THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 1014-2017

TRURO CREEK CULVERTS REPLACEMENT AT WINCHESTER STREET AND LINWOOD STREET AND ASSOCIATED ROAD WORK

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 TRURO CREEK CULVERTS REPLACEMENT AT WINCHESTER STREET AND LINWOOD STREET AND ASSOCIATED ROAD WORK

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, December 13, 2017.

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 D4.1.

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

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

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

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

B5. CONFIDENTIALITY

B5.1 Information provided to a Bidder by the City or acquired by a Bidder by way of further enquiries or through investigation is confidential. Such information shall not be used or disclosed in any way without the prior written authorization of the Contract Administrator. The use and disclosure of the confidential information shall not apply to information which:

(a) was known to the Bidder before receipt hereof; or

(b) becomes publicly known other than through the Bidder; or

(c) is disclosed pursuant to the requirements of a governmental authority or judicial order.

B5.2 The Bidder shall not make any statement of fact or opinion regarding any aspect of the Bid Opportunity to the media or any member of the public without the prior written authorization of the Contract Administrator.

B6. ADDENDA

B6.1 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.

B6.2 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.

(a) 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

(b) The Bidder is responsible for ensuring that he/she 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.

B6.3 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.

B7. SUBSTITUTES

B7.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.

B7.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.

B7.3 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.

B7.4 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.

B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her 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.

B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.

(a) The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and

obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.

B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her 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 B17.

B7.9 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.

B8. BID COMPONENTS

B8.1 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;

B8.2 Further to B8.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B7.

B8.3 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.

B8.4 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.

(a) 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.

(b) A hard copy of Form B: Prices must be submitted with the Bid. If there is any discrepancy between the Adobe PDF version of Form B: Prices and the Microsoft Excel version of Form B: Prices, the PDF version shall take precedence.

B8.5 Bidders are advised not to include any information/literature except as requested in accordance with B8.1.

B8.6 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 B17.1(a).

B8.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B8.8 Bids shall be submitted to:

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

B9. BID

B9.1 The Bidder shall complete Form A: Bid, making all required entries.

B9.2 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/her own name, his/her 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/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.

B9.3 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.

B9.4 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/her 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/her 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.

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

B9.5 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.

B10. PRICES

B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

(a) For the convenience of Bidders, and pursuant to B8.4(b) and B17.4(b), an electronic spreadsheet from Form B: Prices in Microsoft Excel (.xls) format is available along with the Adobe PDF documents for this Bid Opportunity on the Bid Opportunities page at the Materials Management Division website at http://www.winnipeg.ca/matmgt/.

B10.2 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.

B10.3 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.

B10.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B11. DISCLOSURE

B11.1 Various Persons provided information or services with respect to this Work. In the City's opinion, this relationship or association does not create a conflict of interest because of this full disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.

B11.2 The Persons are:

(a) N/A

B12. QUALIFICATION

B12.1 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.

B12.2 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

B12.3 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);

B12.4 Further to B12.3(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) Written confirmation of a safety and health certification meeting SAFE Work Manitoba's SAFE Work Certified Standard (e.g., COR™ and SECOR™) or

(i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

(ii) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ 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/.

B12.5 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.

B12.6 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.

B13. BID SECURITY

B13.1 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.

(i) 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.

(ii) All signatures on bid securities shall be original.

(iii) The Bidder shall sign the Bid Bond.

(iv) The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B13.2 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.

(a) Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B13.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

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

B13.3 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.

B14. OPENING OF BIDS AND RELEASE OF INFORMATION

B14.1 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.

(a) Bidders or their representatives may attend.

B14.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B14.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/default.stm

B14.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law or by City policy or procedures (which may include access by members of City Council).

B15. IRREVOCABLE BID

B15.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.

B15.2 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.

B16. WITHDRAWAL OF BIDS

B16.1 A Bidder may withdraw his/her Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

(a) 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.

(b) 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.

(c) If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:

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

(ii) 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

(iii) if the notice has been given by any one of the persons specified in B16.1(c)(ii), declare the Bid withdrawn.

B16.2 A Bidder who withdraws his/her Bid after the Submission Deadline but before his/her Bid has been released or has lapsed as provided for in B15.2 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.

B17. EVALUATION OF BIDS

B17.1 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 B12 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B7.

B17.2 Further to B17.1(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.

B17.3 Further to B17.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is responsible and qualified.

B17.4 Further to B17.1(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.

(a) Further to B17.1(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.

(b) The electronic Form B: Prices and the formulas imbedded in that spreadsheet are only provided for the convenience of Bidders. The City makes no representations of warranties as to the correctness of the imbedded formulas. It is the Bidder's responsibility to ensure the extensions of the unit prices and the sum of Total Bid Price performed as a function of the formulas within the electronic Form B: Prices are correct.

B18. AWARD OF CONTRACT

B18.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B18.2 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.

(a) Without limiting the generality of B18.2, the City will have no obligation to award a Contract where:

(i) the prices exceed the available City funds for the Work;

(ii) the prices are materially in excess of the prices received for similar work in the past;

(iii) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;

(iv) only one Bid is received; or

(v) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.

B18.3 The Work of this Contract is contingent upon Council approval of sufficient funding in the 2017 and 2018 Capital Budgets. If the Capital Budget approved by Council does not include sufficient funding for the Work, the City will have no obligation to award a Contract.

B18.4 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 B17.

(a) Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her 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.

i. 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 replacement of the existing culverts at Winchester Street and Linwood Street and associated roadworks.

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

(a) Culvert Replacements
- (i) Implement traffic control;
- (ii) Creek flow maintenance;
- (iii) Cofferdam installation;
- (iv) Coordinate and perform relocation of utilities;
- (v) Remove and relocate existing water mains;
- (vi) Excavation and backfill;
- (vii) Demolition and removal of existing culverts;
- (viii) Placement of sub-base, base course and other related materials;
- (ix) Cast-in-place concrete;
- (x) Dampproofing
- (xi) Waterprooofing
- (xii) Placement of separation geotextile fabric;
- (xiii) Rip rap;
- (xiv) Road reconstruction;
- (xv) Barrier top rail;
- (xvi) Slope stabilization;
- (xvii) Sidewalk construction;

(b) Road Reconstruction
- (i) Implement traffic control;
- (ii) Pavement removal and excavation;
- (iii) Subgrade compaction;
- (iv) Placement of separation geotextile fabric;
- (v) Placement of sub-base and base course materials;
- (vi) Construction of asphaltic concrete pavement at Winchester Street and concrete pavement at Linwood street;
- (vii) Cast-in-place concrete approach slabs and drains.
- (viii) Construction of 180 mm barrier curb and gutter;
- (ix) Concrete sidewalk renewal;
- (x) Curb to traffic barrier transitions;
- (xi) Aluminum Balanced Barriers;
- (xii) Replace trees;
- (xiii) Boulevard restoration;
- (xiv) Embankments restoration.

DEFINITIONS

D3.1 When used in the Bid Opportunity:

(a) **"API"** means American Petroleum Institute that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work;

(b) **"ACI"** means the American Concrete Institute that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work;

(c) **"ASTM"** means the American Society for Testing and Materials that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work;

(d) **"CSA"** means the Canadian Standards Association that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.

(e) **"ICRI"** means the International Concrete Repair Institute that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.

(f) **"RSIC"** means the Reinforcing Steel Institute of Canada that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.

(g) **"CGSB"** means the Canadian General Standards Board that complies with the latest edition of standards including amendments and supplements in effect on the date of issue.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is WSP Canada Group Limited, represented by:

Mr. Jim Lukashenko, P.Eng.
Manager, Bridges & Structures

Telephone No. 204 272-2025
Email Address Jim.Lukashenko@wsp.com

D4.2 At the pre-construction meeting, Mr. Lukashenko will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D4.3 Bids Submissions must be submitted to the address in B8.8.

D5. CONTRACTOR'S SUPERVISOR

D5.1 At the pre-construction meeting, the Contractor shall identify his/her designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D5.2 At least two (2) business days prior to the commencement of any Work on the site, the Contractor shall provide the Contract Administrator with a phone number for the Contractor's Supervisor or an alternate who can be contacted twenty-four (24) hours a day to respond to an emergency.

D6. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

D6.1 The Contract, all deliverables produced or developed, and information provided to or acquired by the Contractor are the property of the City and shall not be appropriated for the Contractors own use, or for the use of any third party.

D6.2 The Contractor shall not make any public announcements or press releases regarding the Contract, without the prior written authorization of the Contract Administrator.

D6.3 The following shall be confidential and shall not be disclosed by the Contractor to the media or any member of the public without the prior written authorization of the Contract Administrator;

(a) information provided to the Contractor by the City or acquired by the Contractor during the course of the Work;

(b) the Contract, all deliverables produced or developed; and

(c) any statement of fact or opinion regarding any aspect of the Contract.

D6.4 A Contractor who violates any provision of D6 may be determined to be in breach of Contract.

D7. NOTICES

D7.1 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.

D7.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D7.3, D7.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the email address identified in D4.1.

D7.3 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:

The City of Winnipeg
Attn: Chief Financial Officer
Office of the Chief Administrative Officer
Susan A. Thompson Building
2nd Floor, 510 Main Street
Winnipeg MB R3B 1B9

D7.4 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 facsimile number:

The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services

Facsimile No.: 204 947-9155

D7.5 Bids Submissions must not be submitted to the above facsimile number. Bids must be submitted in accordance with B8.

D8. FURNISHING OF DOCUMENTS

D8.1 Upon award of the Contract, the Contractor will be provided with five (5) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him/her at cost.

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

D9.1 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.

D10. SAFE WORK PLAN

D10.1 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.

D10.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/Safety/default.stm

D10.3 Notwithstanding B12.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D11. INSURANCE

D11.1 The Contractor shall provide and maintain the following insurance coverage:

(a) Wrap Up Liability insurances in the amount of at least five million dollars ($5,000,000) inclusive per occurrence written in the name of the Contractors, sub-contractors, engineers and sub-consultants, and City of Winnipeg covering bodily injury, personal injury, property damage, unlicensed motor vehicles, non-owned automobile liability and products and completed operations endorsement. Wrap Up Liability shall also include the cross liability clause, contractual liability, and to include a 24 months completed operations endorsement which will take effect after Total Performance.

(b) Automobile liability insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than $2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.

(c) All risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price, written in the name of the Contractor and The City of Winnipeg, at all times during the performance of the Work and until the date of Substantial Performance.

(d) Contractor's Pollution Liability insurance in the amount of at least one million dollars ($1,000,000) per occurrence and two million dollars ($2,000,000) annual aggregate insuring against claims for:

(i) Bodily injury;
(ii) Property damage including diminution in value and natural resource damages;
(iii) Clean-up costs;
(iv) Transported cargo as a result of pollution conditions arising;
(v) Sudden or gradual pollution conditions including the further disruption of pre-existing conditions from the Contractor's operations and completed operations.

The policy shall remain in place for a minimum of twelve (12) months following total completion.

D11.2 Deductibles shall be borne by the Contractor.

D11.3 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D11.4 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.

D11.5 All policies shall be in a form satisfactory to the City and shall be kept in full force during the Work and throughout the warranty period.

D11.6 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.

D12. PERFORMANCE SECURITY

D12.1 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.

(i) 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.

D12.2 If the bid security provided in his/her Bid was not a certified cheque or draft pursuant to B13.1(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.

D13. SUBCONTRACTOR LIST

D13.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D14. EQUIPMENT LIST

D14.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment list) at or prior to a pre-construction meeting, or 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.

D15. DETAILED WORK SCHEDULE

D15.1 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.

D15.2 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;

(c) a daily manpower schedule for the Work;

all acceptable to the Contract Administrator.

D15.3 Further to D15.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path, as well as critical stages identified in D18.

D15.4 Further to D15.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis. The Gantt chart shall be tracked and submitted bi-weekly, to be viewed and discussed at the construction meetings.

D15.5 Further to D15.2(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

SCHEDULE OF WORK

D16. COMMENCEMENT

D16.1 The Contractor shall not commence any Work until he/she is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.

D16.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:
  (i) evidence of authority to carry on business specified in D9;
  (ii) evidence of the workers compensation coverage specified in C6.15;
  (iii) the Safe Work Plan specified in D10;
  (iv) evidence of the insurance specified in D11;
  (v) the performance security specified in D12;
  (vi) the Subcontractor list specified in D13;
  (vii) the equipment list specified in D14; and
  (viii) the detailed work schedule specified in D15.

(b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a pre-construction meeting.

D16.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.

D16.4 The Contractor shall not commence the Road Reconstruction (D2.2(b)) on the Site before May 21, 2018.

D16.5 The City intends to award this Contract by January 3, 2018.

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

D17. RESTRICTED WORK HOURS

D17.1 All Work shall be carried out between the hours of 07:00 to 22:00, Monday to Friday, and between 09:00 and 21:00 on Saturdays, Sundays, Civic, or Public Holidays.

D17.2 No Work shall be performed outside of the hours stated in D17.1 without written permission from the Contract Administrator. Approval will only be granted if it is in the best interests of the City to do so.

D17.3 Further to Clause 3.10 of CW 1130 “Site Requirements”, the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed outside the hours outlined in D17.1.

D18. CRITICAL STAGES

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

(a) All instream work, including the completion of the culverts, head walls, rip rap, slope stabilization works, the removal of cofferdams, and any activities impacting the creek shall be complete by March 1, 2018.

