot poured rubberized asphalt waterproofing as specified herein.

E23.1.2 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.

E23.2 General

- (a) The hot poured rubberized asphalt waterproofing shall be applied onto the culvert to the limits as shown on the Drawings. Hot poured rubberized asphalt waterproofing of the approach slabs will not be required.
- (b) The entire concrete surface area onto which the hot poured rubberized asphalt waterproofing is to be applied shall be thoroughly cleaned in a manner acceptable to the Contract Administrator. The cleaned surfaces shall be sound, free from curing compounds, laitance and scaling. All rough spots, ridges and edges in the concrete surface resulting from protrusions of concrete aggregate or cement paste shall be removed by light chipping or grinding to leave a smooth and level surface. Immediately prior to the application of the hot poured rubberized asphalt waterproofing, a final cleaning of the concrete surfaces shall be done using high velocity compressed air. The concrete surfaces shall be dry, clean and free from frost, dust, dirt and all foreign matter. The Contractor is responsible for the preparation of the concrete surfaces to ensure that the hot poured rubberized asphalt waterproofing can be installed in accordance with the manufacturer's requirements.
- (c) The Contractor is responsible to ensure that the concrete surfaces onto which the hot poured rubberized asphalt waterproofing is to be applied is prepared (including supply and application of waterproofing primer) to the degree that the hot poured rubberized asphalt waterproofing can be installed in accordance with the manufacturer's requirements.
- (d) The hot poured rubberized asphalt waterproofing system shall consist of the following compounds.
 - (i) Primer
 - (ii) Hot Applied Rubberized Asphalt Waterproofing Membrane
 - (iii) Polyester Fabric
 - (iv) Protection Board
- (e) The hot poured rubberized asphalt waterproofing membrane shall be a two layer, fabric-reinforced system. Each layer shall be 2.0mm to 3.0mm in thickness. The intermediate fabric reinforcement shall be placed between the layers.
- (f) The Contractor shall supply and install protection board to cover the hot poured rubberized asphalt waterproofing membrane. Installation of the protection board shall replace the requirement of dusting the waterproofing membrane with Portland cement.
- (g) Primer – The entire concrete surface to be waterproofed shall receive a prime coat of CGSB37-GP-9Ma, 930-18 (BAKOR) or approved equivalent at an application rate in accordance with the manufacturer's recommendations.
- (h) Hot Applied Rubberized Asphalt Waterproofing Membrane (2 layers) – the hot-poured rubberized asphalt waterproofing membrane shall be Bemalastic 1213 BDM by Bemac products or 6790-11 by BAKOR or an approved equivalent. The waterproofing membrane shall be melted, mixed and applied according to the manufacturer's recommendations. The laying operation shall be such that the waterproofing membrane is applied in two 2.0mm – 3.0mm thick layers. Discontinuities in the waterproofing membrane shall be avoided and joints lapped a minimum of 150mm. The waterproofing membrane shall be applied to the entire culvert to slab (excluding approach slabs). The Contract Administrator shall be free to take samples from the kettles for testing.
- (i) Polyester Fabric – An intermediate reinforcing layer shall be placed between the layers of waterproofing membrane. The intermediate reinforcing layer shall be spun-bonded polyester fabric such as Remay 2016 grade, Bakor Polyester Fabric Reinforcing Sheet, McAsphalt Fabric Reinforcement BP-16 or approved equivalent and set into the first layer of waterproofing membrane to achieve a minimum of 50%

bleed through. There should not be any dry sheet-to-sheet overlap and a maximum overlap or gap between sheets of 6mm.

- (j) Protection Board – The protection board shall be a durable panel of 3mm thickness specifically designed to provide a protective cushion between the hot mix asphalt pavement and the hot-applied rubberized asphalt waterproofing membrane for bridges and shall be approved by the Contract Administrator. The protection board shall be Bakor Asphalt Protection Board, McAsphalt Protection Board BP-Asp PB or approved equal in accordance with B6 The protection boards shall be placed on top of the upper layer of waterproofing and rolled by means of a linoleum or lawn type roller while the membrane is still warm to ensure good contact with the membrane. The protection boards shall be placed with edges overlapping 25mm both longitudinally and transversely. Protection board shall be placed such that the longitudinal (direction of traffic) joints are staggered at least 150mm. In instances where edges of the protection board curl up, the edges shall be cemented down using asphalt waterproofing. Protection boards that are warped, distorted or damaged in any way shall be rejected.

E23.3 Method of Measurement

- (a) Hot poured rubberized asphalt waterproofing will be measured on an area basis. The area to be paid for will be the total number of square metres of hot poured rubberized asphalt waterproofing supplied and installed in accordance with this Special Provision as computed from measurements made by the Contract Administrator.

E23.4 Basis of Payment

- (a) Hot poured rubberized asphalt waterproofing will be paid for at the Contract unit price per square metre for “Hot Poured Rubberized Asphalt Waterproofing”, measured as specified herein, which price will be payment in full for performing all operations herein described and all other items incidental to the work.

E24. TREE REMOVAL

E24.1 General

- E24.1.1 Further to CW 3010, this specification shall cover the felling of trees and removal of stumps, limbs, roots, and tree debris.
- E24.1.2 Tree removal will be measured on a unit basis for each tree removed and paid for at the Contract Unit Price for “Tree Removal”. The number of units to be paid for will be the total number trees removed and disposed of off site in accordance with CW 3010 and this specification, accepted and measured by the Contract Administrator.

APPENDIX A

GEOTECHNICAL REPORT