(b) All Roadwork shall be completed by July 4, 2018.

D18.2 When the Contractor considers the Work associated with the critical stage to be completed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying completion. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible convenience and the Contract Administrator notified so that the Work can be re-inspected.

D18.3 The date on which the critical stage work has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of the critical stage has been achieved.

D19. SUBSTANTIAL PERFORMANCE

D19.1 The Contractor shall achieve Substantial Performance by July 18, 2018.

D19.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D19.3 The date on which the Work has been certified by the Contract Administrator as being substantially performed to the requirements of the Contract through the issue of a certificate of Substantial Performance is the date on which Substantial Performance has been achieved.

D20. TOTAL PERFORMANCE

D20.1 The Contractor shall achieve Total Performance by August 1, 2018.

D20.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D20.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D21. LIQUIDATED DAMAGES

D21.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:

(a) All instream work, including the completion of the cast-in-place culverts, wing walls, and head walls, rip rap placement, and slope stabilization works – Two thousand dollars ($2,000.00);

(b) All Roadwork – Five hundred dollars ($500.00);

(c) Substantial Performance – Two thousand dollars ($2,000.00);

(d) Total Performance – Five hundred dollars ($500.00).

D21.2 The amounts specified for liquidated damages in D21.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days fixed herein for same.

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

D22. SCHEDULED MAINTENANCE

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

(a) Reflective crack maintenance and crack sealing as specified in CW 3250;

(b) Sodding (maintenance period) as specified in CW 3510;

(c) Seeding (maintenance period) as specified in CW 3520;

D22.2 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

D23. JOB MEETINGS

D23.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

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

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

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

D25. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D25.1 Further to B12.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B12.4.

D26. WORK BY OTHERS

D26.1 Work by others on or near the Site will include but not necessarily be limited to:

(a) City of Winnipeg Traffic Services Branch – Set-up, maintenance, and removal of required signage and traffic control.

(b) Manitoba Hydro (Gas) – Underground gas utilities to be relocated along the west side of each cast-in-place concrete culvert. The Contract Administrator shall coordinate the relocation of the gas lines with Manitoba Hydro prior to construction.

(c) Manitoba Hydro (Electricity) –Street lighting and underground electrical utilities are to be relocated along the west side of each cast-in-place concrete culvert. The Contract Administrator shall coordinate the relocation of the street lighting and underground electrical utilities prior to construction.

(d) City of Winnipeg Urban Forestry Branch – Set-up, maintenance, and removal of required trees.

(e) Any additional unidentified Work if and as necessary.

D26.2 The Contract Administrator will attempt to arrange and coordinate Work to be performed by others so that such Work does not interfere with the Work and Schedule of the Contractor. Where Work by others interferes, as determined by the Contract Administrator, with the Contractor's planned Work, the Contractor shall modify his plans and do other Work. Unless the Contract Administrator determines that there was no opportunity for the Contractor to do a similar amount of Work, no consideration will be made to extending the Contract time.

D27. COOPERATION WITH OTHERS

D27.1 The Contractor's attention is directed to the fact that other Contractors, the personnel of utilities, and the staff of the City of Winnipeg may be working on the structure, approach roadways, adjacent roadways or right-of-ways. The activities of these agencies may coincide with the Contractor's execution of the Work, and it will be the Contractor's responsibility to cooperate to the fullest extent with the other personnel working in the area. Such cooperation is an obligation of the Contractor under the terms of the Contract.

D28. AUTHORIZED WORK ON PRIVATE PROPERTY

D28.1 The Contractor shall confine his Works to the right-of-way or easements as much as possible. Where Work is required to be done on or accessed through private property, the Contractor shall obtain written permission from the property owner and provide a copy to the Contract Administrator.

D29. ENCROACHMENT ON PRIVATE PROPERTY

D29.1 Further to Section 3.11 of CW 1130 of the General Requirements, the Contractor shall confine his Work to the public right-of-ways and construction easements at all times, except if he has received written permission from the property owner. The Contractor shall provide the Contract Administrator with a copy of any written permission he has received to enter onto private property.

D29.2 The Contractor's construction activities shall be confined to the minimum area necessary for undertaking the Work and he shall be responsible for all damage to private property resulting from his Work. Particular care shall be taken to assure no damage is done to buildings, fencing, trees and plants, and provision shall be made to maintain full drainage for private properties during construction.

D30. DAMAGE TO EXISTING STRUCTURES AND PROPERTY

D30.1 Further to Section 3.13 of CW 1130 of the General Requirements, special care shall be taken to avoid damage to existing adjacent structures and properties during the course of Work.

D30.2 Any damage caused by the Contractor or his Subcontractors to the adjacent structures of properties shall be promptly repaired by the Contractor at his own expense to the satisfaction of the Contract Administrator.

D31. LAYOUT OF WORK

D31.1 Further of C6, the Contract Administrator shall provide the basic centrelines and a benchmark for construction.

D31.2 The Contractor shall be responsible for the true and proper laying out of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work. He shall provide all required instruments and competent personnel for performing all layouts.

D31.3 The Contract Administrator shall be notified at least one (1) Business Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.

D31.4 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.

D31.5 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items of 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.

D32. CONTRACTOR LIGHTING DURING CONSTRUCTION

D32.1 The Contractor shall not apply direct lighting to any nearby residential buildings for the construction of the Work.

D33. ENVIRONMENTAL PROTECTION PLAN

D33.1 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the Environmental Protection Plan as herein specified.

D33.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

(a) Federal

(i) Canadian Environmental Assessment Act (CEAA), 1992 c.37;

(ii) Canadian Environmental Protection Act;

(iii) Fisheries Act, 1985 c.F-14;

(iv) Transportation of Dangerous Goods Act and Regulations, c.34;

(v) Migratory Birds Convention Act and Regulations, c.22;

(vi) Species at Risk Act, c.29;

(vii) Transportation Association of Canada's Transportation Association of Canada *National Guide to Erosion and Sediment Control on Roadway Projects*, 2005;

(viii) Applicable Fisheries and Oceans Canada Operational Statements for Manitoba for Temporary Stream Crossings;

(ix) The Department of Fisheries and Oceans *Freshwater Intake End-of-Pipe Fish Screen Guidelines*, DFO 1995;

(x) Fisheries and Oceans Policy for the *Management of Fish Habitat* 1986;

(xi) Federal Policy on Wetland Conservation 1991;

(xii) Navigable Waters Best Practices; and

(xiii) Any other applicable Acts, Regulations, and By-laws.

(b) Provincial

(i) The Dangerous Goods Handling and Transportation Act, D12;

(ii) The Endangered Species Act, c.E111;

(iii) The Environment Act, c.E125;

(iv) The Fire Prevention Act, c.F80;

(v) The Heritage Resources Act, c.H39.1;

(vi) The Noxious Weeds Act , c.N110;

(vii) The Nuisance Act, c.N120;

(viii) The Pesticides Regulation, M.R. 94/88R;

(ix) The Public Health Act, c.P210;

(x) The Water Protection Act, c.W65;

(xi) The Workplace Safety and Health Act c.W210;

(xii) Current applicable Associated Regulations;

(xiii) The Manitoba Stream Crossing Guidelines for the *Protection of Fish and Fish Habitat, Manitoba National Resources*, 1996.; and

(xiv) Any other applicable Acts, Regulations, and By-laws.

(c) Municipal

(i) The City of Winnipeg Neighbourhood Liveability By-law No. 1/2008;

(ii) The City of Winnipeg By-law No. 1573/77 and all amendments up to and including 7670/2000;

(iii) City of Winnipeg *Best Management Practices for Activities In and Around the City's Waterways and Watercourses*, City of Winnipeg 2005;

(iv) The City of Winnipeg *Motor Vehicle Noise Policies and Guidelines*;

(v) The City of Winnipeg By-law No. 2480/79 and all amendments up to and including 7976/2000;

(vi) The City of Winnipeg By-law No. 92/2010; and

(vii) Any other applicable Acts, Regulations, and By-laws.

D33.3 Work shall be undertaken with consideration of the mitigation measures outlined in Fisheries and Oceans Canada's email "17-HCAA-01419 Culvert Replacements, Truro Creek, Winnipeg" dated October 24, 2017. This email is included as Appendix A.

D33.4 City of Winnipeg Waterways permit is currently underway for this Project. The permit shall be provided to the Contractor when it is formally issued. The Contractor shall comply with the requirements outlined in the permit.

D33.5 The Contractor is advised that the following environmental protection measures apply to the Work.

(a) Materials Handling and Storage

(i) Storage on construction materials shall be confined to the defined laydown areas as shown on the Contract Drawings or at a location approved by the Contract Administrator.

(ii) Construction materials shall not be deposited or stored on or near watercourses unless written acceptance from the Contract Administrator is received in advance.

(iii) Construction materials and debris shall be tied down or secured if severe weather and high wind velocities are forecasted. Work shall be suspended during extreme high wind conditions.

(iv) Construction materials and debris shall be prevented from entering watercourses. In the event that materials and/or debris inadvertently enter the land drainage system, the Contractor will be required to remove the material to an appropriate landfill or storage facility and restore the watercourse to its original condition.

(b) Fuel Handling and Storage

(i) The Contractor shall obtain all necessary permits from Manitoba Conservation and Water Stewardship for the handling and storage of fuel products and shall provide copies to the Contract Administrator.

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

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

(iv) The Contractor shall ensure that any temporary fuel storage areas established for construction of the project are contained by an impermeable dyke. Dykes shall be designed, constructed, and maintained to retain not less than 100% of the capacity of the total number of containers or 110% of the largest container, whichever is greatest. The dykes shall be constructed of clay or similar impervious material. If this type of material is not available, the dyke shall be constructed of locally available material and lined with high-density polyethylene (HDPE). Furthermore, the fuel storage area(s) shall be secured by a battier such as a high fence and gate to prevent vandalism.

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

(vi) Products transferred from the fuel storage area(s) to specific Work Sites shall not exceed the daily usage requirement.

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

(viii) Washing, refuelling, and servicing of machinery and storage of fuel and other materials for the machinery shall take place at least 100 metres from a watercourse to prevent deleterious substances from entering the water.

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

(x) The deposit of deleterious substances into water frequented by fish is prohibited under the Fisheries Act, 1985. The Contractor shall take appropriate precautions to ensure that potentially deleterious substances (such as fuel, hydraulic fluids, oil, sediment, etc.) do not enter any water body.

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

(xii) Machinery shall arrive on Site in a clean condition and shall be maintained to be free to fluid leaks.

(xiii) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on Site. The Contractor shall ensure that additional material can be made available upon short notice. Additionally, appropriate staff on Site shall be trained for proper handling of deleterious liquids (i.e. fueling) and trained in preventing and cleaning up minor spills.

(c) Waste Handling and Disposal

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

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

(iii) The Contractor shall, during and at the completion of construction, clean-up the construction area and all resulting debris shall be deposited at a Waste Disposal Ground operating under the authority of Manitoba Regulation 150/91. Exceptions are liquid industrial and hazardous wastes which require special disposal methods (refer to Section 30.5D).

(iv) On Site volumes of sewage and/or septage will be removed on a weekly basis.

(v) The Contractor shall ensure sewage, septage, and other liquid wastes generated on Site are handled and disposed of by a certified disposal contractor.

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

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

(viii) Structurally unsuitable site excavation material will be removed by the Contractor.

(ix) Waste storage areas shall not be located so as to block natural drainage.

(x) Runoff from a waste storage area shall not be allowed to cause siltation of a watercourse.

(xi) Waste storage areas shall be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.

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

(xiii) The Contractor shall notify and receive written approval from the Contract Administrator prior to discharge from any dewatered areas. The discharge will be released into a well-vegetated area, filter bag, settling basin, or storm sewer system to remove the suspended material and other deleterious substances from the discharge before it finds its way into any watercourse. Discharge from dewatering areas may require approved disposal via the sanitary sewer system or disposal truck in accordance with Construction Specifications, at the request of the Contract Administrator.

(xiv) Flows will be dissipated so that dewatering discharges minimize erosion at the discharge point.

(d) Dangerous Goods/Hazardous Waste Handling and Disposal

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

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

(iii) The Contractor shall have on Site staff that is trained and certified in the handling of the dangerous/hazardous goods, when said dangerous/hazardous goods are being utilized on Site for the performance of the Work.

(iv) Different waste streams shall not be mixed.

(v) Disposal of dangerous goods/hazardous wastes shall be at approved hazardous waste facilities.

(vi) Liquid hydrocarbons shall not be stored or disposed of in earthen pits on Site.

(vii) Used oils shall be stored in appropriate drums or tankage until shipment to waste oil recycling centres, incinerators, or secure disposal facilities approved for such wastes.

(viii) Used oil filters shall be drained, placed in suitable storage containers, and buried or incinerated at approved hazardous waste treatment and disposal facilities.

(ix) Dangerous goods/hazardous waste storage areas shall be located at least 107 metres away from the edge of the water line for normal summer water levels and be dyked.

(x) Dangerous goods/hazardous waste storage areas shall not be located so as to block natural drainage.

(xi) Runoff from a dangerous goods/hazardous waste storage areas shall not be allowed to cause siltation of a watercourse.

(xii) Dangerous goods/hazardous waste storage areas shall be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.

(e) Emergency Response

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

(ii) The Contractor shall report all major spills of petroleum products or other hazardous substances with significant impact on the environment and threat to human health and safety (as defined in Table 1 below) to the Contract Administrator of the project, who should notify the City claims branch and Manitoba Environment, immediately after occurrence of the environmental accident, by calling the 24-hour emergency phone number (204) 945-4888.

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

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

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

- Identify exact location and time of accident;
- Indicate injuries, if any;
- Request assistance as required by magnitude of accident (Manitoba Environment 24-hour Spill Response Line (204) 945-4888, Police, Fire Department, Ambulance, company backup).

(ii) Attend to public safety:

- Stop traffic, roadblock/cordon off the immediate danger area;
- Eliminate ignition sources;
- Initiate evacuation procedures if necessary.

(iii) Assess situation and gather information on the status of the situation, noting:

- Personnel on Site;
- Cause and effect of spill;
- Estimated extent of damage;
- Amount and type of material involved; and
- Proximity to waterways, sewers, and manholes.

(iv) If safe to do so, try to stop the dispersion or flow of spill material

- Approach from upwind;
- Stop or reduce leak if safe to do so;
- Dyke spill material with dry, inert absorbent material or dry clay soil or sand;
- Prevent spill material from entering waterways and utilities by dyking;
- Prevent spill material from entering manholes and other openings by covering with rubber spill mats or dyking; and
- Resume any effective action to contain, clean up, or stop the flow of the spilled product.

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

(vi) When dangerous goods are used on Site, materials for containment and cleanup of spill material (e.g. absorbent materials, plastic oil booms, and oversized recovery drums) shall be available on Site.

(vii) Minor spills of such substances that may be contained on land with no significant impact on the environment may be responded to within-house resources without formal notification to Manitoba Environment.

(viii) City Emergency response, 9-1-1, shall be used if other means are not available.

TABLE 1 SPILLS THAT MUST BE REPORTED TO THE MANITOBA SUSTAINABLE DEVELOPMENT AS ENVIRONMENTAL ACCIDENTS		
Classification	**Hazard**	**Reportable quantity/level**
1	Explosives	All
2.1	Compressed Gas (Flammable)	100 L*
2.2	Compressed Gas	100 L*
2.3	Compressed Gas (Toxic)	All
2.4	Compressed Gas (Corrosive)	All
3	Flammable Liquids	100 L
4	Flammable Solids	1 kg
5.1 PG** I & II	Oxidizer	1 kg or 1 L
PG** III	Oxidizer	50 kg or 50 L
5.2	Organic Peroxide	1 kg or 1 L
6.1 PG** I & II	Acute Toxic	1 kg or 1 L
PG** III	Acute Toxic	5 kg or 5 L
6.2	Infectious	All
7	Radioactive	Any discharge or radiation level exceeding 10 mSv/h at the package surface and 200 uSv/h at 1 m from the package surface
8	Corrosive	5 kg or 5 L
9.1	Miscellaneous (except PCB mixtures)	50 kg
9.2	PCB Mixtures	500 g
9.3	Aquatic Toxic	1 kg or 1 L
9.4	Wastes (chronic toxic)	5 kg or 5 L
* Container capacity (refers to container water capacity) ** PG = Packing Group(s)		

(f) Noise and Vibration

(i) Noise-generating activities shall be limited to the hours indicated in the City of Winnipeg Noise Bylaw, and the Province of Manitoba Environment Act Licence, unless otherwise accepted in advance by the Contract Administrator. The activities will generally be restricted to 7:00 a.m. to 7:00 p.m. weekdays with written permission of the Contract Administrator and the City of Winnipeg for any afterhours or weekend work required for special cases. No extended or alternative working hours/dates will be permitted for pile driving activities.

(ii) The Contractor shall be responsible for scheduling Work to avoid potential noise problems and/or employ noise reduction measures to reduce noise to acceptable limits. The Contractor shall also demonstrate to the Contract Administrator that Works to be performed during the night-time period, on Sundays, and Holidays as stated in the Licence shall not exceed the approved limit.

(iii) The Contractor shall locate stationary noise generating equipment (i.e. generators) away from sensitive receptors and wildlife areas.

(iv) Construction vehicles and equipment will adhere to posted speed limits.

(g) Dust and Emissions

(i) Dust control practices implemented by the Contractor during construction shall include regular street cleaning and dampening of construction access roads and Work areas with water or approved chemicals at an adequate frequency to prevent the creation of dust.

(ii) The Contractor shall minimize construction equipment idling times and turn off machinery, when feasible.

(iii) Dust control practices implemented by the Contractor during construction will include regular street cleaning and dampening of construction access roads and Work areas with water or approved chemicals at an adequate frequency to prevent the creation of dust.

(iv) Only water or chemicals approved by the Contract Administrator shall be used for dust control. The use of waste petroleum or petroleum by-products is not permitted.

(v) The Contractor shall ensure that trucks which are used to haul excavated material and backfill material to and from the Work Site utilize tarpaulin covers during transport to prevent material from falling onto the street and creating dust.

(vi) Stockpiled soils shall be covered with tarpaulin covers to prevent the creation of dust.

(h) Erosion Control

(i) The Contractor shall develop a sediment control plan prior to beginning construction in adherence to the Transportation Association of Canada National Guide to Erosion and Sediment Control on Roadway Projects, the City of Winnipeg's *Best Management Practices for Activities In and Around the City's Waterways and Watercourses*, and to the satisfaction of the Contract Administrator.

(ii) Exposure of soils shall be kept to a minimum practical amount, acceptable to the Contract Administrator. The cover of trees and undergrowth shall be preserved to the maximum extent possible.

(iii) Sediment control fencing, or other such erosion control structures, shall be employed wherever 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 a heavy rainfall to ensure their continued integrity.

(iv) All areas disturbed during construction shall be landscaped and revegetated with native and/or introduced plant species in order to restore and enhance the Site and to protect against soil erosion unless otherwise indicated.

(v) The disturbed surface shall be revegetated so as to create a dense root system in order to defend against soil erosion on the right-of-way and any other disturbed areas susceptible to erosion.

(vi) 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.

(vii) The Contractor shall routinely inspect all erosion and sediment control structures and immediately carry out any necessary maintenance. Several inspections will be performed during rainy days.

(viii) Construction activities will be avoided during periods of high winds to prevent erosion and the creation of dust.

(i) Runoff Control

(i) Measures shall be undertaken to ensure that runoff containing suspended soil particles is minimized from entering the land drainage system and Truro Creek to the greatest extent possible, to the satisfaction of the Contract Administrator.

(ii) Areas that are heavily disturbed and vulnerable to erosion or gullying will be dyked to redirect surface runoff around the area prior to spring runoff.

(iii) Construction activities on erodible slopes shall be avoided during spring runoff and heavy rain fall events.

(iv) Soil and fill shall not be stockpiled on immediate watercourse bank areas. Stockpile locations shall be presented for review and approval to the Contract Administrator.

(j) Fish

(i) Due to the presence of spawning fish species no instream works will occur between April 1 and June 15 of any given year.

(ii) Culvert removal, instream culvert construction works, and specified underground works occurring within the riverbank shall be constructed during periods of low flow. Flowing water should be diverted around the construction area using a cofferdam and bypass pump. Water will be diverted in a manner that avoids sediment generation to downstream areas and does not alter the volume of flow in the watercourse. Use cofferdams made of non-earthen material such as aquadams, sand bags, sheet pile or clean granular material wrapped in poly-plastic or other suitable isolation materials. Ensure any pump inlets are appropriately screened following the DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines. Ensure all isolation materials are completely removed from the watercourse once construction is complete.

(iii) Any fish trapped within the isolated area will be captured and returned to the watercourse unharmed. Fish includes fin fish, crayfish, and mussels (clams).

(iv) A buffer of vegetation will be maintained when working along waterways, where possible.

(v) The duration of Work and amount of disturbance to the bed and banks of the waterbody will be minimized.

(k) Wildlife

(i) No clearing of trees, shrubs, or vegetation is permitted between May 1 and July 31 of any year to protect the nesting and breeding season for migratory birds and other wildlife, unless otherwise identified by a Project biologist.

(ii) No disruption, movement, or destruction shall occur to any migratory bird nests.

(iii) In the event that a species at risk or a nest is encountered during construction, all Work will cease in the immediate area, the site will be made safe, and the Contract Administrator shall be contacted for further direction.

(l) Vegetation

(i) Vegetation shall not be disturbed without written permission from the Contract Administrator.

(ii) The Contractor shall protect plants or trees which may be at risk of accidental damage. Such measures may include protective fencing or signage and shall be approved in advance by the Contract Administrator.

(iii) The Contractor will limit the removal of trees and snags (standing dead trees), surface disturbance, and vegetation clearing.

(iv) Herbicides and pesticides shall not be used adjacent to any surface watercourses.

(v) Trees or shrubs shall not be felled into watercourses.

(vi) Areas where vegetation is removed during clearing, construction, and decommissioning activities, shall be revegetated as soon as possible in accordance with the landscaping plans forming part of the contract, or as directed by the Contract Administrator.

(vii) Trees damaged during construction activities shall be examined by bonded tree carte professionals; viable trees damaged during construction activities shall be pruned according to good practice by bonded tree care professionals.

(viii) Damaged trees which are not viable shall be replaced at the expense of the Contractor.

(m) Landscaping

(i) Construction waste (excluding common construction gravel, sand etc.) shall be removed to a minimum depth of 600 mm below final grade in all areas that are to be backfilled with suitable material and revegetated in accordance with Standard City Practice.

(ii) The Contractor shall adhere to the landscaping plan for maintenance of initial stage and development stages of the plant community.

(n) Construction Traffic

(i) Workforce parking shall be limited to the areas designated for such as detailed in the Contract Documents, or as otherwise may be directed by the Contract Administrator.

(ii) The Contractor shall adhere to the Standard Provisions of the Standard Construction Specifications, and of the Manual of Temporary Traffic Control in Work Areas on City Streets of The City of Winnipeg, Works & Operations Division.

(iii) The Contractor's laydown area, construction Site and access road shall be fenced and gated to secure the Site and materials and to discourage pedestrian entrance to construction area and to control any potential hazard to the public, particularly children.

(iv) For circumstances where the Contract Administrator has accepted Site access of special equipment or material, the Contractor shall provide adequate flagmen for traffic control in the vicinity of any public buildings.

(o) Access

(i) The Contractor shall maintain access to affected residential properties.

(p) The Contractor shall provide or maintain general and off-street access to any affected business during construction.

MEASUREMENT AND PAYMENT

D34. PAYMENT

D34.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D35. WARRANTY

D35.1 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.

D35.2 Notwithstanding C13.2 or D35.1, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if:

(a) a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use.

FORM H1: PERFORMANCE BOND
(See D12)

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. 1014-2017

TRURO CREEK CULVERTS REPLACEMENT AT WINCHESTER STREET AND LINWOOD STREET 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 D12)

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 1014-2017

TRURO CREEK CULVERTS REPLACEMENT AT WINCHESTER STREET AND LINWOOD STREET 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 (2007 Revision), International Chamber of Commerce Publication Number 600.

_____
(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST

(See D13)

TRURO CREEK CULVERTS REPLACEMENT AT WINCHESTER STREET AND LINWOOD STREET AND ASSOCIATED ROAD WORK

Name	Address

FORM K: EQUIPMENT

(See D14)

Truro Creek Culverts Replacement at Winchester Street and Linwood Street And Associated Road Work

1. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT

(See D14)

Truro Creek Culverts Replacement at Winchester Street and Linwood Street And Associated Road Work

4. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

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

(a) *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 .

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

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

E1.3 The following are applicable to the Work:

Drawing No.	Drawing Name/Title
C322-17-01	Winchester Street - Cover Sheet and Drawing List
C322-17-02	Winchester Street - Design Data and General Notes
C322-17-03	Winchester Street - Boring Logs
C322-17-04	Winchester Street - Existing Site Plan
C322-17-05	Winchester Street - Proposed General Arrangement Plan and Scope of Work
C322-17-06	Winchester Street - Head Wall Elevations and Sections
C322-17-07	Winchester Street - Section and Details
C322-17-08	Winchester Street - Concrete Details (Sheet 1 of 2)
C322-17-09	Winchester Street - Concrete Details (Sheet 2 of 2)
C322-17-10	Winchester Street - Reinforcing Details (Sheet 1 of 5)
C322-17-11	Winchester Street - Reinforcing Details (Sheet 2 of 5)
C322-17-12	Winchester Street - Reinforcing Details (Sheet 3 of 5)
C322-17-13	Winchester Street - Reinforcing Details (Sheet 4 of 5)
C322-17-14	Winchester Street - Reinforcing Details (Sheet 5 of 5)
C322-17-15	Winchester Street - Retaining Wall Details
C322-17-16	Winchester Street - Approach Slab Details
C322-17-17	Winchester Street - Aluminum Top Rail Details (Sheet 1 of 2)
C322-17-18	Winchester Street - Aluminum Top Rail Details (Sheet 2 of 2)
C322-17-19	Winchester Street - Approach Barrier Details (Sheet 1 of 2)
C322-17-20	Winchester Street - Approach Barrier Details (Sheet 2 of 2)
C322-17-21	Winchester Street - Bill of Reinforcing Steel (Sheet 1 of 3)
C322-17-22	Winchester Street - Bill of Reinforcing Steel (Sheet 2 of 3)
C322-17-23	Winchester Street - Bill of Reinforcing Steel (Sheet 3 of 3)
C322-17-24	Winchester Street - Road Reconstruction Plan Profile and Section
C322-17-25	Winchester Street - Water Main Renewal
C321-17-01	Linwood Street - Cover Sheet and Drawing List
C321-17-02	Linwood Street - Design Data and General Notes
C321-17-03	Linwood Street - Boring Logs
C321-17-04	Linwood Street - Existing Site Plan
C321-17-05	Linwood Street - Proposed General Arrangement Plan and Scope of Work
C321-17-06	Linwood Street - Sections and Details
C321-17-07	Linwood Street - Concrete Details (Sheet 1 of 2)
C321-17-08	Linwood Street - Concrete Details (Sheet 2 of 2)
C321-17-09	Linwood Street - Reinforcing Details (Sheet 1 of 3)
C321-17-10	Linwood Street - Reinforcing Details (Sheet 2 of 3)
C321-17-11	Linwood Street - Reinforcing Details (Sheet 3 of 3)
C321-17-12	Linwood Street - Approach Slab Details

C321-17-13	Linwood Street - Aluminum Top Rail Details (Sheet 1 of 2)
C321-17-14	Linwood Street - Aluminum Top Rail Details (Sheet 2 of 2)
C321-17-15	Linwood Street - Transition Barrier Details
C321-17-16	Linwood Street - Bill of Reinforcing Steel (Sheet 1 of 2)
C321-17-17	Linwood Street - Bill of Reinforcing Steel (Sheet 2 of 2)
C321-17-18	Linwood Street - Road Reconstruction Plan Profile and Section
C321-17-19	Linwood Street - Water Main Renewal

E2. GEOTECHNICAL REPORT

E2.1 Further to C3.1, the preliminary geotechnical report is available for viewing to aid the bidder's evaluation of the pavement structure and/or existing soil conditions during the tender period. Borehole logs are also provided on the Drawings. Bidders may view the report in Appendix B.

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.

GENERAL REQUIREMENTS

E3. SHOP DRAWINGS

E3.1 Description

(a) This Specification provides instructions for the preparation and submission of Shop Drawings. The term 'Shop Drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, including Site erection drawings which are to be provided by the Contractor to illustrate details of a portion of the Work.

(b) Further to C6.9, the Contractor shall arrange for the preparation of Shop Drawings required by the Contract, or as reasonably required by the Contract Administrator.

E3.2 The Contractor shall submit to the Contract Administrator for review, all specified Shop Drawings. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be shown on all submissions for the Contract Administrator's review.

E3.3 Shop Drawings

(a) Original drawings shall be prepared by the Contractor, to illustrate the appropriate portion of Work including fabrication, layout, setting, or erection details as specified in the appropriate sections.

(b) Shop Drawings shall bear the seal of a Professional Engineer licensed to practice in the Province of Manitoba.

(c) Shop Drawings shall be prepared by the Contractor.

E3.4 Contractor's Responsibilities

(a) Review Shop Drawings, product data, and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.

(b) Verify:

(i) Field Measurements;

(ii) Field Construction Criteria;

(iii) Catalogue numbers and similar data.

(c) Coordinate each submission with requirement of Work and Contract Documents. Individual Shop Drawings will not be reviewed until all related drawings are available.

(d) Promptly submit Shop Drawings in an orderly sequence to prevent delay in the Work or the Work of other Contractors.

(e) Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.

(f) Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review of submission, unless Contract Administrator gives written acceptance of specified deviations.

(g) Responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.

(h) Make any corrections required by the Contract Administrator and resubmit the required number of corrected copies of Shop Drawings. Direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.

(i) After Contract Administrator's review and return of copies, distribute copies to Subcontractors and others as appropriate.

(j) Maintain one (1) complete set of reviewed Shop Drawings, filed by Specification Section Number, at the Site of the Work for use and reference of the Contract Administrator and Subcontractors.

E3.5 Submission Requirements

(a) Allow for a ten (10) Business Day period for review by the Contract Administrator of each individual submission and re-submission, unless otherwise noted in the Contract Documents.

(b) Accompany submissions with transmittal letter containing:
  (i) Date;
  (ii) Project title and Bid Opportunity number;
  (iii) Contractor's name and address;
  (iv) Number of each Shop Drawing, product data and sample submitted;
  (v) Specification Section, Title, Number, and Clause;
  (vi) Drawing Number and Detail/Section Number; and
  (vii) Other pertinent data.

(c) Submissions shall include:
  (i) Date and revision dates; and
  (ii) Project title and Bid Opportunity number.

(d) Name of:
  (i) Contract;
  (ii) Subcontractor;
  (iii) Supplier;
  (iv) Manufacturer;
  (v) Detailer (if applicable);
  (vi) Identification of product or material;
  (vii) Relation to adjacent structure or materials;
  (viii) Field dimensions, clearly identified as such;
  (ix) Specification section name, number, and clause number or drawing number and detail/section number;
  (x) Applicable standard, such as CSA or CGSB numbers; and
  (xi) Contractor's stamp, initialed or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.

E3.6 Other Considerations

(a) Fabrication, erection, installation, or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent Shop Drawings and resubmit.

(b) Material and equipment delivered to the Site of the Works will not be paid for at least until pertinent Shop Drawings have been submitted and reviewed.

(c) Incomplete Shop Drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

(d) No delay or cost claims will be allowed that arise because of delays in submissions, resubmissions, and review of the Shop Drawings.

E4. VERIFICATION OF WEIGHT

E4.1 Weight Verification

(a) All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.

(b) Tickets shall be provided daily by the Contractor for work paid on a weight basis, and shall include a description of the location and component of the work performed. Payment shall only be made upon acceptance of the weight tickets.

(c) 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.

(d) 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:

(i) Checking Contractor's scales for Consumer & Corporate Affairs certification seals;

(ii) Observing weighing procedures;

(iii) 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; and

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

(e) No charge shall be made to the City for any delays or loss of production caused by such inspection and verification.

E4.2 Evaluation of Tare Weight

(a) 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.

(b) The tare shall be obtained by weighing the truck or truck/trailer(s) combination on a certified scale and shall show:

(i) Upon which scale the truck or truck/trailer(s) combination was weighed;

(ii) The mechanically printed tare weight;

(iii) The license number(s) of the truck and trailer(s); and

(iv) The time and date of weighing.

E5. MOBILIZATION AND DEMOBILIZATION

E5.1 Description

(a) This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the Culvert Sites, as specified herein.

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

E5.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) CW 3550 – Chain Link and Drift Control Fence

(ii) D33 - Environmental Protection Plan

(iii) E11 - Creek Flow Maintenance

(iv) E14 – Silt Fence Barrier;

E5.3 Scope of Work

(a) The Work under this Specification shall include but not be limited to:

(i) Mobilizing and demobilizing on-site Work facilities;

(ii) Supply, setting-up, laying-out, and removing site office facilities as detailed in E6 “Site Office Facilities”;

(iii) Supplying and installing secure fencing around the site;

(iv) Maintaining and removing any access roadways; and

(v) Restoring all existing facilities.

E5.4 Materials

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

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

E5.5 Equipment

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

E5.6 Construction Methods

(a) Layout of On-Site Work Facilities

(i) The Contractor shall mobilize all on-site Work and other temporary facilities.

(ii) Possible locations for the Contractor’s staging areas include the approach roadways and Linwood Street south of the culvert and north of Ness Avenue. The Contractor should consider spring flood levels when proposing a location for temporary facilities. The Contractor shall coordinate with relevant parties to make arrangements for use of these areas.

(iii) Upon completion of construction activities, the Contractor shall remove all on-site Work and other temporary facilities, and restore to pre-existing conditions.

(b) Cellular Telephone Communication

(i) The Contractor’s Site supervisor is required to carry, at all times, a cellular telephone with voice mail.

(c) Secure Site Fencing

(i) A minimum 1.8 m high chain-link, or equivalent as approved by the Contract Administrator in accordance with B7 “Substitutes”, secure fence around the site laydown and Work site areas shall be installed prior to commencement of site activities.

(ii) During winter months, a minimum 1.2 m high snow fence shall be installed across Truro Creek.

(iii) The fencing shall remain secure and in place during all construction facilities.

(iv) The fencing shall be removed upon demobilization of on-site Work facilities.

(d) Traffic Gates

(i) The Contractor shall supply, install, maintain, and remove steel gates to keep non-Contractor traffic and pedestrians out of the Work site, wherever required.

(ii) The gates shall be removed upon completion of construction activities.

(e) Access Roadway

(i) The Contractor shall maintain any access roadway they install.

(ii) The access road shall be maintained on a regular basis to provide continual unrestricted site access, to the satisfaction of the Contract Administrator.

(iii) City of Winnipeg streets and alleys adjacent to all access roads and staging areas must be kept clean at all times.

(iv) Upon completion of the Work, the area shall be restored to its original condition.

(f) Restoration of Existing Facilities

(i) Upon completion of the Work and demobilization, the Contractor shall restore existing facilities.

E5.7 Quality Control

(a) Inspection

(i) 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.

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

(b) Access

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

E5.8 Measurement and Payment

(a) Mobilization and demobilization shall not be measured. This item of work shall be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization", which price shall be paid in full for supply all materials and performing all operations herein described and all other items incidental to the Work. Payment will be based on the following breakdown:

(i) Commencement of Construction: 30%

(ii) During Construction: 60%

(iii) Upon Completion of the Work: 10%

E6. SITE OFFICE FACILITIES

E6.1 Description

(a) This Specification shall cover all operations relating to the supply of site office facilities, as specified herein.

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

E6.2 Materials

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

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

E6.3 Equipment

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

E6.4 Construction Methods

(a) Site Office Facilities

(i) The Contractor shall supply the Contract Administrator's site office facilities meeting the following requirements:

(i) A site office shall be provided for the exclusive use of the Contract Administrator;

(ii) The office shall be conveniently located within the site lay-down area near the Work site;

(iii) The office shall be a newer building with a minimum floor area of 15 square metres, having a ceiling height of 2.4 m and adequate windows (complete with security bars) to provide for cross ventilation, with door entrance(s) with suitable lock(s);

(iv) The office shall be suitable for all weather use. It shall be equipped with suitable heating and air conditioning systems, so that the interior room temperature can be maintained between 20°C to 22ºC at any outside ambient temperature;

(v) The office shall be adequately lighted with fluorescent fixtures and have a minimum of ten – 120 volt ac electrical receptacles;

(vi) The office shall be furnished with one office desk and two chairs, one drafting table, one meeting table, one stool, one legal size filing cabinet, one bookcase, and a minimum of eight (8) chairs;

(vii) The office shall be equipped with reliable internet access, supplied and paid for by the Contractor, either provided by Ethernet cable (hard line) or wireless internet service. Any wireless internet access shall be secured by an access password and by conventional WPA2 256-bit encryption to prevent unauthorized access. If wireless internet access is not provided, then a minimum of two Ethernet connections shall be provided.

(viii) One refrigerator, approximately 5 ft^3 and one mid-size microwave shall be supplied by the Contractor;

(ix) A bottled water supply, with associated consumables, shall be supplied fresh regularly by the Contractor;

(x) A portable flush or chemical-type toilet, lavatory, and mirror shall be located near the site office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and personnel from the City;

(xi) The site office building and the portable toilet shall be cleaned on a weekly basis. The Contract Administrator may request additional cleaning when he deems it necessary;

(xii) A minimum of three parking stalls shall be made available for use by the Contract Administrator immediately adjacent to the site office; and

(xiii) All site office facilities and furnishings shall be approved by the Contract Administrator;

(ii) The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the site office facilities.

(iii) The site office facilities shall be provided from the date of the commencement of the Work to the date of Total Performance unless otherwise approved in writing by the Contract Administrator,

E6.5 Measurement and Payment

(a) Site Office Facilities

(i) The supply of site office facilities shall not be measured. This item of Work shall be paid for at the Lump Sum Price for "Mobilization and Demobilization", which price shall be paid in full for supply all materials and performing all operations herein described and all other items incidental to the Work.

E7. TRAFFIC CONTROL AND MANAGEMENT

E7.1 Description

(a) This Specification shall cover all operations relating to the supply, erection, and maintenance of all applicable traffic control devices in accordance with the provision contained in the latest edition of the “Manual of Temporary Traffic Control in Work Area on City Streets,” and Clauses 3.6, 3.7, and 3.8 of the latest version of the City of Winnipeg Standard Construction Specification CW 1130, and as specified herein.

(b) This Specification shall include all operations related to establishing and executing the public access and traffic control plan as specified herein and as shown in the Drawings.

(c) 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.

E7.2 Scope of Work

(a) The City of Winnipeg is responsible for traffic control related to the movement of vehicles outside of the Project area. The City shall bear all costs associated with these Works. This includes:

(i) Turning restrictions and related signage;

(ii) All regulatory signage; and

(iii) Daily maintenance of all items above.

(b) The Work 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, excluding that being performed by the City of Winnipeg as listed above in E7.2(a). This generally includes:

(i) Installation of barricades in areas under construction, including chevrons or other directional signage to facilitate construction vehicle access and prevent general traffic access;

(ii) Installation, adjustment, and maintenance of sidewalk barricades stating “sidewalk closed”;

(iii) Securing Work areas to provide safe pedestrian and vehicular access; and

(iv) Daily maintenance of all items listed above.

E7.3 Materials

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

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

E7.4 Equipment

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

E7.5 Notification

(a) The Contractor shall notify the City of Winnipeg Customer Services Division at (204) 986-5640, at least one (1) Calendar Day in advance of any traffic lane closures.

E7.6 Construction Methods

(a) General

(i) The Contractor may close Winchester Street and Linwood Street simultaneously in the location of the culvert to all vehicle traffic from the time of mobilization until March 7, 2018. Winchester Street and Linwood Street may be closed again for a maximum period of seven (7) consecutive weeks to complete permanent roadworks starting in spring 2018. The closure shall be limited to the width of the excavation plus space required for the construction “laydown and site office”. On Winchester Street, the north limit of closure for culvert work until March 7, 2018 shall be to the hydrant immediately north of the culvert and the south limit of closure shall be up to and including the north extent of the existing back lane immediately south of the culvert as shown on the Drawing. On Linwood Street, the north limit of closure for culvert work until March 7, 2018 shall be up to the south limit of the existing back lane immediately north of the culvert and the south limit of closure shall be up to the north extents of Ness Avenue. It is intended that the Contractor laydown and site office area be either north of the culvert on Winchester Street or south of the culvert on Linwood Street.

(ii) The existing back lane south of the Winchester Street culvert and north of the Linwood Street culvert may be closed temporarily for up to thirty (30) days to complete permanent roadworks in 2018.

(iii) The Contractor shall provide and maintain flagmen in accordance with the “Manual of Temporary Traffic Control in Work Areas on City Streets”, issued by the City of Winnipeg .

(iv) 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 users and that his operations in no way interfere with the safe operation of traffic.

(v) Improper signing will be sufficient reason for the Contract Administrator or Inspector to immediately shut down the entire job.

(vi) Barricades supplied and installed by the Contractor shall show the telephone number(s) at which he can be reached twenty-four (24) hours per day, seven (7) days per week.

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

(viii) Ambulance / emergency vehicle access must be maintained at all times. The Contractor shall advise emergency services of planned road closures prior to closing roads.

E7.7 Quality Control

(a) Inspection

(i) 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.

(ii) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any

materials or Works, which are not in accordance with the requirements of this Specification.

(b) Access

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

E7.8 Measurement and Payment

(a) Traffic Control

(i) Traffic control shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for "Traffic Control" performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work. Payment will be based on the following breakdown:

(i) Traffic Control Initiation: 50%

(ii) Site Restoration: 50%

E8. REFUSE AND RECYCLING COLLECTION

E8.1 While access to refuse and/or recycling collection vehicles is restricted, on collection day(s) the Contractor shall move all of the affected property owners refuse and/or recycling materials to a nearby common area, prior to an established time, in accordance with E8.2 to permit the normal collection vehicles to collect the materials. Immediately following recycling collection, the Contractor shall return recycling receptacles to the addresses marked on the receptacles.

E8.2 Collection Schedule:

(a) Winchester Street & Linwood Street:

(i) Collection Day(s): Friday

(ii) Collection Time: 7:00 a.m. to 7:00 p.m.

(iii) Common Collection Area: Maintain access to properties for refuse and recycling trucks or move bins to Silver Avenue or Lyle Street for collection.

E9. WATER OBTAINED BY CITY

E9.1 Further to Clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water in accordance with the Waterworks and Sewer By-laws.

E10. SURFACE RESTORATIONS

E10.1 Further to Clause 3.3 of CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E11. CREEK FLOW MAINTENANCE

E11.1 Description

(a) This Specification shall cover all operations relating to maintaining flows in Truro Creek through Winchester Street and Linwood Street for the duration of the construction Works

and constructing a cofferdam to facilitate removal of the existing culverts, and to accommodate rip rap works, embankment works and construction of the new culverts.

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

E11.2 Scope of Work

(a) The Work under this Specification shall include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:

(i) Designing creek flow maintenance methods;

(ii) Maintaining creek flows during construction;

(iii) Removing and disposing of material to maintain creek flows;

(iv) Confining suspended matter in Truro Creek;

(v) Constructing cofferdams and dewatering in Truro Creek; and

(vi) Complying with all requirements outlined in D33, “Environmental Protection Plan”.

E11.3 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, a detailed plan and schedule for the construction of cofferdams, clearly illustrating the method and sequence by which he proposes to perform the Work, including a description of the measures that will be implemented to meet the environmental requirements outlined in D33, “Environmental Protection Plan”. The submission shall also include detailed drawings and design details of the proposed cofferdams.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least five (5) Business Days prior to the commencement of any Work on site, a Creek Flow Maintenance Plan showing how the Contractor will undertake dewatering activities and maintain creek flow at the Site during construction. This plan shall be comprised of drawings and/or description of the proposed maintenance methods. The Contractor’s Creek Flow Maintenance Plan shall be designed to meet the following requirements:

(i) Cofferdams shall be constructed on both the upstream and downstream ends of the Site, as shown on the Drawings. Water shall be pumped from upstream to downstream. Water or ice elevations upstream of any upstream cofferdam shall not exceed a level to cause overflowing of the banks at any upstream point.

(ii) The Contractor shall have backup pump(s) available on site with adequate capacity to maintain 100% of downstream flow at all times. Pumps shall be ready to be put into operation 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 fully restored to the creek.

E11.4 Materials

(a) General

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

(ii) 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.

(b) Cofferdams

(i) Cofferdams shall be designed to use non-erodible material such as sandbags. Earthen berms shall not be used as cofferdams.

E11.5 Construction Methods

(a) In general, the Work shall include, but not necessarily be limited to:

(i) Design of creek flow maintenance methods including the preparation and submission for review and approval by the Contract Administrator of a Creek Flow Maintenance Plan.

(ii) Maintenance of creek flows for the duration of construction.

(iii) Removal of materials and/or equipment required to maintain creek flows, at the end of their use.

(iv) Confinement of suspended matter in the creek water generated at the Site through excavation and structural removal activities, within the Project area. This will require the construction of cofferdams.

(b) Instream Activities

(i) All instream work shall be completed by the date specified in D18. Instream work includes the completion of the culverts, head walls, rip rap, slope stabilization works, the removal of cofferdams, and any activities impacting the creek. It is the Contractor's responsibility to monitor and measure creek flows and schedule the works so that early flooding does not impact the Contractor's ability to complete the work in compliance with the Environmental Permit.

(ii) No instream activities or any activities impacting the creek or affecting fish mobility or habitat shall be permitted during the dates specified in D33.5(j)(i).

(c) Bypass Pumping Operations

(i) Structural removals, rip rap works, and new culvert construction are anticipated to take place during freezing conditions when flow within Truro Creek is minimal. As such, the Contractor shall install a cofferdam at the upstream and downstream limits of the work area and install and maintain temporary by-pass diversion pumps to handle any flows.

(ii) Pumps shall include a fish screen that meets DFO's Freshwater Intake End-of-Pipe Fish Screen Guideline to prevent the entrainment or impingement of fish.

(iii) The Contractor shall be required to supply flood pumps to manage up to 0.1 m^3/s of Truro Creek flow including pumps necessary to account for freezing or maintenance. Dewatering of the site beyond the limits of the existing culvert shall not be permitted.

(iv) To fairly mitigate anticipated costs, if the flows encountered during the period from commencement of construction up to and including March 1, 2018 exceed the capacity of the required pumps, the Contractor shall be reimbursed for expenses as specified in C7. The use of any pumps in addition to the required pumps noted in E11.5 shall be recorded by the Contractor and signed off daily by the Contract Administrator.

(d) Cofferdam Construction

(i) The construction of cofferdams are required in order to dewater Truro Creek to remove the existing culverts, excavate channel material for the new culvert construction, and complete construction of the new culvert crossings.

(ii) The proposed cofferdam locations are shown on the Drawings. Cofferdams shall be provided at the upstream and downstream limits of the site to allow structural removals of the existing culvert and perform all required channel works under dry conditions. Cofferdams shall be designed and constructed with granular materials and as watertight as is necessary for the proper performance of the Work. The cofferdams shall be designed and constructed to meet the requirements of the Contractor's Creek Flow Maintenance Plan.

(iii) Efforts shall be made to minimize the period of time for which Truro Creek is dewatered. As part of the submittals noted in E11.3, the Contractor shall provide an anticipated timeline for which the channel will be dewatered.

(iv) Construction of and dewatering of the cofferdams shall be undertaken in coordination with bank stabilization works. Provisions for maintaining bank stability by providing toe support are outlined in E13 “Slope Stabilization Works”.

(v) Coordination will be required for scheduling of bank stabilization operations, culvert demolition and removals, creek bank excavation and structural backfill. Refer to E12 “Creek Bank Excavation”, E13 “Slope Stabilization Works”, E20 “Culvert Demolition and Removals”, and E21 “Structural Backfill”.

(e) Complying with Environmental Protection Requirements

(i) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Truro Creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D33, “Environmental Protection Plan”. Specific sediment and erosion control measures are outlined in E14, “Silt Fence Barrier” and E15, “Erosion Control Blanket (ECB)”.

(ii) The Contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales, or other measures as required in the event that there is runoff from the site.

(iii) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.

(iv) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

E11.6 Measurement and Payment

(a) Creek Flow Maintenance

(i) Creek flow maintenance shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for “Creek Flow Maintenance”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. Payment will be based upon the following breakdown:

(i) Installation: 50%

(ii) Removal: 50%

E12. CREEK BANK EXCAVATION

E12.1 Description

(a) This Specification shall cover the requirements for surface excavation near Truro Creek including removal of topsoil and vegetation, and shall amend and supplement CW 3170.

(b) The Contractor shall coordinate creek bank excavation activities with creek flow maintenance, culvert demolition and removals and slope stabilization works, as there is specific sequencing of works that must take place in order to maintain stability of the embankment slopes. Coordinate activities in accordance with E11 “Creek Flow Maintenance”, E20 “Culvert Demolition and Removals” and E13 “Slope Stabilization Works”.

(c) 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 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) CW 2030 – Excavation Bedding and Backfill;
(ii) CW 2130 – Gravity Sewers;
(iii) CW 2160 – Concrete Underground Structures and Works;
(iv) CW 3110 – Sub-Grade, Sub-Base and Base Course Construction;
(v) CW 3130 – Supply and Installation of Geotextile Fabrics; and
(vi) CW 3615 – Rip Rap.

E12.3 Scope of Work

(a) The Work under this Specification shall involve:
(i) Excavating all material required to construct the Works;
(ii) The design, fabrication and erection of all temporary shoring and such temporary protective measures as may be required to construct the Works;
(iii) Clearing and grubbing operations in areas where excavation is required;
(iv) Excavating topsoil where excavation is required;
(v) Off-site disposing of surplus and unsuitable material;
(vi) Dewatering of all excavations, as required; and
(vii) Complying with the requirements outlined in D33, “Environmental Protection Plan”.

E12.4 Submittals

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

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

E12.5 Materials

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

(b) Testing
(i) All excavated materials 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.

(c) Excavation
(i) Excavated material shall be unclassified excavation and shall include the excavation and satisfactory disposal of any and all materials that may be encountered.
(ii) Suitable clean clay fill material shall be used for areas requiring fill.

E12.6 Equipment

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

E12.7 Construction Methods

(a) Excavation

(i) Alterations to Site

(i) The Contractor shall excavate only material that is necessary for the expeditious construction of the Works or as set out by the Contract Administrator in the field. If the Contract Administrator permits the excavation of runways, existing stock piling, or trenches within the right-of-way, the Contractor shall, on completion of the Work, backfill the runways and trenches to the elevation of the original ground existing at the time of excavation and compact the backfill material, all at his own expense and as directed by the Contract Administrator.

(b) Protection of Existing Embankment Slopes

(i) The Contractor shall not disturb the embankment slopes outside the excavation limits and shall not dump excavated material onto the roadway embankment or the creek bank.

(c) Excess Material

(i) All excess excavated material 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.

(d) Excavating Creek Bank Material

(i) Prior to commencing any excavation Works, underground clearances shall be obtained from all applicable utilities by the Contractor. Due care and caution shall be taken by the Contractor to work around all identified underground utilities.

(ii) Excavations shall be completed to the elevations required to construct the Works, to the lines and grades as shown on the Drawings, or to such other elevations as may be directed by the Contract Administrator in the field.

(iii) In general creek bank excavation shall consist of removing existing material to facilitate removal of the existing culvert and construction of the new culvert, channel excavation to provide the new channel profile and slopes and hydraulic opening, and thickened rip rap and excavation required for installation of rip rap.

(iv) Excavation sequence shall be done in a “top down” direction, in order to maintain stability. The dimensions of excavation shall be such as to give sufficient clearances for the construction of forms and their subsequent removal.

(v) All material shall be brought to the surface by approved method, and shall be disposed of away from the Site and not into the existing water channel. Shored excavations 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.

(vi) Double handling of excavated material may be required due to the depth of excavation and height of the bank, and material should be transferred up the slope in an expeditious manner. No temporary material piles may remain on the slope for longer than one hour during the transferring process. The Contractor should pace the excavation to keep up with the removal from site.

(vii) Areas for stockpiling of materials shall be proposed by the Contractor for approval by the Contract Administrator. No stockpiling shall be permitted without prior approval by the Contract Administrator.

(e) Clearing and Grubbing

(i) Removal of brush and other vegetation may be required to facilitate the Works. Existing vegetation shall not be removed without prior approval from the Contract Administrator. The Contractor shall load and haul any removed vegetation, and dispose of the material off site.

(f) Excavating Topsoil

(i) Removal of vegetation and topsoil may be required to facilitate the Works. Existing vegetation shall not be removed without prior approval from the Contract Administrator. The Contractor shall load and haul any removed vegetation, and dispose of the material off site.

(ii) Stripping of topsoil shall not be measured or paid for directly, but shall be considered incidental to construction of the Works.

(g) Off-Site Disposing of Surplus and Unsuitable Material

(i) All excess excavated material 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 the waterway.

(ii) Stockpiling will not be permitted.

(h) Alterations to Site

(i) The Contractor shall excavate only material that is necessary for the expeditious construction of the structure or as set out by the Contract Administrator in the field. If the Contract Administrator permits the excavation of runways, or trenches within the right-of-way, the Contractor shall, on completion of the Work, backfill the runways and trenches to the elevation of the original ground existing at the time of excavation and compact the backfill material, all at his own expense and as directed by the Contract Administrator.

(i) Protection of Existing Embankment Slopes

(i) The Contractor shall not disturb the embankment slopes outside the excavation limits and shall not dump excavated material onto the roadway embankment or the creek bank.

(j) Complying with Environmental Protection Requirements

(i) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into the waterway from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D33, “Environmental Protection Plan” and E11, “Creek Flow Maintenance”. Specific sediment and erosion control measures are outlined in E14, “Silt Fence Barrier” and E15, “Erosion Control Blanket (ECB)”.

(ii) The Contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales, or other measures as required in the event that there is runoff from the site.

(iii) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.

(iv) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

E12.8 Quality Control

(a) Inspection

(i) After each excavation is completed, the Contractor shall notify the Contract Administrator to inspect the excavation.

(b) Access

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

E12.9 Measurement and Payment

(a) Creek Bank Excavation

(i) Creek bank excavation shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for “Creek Bank Excavation”, performed in accordance with this Specification and accepted by the Contract Administrator,

which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E13. SLOPE STABILIZATION WORKS

E13.1 Description

(a) This Specification shall cover all operations related to slope stabilization and permanent protection works as herein specified and as shown on the Drawings.

(b) The Contractor shall coordinate slope stabilization works with creek flow maintenance, creek bank excavation, and structural removals. Coordinate activities in accordance with the referenced specifications noted in E13.2.

(c) 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. Coordinate activities in accordance with E11 “Creek Flow Maintenance”, E12 “Creek Bank Excavation”, and E20 “Culvert Demolition and Removals”.

E13.2 Referenced Specifications and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications and the latest edition and all subsequent revisions of the following standards

(i) ASTM C88 – Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate;

(ii) ASTM C127 – Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate;

(iii) ASTM C535 – Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact on Los Angeles Machine

(iv) ASTM D5519 – Standard Test Methods for Particle Size Analysis of Natural and Man-Made Rip rap Materials; and

(v) CW 3130 – Supply and Installation of Geotextile Fabrics

(vi) CW 3615 – Rip Rap

E13.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Preparing existing surfaces to receive rip rap material;

(ii) Placing geotextile material and bedding material;

(iii) Placing rip rap to limits provided on the Drawings;

(iv) Complying with all requirements outlined in D33 “Environmental Protection Plan”.

E13.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed supplier(s) and location or quarry sites for the supply of rip rap.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, test reports showing evidence that the proposed material meets limits specified in Tables 13.1 and 13.2.

E13.5 Materials

(a) General

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

(ii) 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.

(b) Rip Rap

(i) Rip rap material shall be Class 350. The material shall be quarried rock or quarried limestone which is dense, durable, sound, resistant to the action of water and frost, and suitable in all respects for the purpose intended.

(ii) Rip rap material inside the culvert shall be 300 nominal stone. The material shall be quarried rock or quarried limestone which is dense, durable, sound, resistant to the action of water and frost, and suitable in all respects for the purpose intended.

(iii) Rip rap shall consist of a clean free draining, sound, dense, durable, quarried rock. The material shall be free from organics, roots, silts, sand, clay, snow, ice, or any other material that would detract from the strength and drainage characteristics of clean rock.

(iv) Individual particles shall be shaped such that no dimension is greater than two times the smallest dimension. Flat, elongated, or platy particle shapes will not be accepted.

(v) Should the Contractor choose to use limestone, it shall be durable crystalline limestone.

(vi) The Class 350 rock material shall meet the following requirements:

TABLE 13.1
ROCK MATERIAL SPECIFICATIONS

Parameter	Test Method	Specified Limit
LA Abrasion Loss	ASTM C535	32% maximum
Magnesium Sulphate Soundness Loss	ASTM C88	13% maximum

(vii) Class 350 rip rap shall be well graded having a full range and even distribution of sizes. The stones shall range in size from 100 mm to 350 mm in diameter with at least seventy-five (75%) percent ranging from 200 mm to 300 mm in diameter. The Rip rap rock shall conform to the following gradation:

TABLE 13.2
CLASS 350 RIP RAP GRADATION REQUIREMENTS

Canadian Metric Sieve Size (millimetres)	Percent of Total Dry Weight Passing Each Sieve
350	100%
200	15-50%
100	0-15%

(viii) The infill 300 nominal rip rap shall be well graded having a full range and even distribution of sizes.

(c) Geotextile

(i) The geotextile fabric shall be non-woven Class II (heavy-duty). Geotextile shall be Armtec 300W (https://www.armtec.com/product_brochure/document/591b5c67db3c2.pdf) or an approved equal as accepted by the Contract Administrator, in accordance with, B7 “Substitutes”.

(d) Quarry Sites

(i) The Contractor supplying rip rap shall be responsible for demonstrating that the material is of adequate quality to meet the material specifications contained herein.

(e) Testing and Approval

(i) All materials set forth in this Specification shall be subject to inspection and testing by a testing laboratory approved by the Contract Administrator.

(ii) The Contract Administrator may approve the use of materials that do not meet this specification if they are deemed to meet the requirements of the design intent.

(iii) The Contract Administrator will visit proposed quarry for inspection of the proposed rip rap material and quarry faces a minimum of fourteen (14) days prior to supply and placement of rip rap.

(iv) No supply and placement of rip rap will be permitted prior to the Contract Administrator reviewing and accepting the source.

(v) The procedures for preparation of all rip rap samples for use in material inspection and testing shall be subject to review and acceptance by the Contract Administrator for individual tests. The samples may be obtained from crushed and processed material at the sizing for specific tests if the material is deemed by the Contract Administrator to be representative of the rip rap that will be used.

(vi) Gradation tests of the rip rap shall be conducted by the Contractor at a frequency of one test for no more than every 2,000 tonnes of material supplied, or as directed by the Contract Administrator.

(vii) In the event that a gradation test does not meet the specified gradations, the Contractor shall correct material deficiencies as directed in the field by the Contract Administrator.

(viii) The Contractor will only be able to continue supply of rip rap to site at the discretion of the Contract Administrator.

E13.6 Construction Methods

(a) Preparing Existing Surfaces to Receive Rip rap Material

(i) The ground surface shall be excavated and neatly shaped to the lines shown on the Drawings prior to placing any rip rap, or geotextile.

(ii) The Contractor shall prepare the surface to achieve a smooth, even surface, clear of any aggregates or debris, and constructed to the cross-section and profile as shown on the Drawings.

(b) Placing Geotextile

(i) Install geotextile and bedding material as shown on the Drawings.

(ii) Geotextile shall be placed on the finished excavated ground surface.

(iii) Geotextile shall not be dragged, nor shall it be rolled out as smoothly as possible, no more than 40 m ahead of the placement of bedding material. Place geotextile in accordance with CW 3130.

(iv) Bedding material shall be placed between the geotextile fabric and the rip rap.

(c) Placing Rip Rap

(i) Rip rap shall be placed to the lines and grades shown on the Drawings. Subcut into the bank as indicated on the drawings. Rip rap shall be placed at all locations as shown on the Drawings.

(ii) Rip rap shall be pushed or rolled into place in such a manner that the larger rocks are uniformly distributed and the smaller rocks serve to fill the places between the larger rocks such that excessive segregation of the various particle sizes does not occur.

(iii) Sufficient levelling shall be done to produce a neat and uniform surface, conforming to the shape and dimensions shown on the Drawings.

(iv) Provide a smooth uniform surface from the existing grade and new rip rap when placing outside edges or transitions.

(v) Temporary stockpiling of rip rap along the riverbank shall not be permitted. Material shall be placed to the required lines and grade shown on the Drawings immediately upon delivery to the Site.

(vi) The 300 mm nominal rip rap stone inside the culverts shall be sparsely placed over 10% of each culvert's floor slab surface area.

(d) Complying with Environmental Protection Requirements

(i) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Truro Creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D33, "Environmental Protection Plan" and E11, "Creek Flow Maintenance". Specific sediment and erosion control measures are outlined in E14, "Silt Fence Barrier" and E15, "Erosion Control Blanket".

(ii) The Contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales, or other measures as required in the event that there is runoff from the site.

(iii) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.

(iv) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

E13.7 Quality Control

(a) Inspection

(i) 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.

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

(b) Access

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

E13.8 Measurement and Payment

(a) Slope Stabilization Works

(i) Undertaking slope stabilization works will be measured in cubic meters of the completed work by multiplying the actual surface area by the specified thickness of rip rap shown on the Drawings. The sparsely placed infill 300 mm nominal rip rap stone will be measured in cubic metres of the completed work by multiplying 10% of the actual surface area by the specified thickness of rip rap in the culvert shown on the Drawings. Overages in thickness or area beyond the limits shown on the drawings will not be paid for unless these changes were requested by the Contract Administrator.

(ii) Slope stabilization works will be paid for at the Contract Unit Price per cubic metre for "Slope Stabilization – Class 350 Rip Rap", for placed Class 350 rip rap measured as specified herein, performed in accordance with this Specification and accepted by

the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(iii) Slope stabilization works will be paid for at the Contract Unit Price per cubic metre for "Slope Stabilization – Infill 300 mm Nominal Stone Rip Rap", for placed culvert infill 300 mm nominal rip rap measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E14. SILT FENCE BARRIER

E14.1 Description

(a) This Specification shall cover all operations relating to the work necessary for the supply, installation, and maintenance of silt fence barrier, as herein specified.

(b) The Contractor shall coordinate silt fencing activities with the referenced specifications noted in D33.

(c) 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 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 (600 kN-m/m^3);

(ii) ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method;

(iii) ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus;

(iv) ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity;

(v) ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles;

(vi) ASTM D4632 – Grab Breaking Load and Elongation of Geotextiles;

(vii) ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile; and

(viii) ASTM D4833 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.

(ix) CW 3550 – Chain Link and Drift Control Fence

(b) The latest version of the City of Winnipeg Standard Construction Specifications

(i) CW 3550 – Chain Link and Drift Control Fence;

E14.3 Scope of Work

(a) The Work under this Specification shall include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:

(i) Supplying and installing temporary silt fence barrier;

(ii) Maintaining silt fence barrier until final site restoration;

(iii) Removing silt fence barrier; and

(iv) Complying with all requirements outlined in D33, “Environmental Protection Plan”.

E14.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E14.5 Materials

(a) General

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

(ii) 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.

(b) Handling and Storage of Materials

(i) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

(c) Fence Posts

(i) Fence posts shall be 38 mm x 38 mm untreated wood posts, 41 mm steel tee posts, or punched steel U posts, minimum length of 1.2 m.

(d) Filter Fabric

(i) Filter fabric shall be a woven geotextile material specifically designed for a silt fence applications, meeting the following minimum requirements:

TABLE 14.1
FILTER FABRIC REQUIREMENTS

Property	Test Method	Value
Grab Tensile Strength	ASTM D4632	0.55 kN
Grab Tensile Elongation	ASTM D4632	15%
Mullen Burst	ASTM D3786	2060 kPa
Puncture	ASTM D4833	0.285 kN
Trapezoid Tear	ASTM D4533	0.285 kN
UV Resistance	ASTM D4355	80% @ 500 hrs
Apparent Opening Size (AOS)	ASTM D4751	0.60 mm
Flow Rate	ASTM D4491	405 l/min/m^2

(ii) The fabric shall be inert to commonly encountered soil chemicals, hydrocarbons, mildew and bacteria.

(e) Wire Mesh

(i) Wire mesh shall be galvanized or plain metal with 3.0 mm wire gauge and wire spacing at 150 mm o/c.

(f) Fencing Material Fasteners

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

E14.6 Equipment

(a) General

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

E14.7 Construction Methods

(a) General

(i) Silt fencing which should be installed at the start of the work, shall be installed along areas where there is stripped or exposed soil where run-off would enter the Truro Creek. Final locations of the silt fence barrier will be dependent upon site conditions and the Contractor's activities and methods, and may require adjustment.

(ii) Locations of silt fence barrier will be confirmed on site with the Contract Administrator.

(iii) Work shall be undertaken in accordance with D33, "Environmental Protection Plan" to prevent deleterious substances from entering into Truro Creek during construction.

(b) Silt Fence Barrier Installation

(i) Excavate a 150 mm x 150 mm anchor trench along alignment of silt fence barrier.

(ii) Install fence posts in accordance with Manufacturer's recommended installation methods. Fence posts shall be firmly driven into undisturbed soil, or are completely and firmly backfilled if installed via auger methods.

(iii) Attach wire mesh as support backing for silt fence barrier filter fabric with specified fasteners. Attach silt fence barrier filter fabric on top of wire mesh in similar fashion. Overlap any fence seams (wire mesh or filter fabric) by 450 mm minimum. Ensure that wire mesh and filter fabric are installed on the upslope side of the post and are fully laid within the anchor trench.

(iv) Install and compact impermeable excavated materials into anchor trench and slope as required. Compact to 95% of maximum dry density in accordance with ASTM D-698.

(c) Silt Fence Barrier Maintenance

(i) Silt fence barrier shall be inspected daily and prior to commencing other construction activities.

(ii) All silt fences shall be inspected immediately after runoff event and at least daily during prolonged rainfall or runoff. Any required repairs shall be made immediately. The silt fence barriers shall be maintained in place, without gaps, and without undermining, so as to prevent sediment passage through and under the barrier. Silt fence barriers shall be maintained vertical without tears and without sagging. Fence posts shall remain upright and shall not be loosely placed into the ground.

(iii) Accumulated sediment that is 300 mm or greater in depth shall be carefully removed and disposed of offsite without disturbing the silt fence barrier. Accumulated sediment shall also be removed as necessary to perform maintenance repairs. Accumulated sediment shall be removed immediately prior to removal of the silt fence barrier.

(d) Silt Fence Barrier Removal

(i) Remove silt fences following completion of all site construction activities (including final restoration and cleanup) and after installation of all permanent erosion control measures and satisfactory establishment of permanent vegetation.

(ii) Restore areas disturbed, without releasing any deleterious substances to the adjacent watercourse.

(e) Complying with Environmental Protection Requirements

(i) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Truro Creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D33, "Environmental Protection Plan" and E11, "Creek Flow Maintenance".

E14.8 Quality Control

(a) Inspection

(i) 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.

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

E14.9 Measurement and Payment

(a) Silt Fence Barrier

(i) Supplying, installing, maintaining, and removing silt fence barrier shall be measured on a length basis and shall be paid for at the Contract Unit Price for "Supply and Install Silt Fence Barrier", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The length to be paid for shall be the total lineal metres of silt fence barrier supplied, installed, maintained, and removed in accordance with this Specification, and as accepted by the Contract Administrator.

(ii) Payment for silt fence barrier shall be based on the following breakdown:

(i) Following supply and installation: 60%

(ii) Following final removal: 40%

(iii) Removal of accumulated sediment from the silt fence shall be considered incidental to the Work and no separate measurement or payment shall be made.

(iv) Temporary removal and reinstallation of the silt fence to facilitate other project activities such as revegetation shall be considered incidental to the Work and no separate measurement or payment shall be made.

E15. EROSION CONTROL BLANKET (ECB)

E15.1 Description

(a) This Specification shall cover the supply, installation, and maintenance of erosion control blanket (ECB), as herein specified.

(b) The Contractor shall coordinate silt fencing activities with the referenced specifications noted in E1 and E14, "Silt Fence Barrier".

(c) 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 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) ASTM D1117 – Standard Guide for Evaluating Nonwoven Fabrics;

(ii) ASTM D1388 – Standard Test Method for Stiffness of Fabrics;

(iii) ASTM D6525 – Standard Test Method for Measuring Nominal Thickness of Rolled Erosion Control Products;

(iv) ASTM 6818 – Standard Test Method for Ultimate Tensile Properties of Rolled Erosion Control Products; and

(v) Erosion Control Technology Council (ECTC) Guidelines.

E15.3 Scope of Work

(a) The Work under this Specification shall include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:

(i) Supplying and installing erosion control blanket on disturbed slopes and channel banks above rip rap limits;

(ii) Supplying and temporarily installing ECB to protect disturbed slopes where sodding and permanent vegetation/restoration is eventually to take place; and

(iii) Complying with all requirements outlined in D33, “Environmental Protection Plan”.

E15.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E15.5 Materials

(a) General

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

(ii) 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.

(b) Handling and Storage of Materials

(i) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

(c) ECB

(i) ECB 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 (http://www.jmdcompany.com/products/N-11%20SC150.pdf), or approved equivalent in accordance with B7 “Substitutes”.

(ii) The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat.

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

(iv) ECB shall have the following properties:

(i) Matrix 70% Straw Fibre (0.19 kg/m^2) and 30% Coconut Fibre (0.08 kg/ m^2);

(ii) Netting top side heavyweight photodegradable with UV additives (1.47 kg/100 m^2);

(iii) Bottom side lightweight photodegradable minimum netting weight (0.73kg/100 m^2); and

(iv) Degradable thread.

(v) Staples used to secure ECB shall be as recommended by the Manufacturer.

E15.6 Equipment

(a) General

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

E15.7 Construction Methods

(a) General

(i) ECB shall be placed on all disturbed and exposed slopes for which revegetation is required.

(ii) Locations of ECB will be confirmed on site with the Contract Administrator.

(b) ECB Installation

(i) The blanket shall be rolled out in the direction of the water flow.

(ii) The upper edges of the blanket on the side slopes and the edges at the terminal ends of the installation shall be placed in a 150 mm x 150 mm trench.

(iii) The upper edges shall be stapled at 1 000 mm intervals and the terminal edges shall be stapled at 300 mm intervals within the trench. The trench shall be then be backfilled and compacted. The side and end seams shall be overlapped edge over edge (shingle style) with an overlap of 150 mm. The side seams shall be stapled at 1000 mm intervals and the end seams shall be stapled at 300 mm intervals.

(iv) At 10 m intervals, the Contractor shall place a double row of staggered staples to secure the blankets. The staples shall be spaced 100 mm apart. The remainder of the blanket shall be stapled at a rate of four staples per m^2. The blanket may have to be trimmed to size to conform to the area to be covered.

(v) Transverse joints and end seams in the ECB shall have a minimum overlap of 150 mm and secured with 200 mm staples a maximum of 300 mm apart.

(vi) Should the Contract Administrator determine that the Contractor has not installed the ECB 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 regrade the areas where sediment removal results in exposed soil. The removal and restoration shall take place within five (5) working days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and restoration must take place within five (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.

(c) Complying with Environmental Protection Requirements

(i) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Sturgeon Creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D33, “Environmental Protection Plan” and E11, “Creek Flow Maintenance”.

(ii) The Contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales, or other measures as required in the event that there is runoff from the site.

(iii) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.

(iv) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

E15.8 Quality Control

(a) Inspection

(i) 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.

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

E15.9 Measurement and Payment

(a) Erosion Control Blanket

(i) Supplying and installing erosion control blanket shall be paid for at the Contract Unit Price per square metre for "Supply and Install Erosion Control Blanket (ECB)", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The area to be paid for shall be the total area of ECB supplied and installed as noted on the Drawings, confirmed by survey, and as measured and accepted by the Contract Administrator.

E16. SOFT EXCAVATION TO EXPOSE UNDERGROUND UTILITIES

E16.1 Description

(a) This Specification covers the soft excavation to expose underground utilities to determine the depth of the underground utility and whether it will interfere with the installation of proposed Works on site.

(b) These underground utilities include, but are not limited to, Manitoba Hydro cables and gas line, telecommunications cables, existing sewers, and existing water mains. Some abandoned utilities are also anticipated to be present within the depth of the excavation required for the culvert works.

(c) The Contractor is responsible for confirming all utility locations prior to commencing work.

E16.2 Materials

(a) Backfill Material

(i) Backfill material for backfill of shafts after hydro-excavation has been completed shall consist of sand as per City of Winnipeg Standard Construction Specification CW 2030.

(b) Void Form

(i) Void form shall be supplied by Void Form International, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E16.3 Construction Methods

(a) Prior to commencement of any construction works adjacent to underground utilities, the Contractor shall use soft digging or hand excavation to expose the underground utilities.

(b) Once the elevation of the top of the pipe or duct has been determined the resulting excavation shall be backfilled with bedding sand to the elevation of the existing ground.

(c) The installation of void form shall be undertaken in accordance with the manufacturer's recommendations and as shown on the Drawings.

E16.4 Measurement and Payment

(a) Soft excavation to expose underground utilities and the supply and installation of void form shall be considered incidental to the Work. No additional measurement or payment shall be made within this section.

(b) Confirmation of utility locations shall be considered incidental to the Work. No additional measurement or payment shall be made within this section.

E17. LAYOUT OF WATER MAIN

E17.1 Description

(a) General

(i) This Specification covers any layout work required for new water main construction and shall amend and supplement Specification CW 2110-R11, latest edition.

(ii) The Contractor shall mark to the extent determined necessary, the location, alignment and elevation of the work by means of stakes, buoys or marks. The Contractor will set control lines and benchmarks by means of stakes, buoys or marks and the Contractor shall make the completed works conform to the lines and marks thus indicated. The Contractor shall furnish all other lines and levels required. The Contractor shall be responsible for the careful preservation of all stakes and marks so set whether relating to his own or to other work. Care must be taken that the Contractor be notified immediately of the disturbance of any such stakes or marks; the cost of correcting any errors arising out of neglect of the Contractor or his agent or his employees, to so notify the Contract Administrator shall be borne entirely by the Contractor.

(iii) All layouts shall be reviewed and approved by the Contract Administrator prior to construction.

(iv) Before commencing Work the Contractor shall satisfy himself as to the meaning and correctness of all stakes and marks and no claims shall be entertained by the City of Winnipeg on account of any alleged inaccuracies. If any error or suspected in the plans, specifications or the directions of the Contract Administrator, Work shall be discontinued until the errors are rectified, but no claims shall be made on account of any delay occasioned thereby.

(v) The Contractor is responsible to determine the location of all underground utilities and obtain clearances prior to construction. Underground structures as shown on the drawings are based on the best information available but no guarantee is given that all existing utilities are shown or that given locations are exact.

E18. EXISTING WATER MAIN REMOVALS

E18.1 Description

(a) General

(i) This Specification covers any removal work required for new water main construction and shall amend and supplement Specification CW 2110-R11, latest edition.

E18.2 Construction Methods

(a) General

(i) Existing water main removals shall be as per the Drawings and as directed by the Contract Administrator.

(ii) All removal work shall be done in a careful, workmanlike manner. The use of equipment which might damage portions of the existing items or materials to be

recommissioned will not be permitted. Recommissioned items shall be placed in safe and secure areas and as may be designated by the Contract Administrator.

(iii) All debris and materials from removals shall be disposed of by the Contractor.

E18.3 Water main Removal

(a) Remove existing water main at locations shown on the Drawings and as directed by the Contract Administrator.

E18.4 Measurement and Payment

(a) Existing Water main Removal

(i) Removal of existing water main will be measured per linear metre and paid for at the Contract Unit Price for "Existing Water main Removal". The amount to be paid for will be the total number of Existing Water main removed in accordance with this specification, accepted and measured by the Contract Administrator.

E19. WATER MAIN INSTALLATION AND CONSTRUCTION

E19.1 Description

(a) General

(i) This Specification covers any work required for new water main construction and shall amend and supplement Specification CW 2110-R11, latest edition.

E19.2 Construction Methods

(a) General

(i) Water main construction shall be as per the Drawings and as directed by the Contract Administrator.

(ii) The Contractor shall furnish all labour, plant and equipment as required for the installation of new water main and appurtenances.

(iii) All work shall be done in a careful, workmanlike manner. The use of equipment which might damage portions of the existing items or materials will not be permitted.

(b) Connection to Existing Water Main

(i) Contractor to connect to existing water main at the locations as shown on the drawings.

(c) Supply and Install New Water Main

(i) Contractor to install new water main to be measured and paid on a per unit basis, as accepted and measured by the Contract Administrator.

(d) Supply and Install Valves and Fittings

(i) Contractor to install valves and fittings at the locations, alignment and elevations as shown on the drawings, and as accepted by the Contract Administrator.

E19.3 Measurement and Payment

(a) Connection to Existing Water Main

(i) Connection to Existing Water Main to be measured and paid on a per unit basis, as accepted and measured by the Contract Administrator.

(b) Supply and Install New Water Main

(i) Supply and Install New Water Main to be measured and paid per linear metre, as accepted and measured by the Contract Administrator.

(c) Supply and Install Valves and Fittings

(i) Supply and Install Valves and Fittings to be measured and paid on a per unit basis, as accepted and measured by the Contract Administrator.

E20. CULVERT DEMOLITION AND REMOVALS

E20.1 Description

(a) Description

(i) This Specification shall cover all operations related to the demolition and removal of the entire existing culvert and previous structural elements as herein specified and as shown on the Drawings.

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

(iii) Scope of Work

(i) The Work under this Specification shall involve the following:

- Removal of all existing components of the existing culverts and previous structural elements as shown on the Drawings;
- All material from the demolished culverts shall be removed from Site by the Contractor in accordance with the Contractor's Environmental Protection Plan; and
- Excavation or any other works beyond the limits shown on the Drawings to facilitate the removals and demolition of the existing culverts and previous structural elements.

E20.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) City of Winnipeg By-Law No. 92/2010 Part 7 – Discharges of Wastewater, and

(ii) CW 3550 – Chain Link and Drift Control Fence.

E20.3 Materials

(a) General

(i) The Contractor shall be responsible for design and construction works related to the demolition and removal of the existing culvert and is subject to the approval of the Contract Administrator.

(ii) 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.

E20.4 Submittals

(a) The Contractor shall prepare a demolition and removals plan. The plan shall include the design and drawings, Sealed by an Engineer Registered in the Province of Manitoba, the sequence and methods to be used to demolish and remove the existing culvert. The demolition plan shall be in strict accordance with the Regulatory Approvals and the Environmental Protection Plan.

(b) The demolition and removals plan shall indicate the sequence, machinery, methods and proposed access to accomplish the demolition of the existing bridge.

(c) The demolition plan shall be submitted a minimum of 10 days prior to the commencement of demolition.

E20.5 Equipment

(a) General

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

E20.6 Construction Methods

(a) General

(i) The Contractor shall prevent movement, settlement, or damage of existing structures to remain, services, paving, trees, landscaping and adjacent grades. The Contractor shall provide bracing, shoring and underpinning as required and shall have this Work certified by a Professional Engineer registered to practice in the Province of Manitoba employed by the Contractor. If the safety of the structure and/or existing structures or services appears to be endangered during structural removal operations, the Contractor shall cease operations and notify the Contract Administrator immediately.

(ii) The Contractor shall provide flagmen, guards, barricades, railings, and necessary warning lights, and whenever necessary, warning signs and lights at the excavations, temporary sidewalks, removals, and/or other construction, to secure the safety of workmen and the public. The safety precautions shall comply with all Provincial Statutes applicable to the Work. The Contractor shall provide all other protective measures as may be required by any law in force in Manitoba and Canada Labour Code.

(iii) The Contractor shall be fully responsible for ensuring the public safety in all areas, and will be held responsible for any loss or damage caused due to neglect by the Contractor or his employees.

(iv) The Contractor close shall not commence any construction operations until such time as all signage and barricades have been installed to the satisfaction of the Contract Administrator.

(v) Traffic and pedestrian control shall conform to the requirements of E7 “Traffic Control and Management”.

(vi) Remove concrete and other removal items with appropriate equipment satisfactory to the Contract Administrator. No demolition products are to find their way into the watercourse. The Contractor shall take all necessary precautions to ensure that material does not fall onto any open roadways or sidewalks during removal operations.

(vii) In no case will the Contractor be permitted to use removal equipment, or other equipment or methods which may cause damage to any remaining structural elements or to any new construction. In the event that any element is damaged, the Contractor shall repair such element at his own expense to the satisfaction of the Contract Administrator.

(viii) The Contractor shall only use methods of concrete removal that will not damage the existing structure to remain or new structures.

(ix) Dispose of all surplus and unsuitable material off site, in accordance with D33 “Environmental Protection Plan”.

(x) Wherever practical, the Contractor shall recycle disposed materials.

(xi) The Contractor shall submit a list of locations of disposal/recycling for all removed materials to the Contract Administrator.

(xii) The Contractor shall promptly haul all removed materials indicated for disposal, off and away from the site. No storage of any materials on site will be allowed without written approval form the Contract Administrator. It shall be the Contractor’s responsibility to find suitable disposal areas away from the site.

(b) Details of Existing Structure

(i) The applicable details and structure dimensions of the existing structures are shown on the Drawings for information only in establishing the methods and limits of Work.

(ii) The information shown has been obtained from existing drawings, measurements and observations of the Site. The accuracy of this information is not guaranteed and the Contractor must verify all information before commencing Work.

(c) Existing Utilities

(i) There are existing buried and overhead utilities in the vicinity of the project work. The Contractor shall contact utility providers prior to commencing construction operations to locate utilities.

(ii) The Contractor is responsible for determining the existence, location and elevation of all utilities and/or structures and is responsible for notifying the appropriate company, department, or person(s) of its intention to carry out its operation.

(iii) The Contractor shall contact all utilities prior to the start of work to arrange for clearances and line locations as construction within the markings provided must be carried out in accordance with the instructions of the affected utilities. The Contractor shall be responsible for the cost of repair to any damage and for any claims due to loss of service caused by construction operations. No compensation will be paid to the Contractor for any delays due to work by utility companies.

(iv) The following utilities have been identified within the limits of Work:

(i) Manitoba Hydro street lights.

(ii) Manitoba Hydro gas line on west side of Winchester Street.

(iii) Manitoba Hydro gas line on west side of Linwood Street.

(iv) City of Winnipeg concrete combined sewer on Winchester Street.

(v) City of Winnipeg PVC combined sewer on Linwood Street.

(vi) City of Winnipeg PVC water main on the east side of Winchester Street.

(vii) City of Winnipeg PVC water main on the east side of Linwood Street.

(d) Complying with Environmental Protection Requirements

(i) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into the creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of D33 “Environmental Protection Plan” and E11 “Creek Flow Maintenance”. Specific sediment and erosion control measures are outlined in E14 “Silt Fence Barrier” and E15 “Erosion Control Blanket (ECB)”.

(ii) The Contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales, or other measures as required in the event that there is runoff from the site.

(iii) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.

(iv) Disturbed areas shall be restored. ECB, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

E20.7 Measurement and Payment

(a) Culvert demolition and removals will not be measured and will be paid for at the Contract Lump Sum Price for “Culvert Demolition and Removals”, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E21. STRUCTURAL BACKFILL

E21.1 Description

(a) This Specification shall cover all operations related to backfill work as herein specified and in the latest version of the City of Winnipeg Standard Construction Specifications CW 2030, CW 3110, CW 3130, CW 3170 and as shown on the Drawings.

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

things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E21.2 References

(a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

(i) CW 2030 – Excavation Bedding and Backfill

(ii) CW 3110 – Subgrade, Sub-Base, and Base Course Construction

(iii) CW 3130 – Supply and Installation of Geotextile Fabrics

(iv) CW 3170 – Earthwork and Grading.

E21.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supply and placing granular base course and sub-base course under the culverts;

(ii) Supply and placing granular base course and sub-base course under the cut-off wall and retaining wall;

(iii) Supply and placing flowable cement stabilized fill around the culverts.

(iv) Supply and placing drainage fill behind the retaining wall.

(v) Supply and placing flowable cement stabilized fill behind the retaining wall.

(vi) Supply and placing granular infill above the culverts.

(vii) Supply and placing compacted base course under the approach slabs.

(viii) Supply and placing common fill for creek works in the vicinity of the culverts, as shown on the Drawings; and

(ix) For backfill placement in freezing conditions, heating of subgrade and backfill prior to placement, and maintaining those materials in an unfrozen state.

E21.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material, including evidence that the specified gradation has been met for granular material and Standard Proctor Density (SPD) and Optimum Moisture Content (OMC) for cohesive (common fill) materials to establish a baseline for field compaction of materials.

E21.5 Equipment

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

E21.6 Materials

(a) Backfill Material

(i) 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.

(ii) All materials shall be approved by the Contract Administrator at least fourteen (14) Days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, at the time of supply to site and placement, do not conform to the Specification detailed herein, or are found to be defective in manufacture, or have become damaged in transit, storage, or handling

operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

(iii) Backfill materials shall be free of frozen lumps and shall be placed and compacted in an unfrozen state. Backfill shall not be placed on frozen subsoil. Heating of the backfill materials and/or subgrade shall be undertaken as required, to maintain the temperature of the material above freezing.

(iv) All granular backfill, including granular base course, granular sub-base course, flowable cement-stabilized fill, compacted granular, and drainage fill shall be clean and free from organic material, meeting the gradation requirements of Table CW 2030.1 in Specification CW 2030 and Table 2160.1 in Specification CW 2160.

(b) Geotextile Fabric

(i) Geotextile fabric placed along the limits or within structural backfill shall be "Separation Geotextile Fabric" supplied in accordance with CW 3130.

(ii) Supply of geotextile fabric for structural backfill shall be considered incidental to Structural Backfill and no separate measurement or payment will be made.

(c) Perforated Drain and Geotextile Filter Sock

(i) The drainage fill shall contain HDPE perforated drains complete with filter socks.

E21.7 Construction Methods

(a) Backfill Material

(i) The Contract Administrator shall be notified at least one (1) working day in advance of any backfilling operations. No backfill shall be placed against any concrete until accepted by the Contract Administrator.

(ii) All backfill material except flowable cement-stabilized fill shall be supplied, placed, and compacted in lifts of 300 mm (maximum) to the minimum percent of Standard Proctor Dry Density specified on the Drawings and City Standards.

(iii) Flowable cement-stabilized fill shall be placed and tested as specified in CW 2160.

(iv) The Contractor shall be required to provide necessary water or equipment during compaction of backfill material to achieve the required densities.

(v) The Standard Proctor Density for granular shall be determined at the optimum moisture content in accordance with ASTM Standard D698 (latest revision).

(vi) The field density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard, Test for Density of Soil in Place by the Sand-Cone Method, or equivalent as accepted by the Contract Administrator.

(vii) The frequency and number of tests to be made shall be as determined by the Contract Administrator.

(b) Heating for Backfill

(i) In locations of frozen subgrade, the Contractor shall preheat the subgrade prior to placement of granular backfill such that a minimum of 300 mm of unfrozen subgrade material is present during placement and compaction of backfill.

(ii) The Contractor shall pre-heat all backfill such that it is placed and compacted in an unfrozen state.

(iii) For subsequent lifts of backfill, the previous lift(s) will be considered the subgrade, and the requirements for unfrozen subgrade shall apply.

(iv) Heating for Backfill and/or Subgrade shall be considered incidental to Structural Backfill.

(c) Installing Geotextile Fabric

(i) Geotextile fabric shall be installed in accordance with CW 3130, and as shown on the Drawings.

(ii) Installation of geotextile fabric for structural backfill shall be considered incidental to Structural Backfill and no separate measurement or payment will be made.

E21.8 Quality Control

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

(ii) The Contract Administrator shall be afforded full access for the inspection and control testing of constituent materials both at the Site of the Work and at any plant used for production of the materials to determine whether the material is being supplied and placed in accordance with this Specification.

(iii) Any backfill material that does not meet the gradation and/or compaction requirements of this Specification shall be removed and replaced by the Contractor at his own expense, to the satisfaction of the Contract Administrator.

E21.9 Measurement and Payment

(a) The backfilling required around the culverts, behind cast-in-place concrete culvert head walls and retaining walls, under the culvert, head walls, and retaining walls, and common clay fill for creek works as shown on the Drawings will not be measured and will be paid for at the Contract Lump Sum Price for the "Structural Backfill - Items of Work" listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

(b) Native soil compaction of the subgrade below and around the reinforced concrete box culvert, head walls, and retaining wall, as indicated on the Drawings, shall be considered incidental to Structural Backfill.

(c) The HDPE perforated drains and geotextile filter socks shall be considered incidental to Structural Backfill.

(d) Items of Work:

(i) Flowable Cement-Stabilized Fill;

(ii) Drainage Fill & HDPE Perforated Drain;

(iii) Clay Fill;

(iv) Granular Base Course Material (includes compacted granular under infill slabs);

(v) Granular Sub-Base Course Material.

E22. SUPPLYING AND PLACING REINFORCING STEEL

E22.1 Description

(a) This Specification shall cover all operations relating to the supply, fabrication, delivery, and placement of black steel reinforcing, and associated bar accessories, as specified herein and as shown on the Drawings.

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

E22.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;

(ii) ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete;

(iii) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;

(iv) CAN/CSA G30.18 – Billet-Steel Bars for Concrete Reinforcement; and

(v) (vii) Reinforcing Steel Institute of Canada (RSIC) – Reinforcement Steel Manual of Standard Practice.

E22.3 Scope of Work

The Work under this Specification shall involve supplying and installing all reinforcing, as shown on the Drawings.

E22.4 Submittals

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

(b) The Contractor submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the Shop Drawings including bar lists, and the mill certificates for black steel reinforcing.

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

E22.5 Materials

(a) General

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

(ii) 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.

(b) Handling and Storage of Materials

(i) 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 and all subsequent revisions of CAN/CSA-A23.1, “Storage of Materials”, except as otherwise specified herein.

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

(iii) The Contractor shall handle and store the reinforcing steel in a manner that ensures it is not damaged or contaminated with dirt or other materials.

(iv) The reinforcing steel shall not be placed directly on the ground. Timber pallets shall be placed under the reinforcing steel to keep them free from dirt and mud and to provide easy handling.

(c) Reinforcing Steel

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

(ii) Reinforcing steel for the culverts, head walls, wing walls, retaining wall, barriers, sidewalks, and approach slabs as shown on the Drawings and shall conform to the requirements of CAN/CSA G30.18, Grade 400W.

(iii) Reinforcing deformations shall conform to the requirements of ASTM A615M. All hooks and bends shall be bent using pin diameters and dimensions recommended by RSIC.

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

No additional costs will be applied to this Contract for the replacement of deficient reinforcing steel.

(v) All reinforcing steel shall be straight and free from paint, oil, millscale, and injurious defects. Rust, surface seams, or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross sectional area, and tensile properties of a hand-wire-brushed specimen are not less than the requirements of CSA Standard CAN/CSA G30.18-M92.

(d) Bar Accessories

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

(ii) Bar chairs, bolsters, and bar supports shall be cementitious material as acceptable to the Contract Administrator. Plastic, PVC or galvanized bar chairs may be permitted if accepted in writing by the Contract Administrator prior to installation.

(iii) The use of pebbles, pieces of broken stone or brick, plastic, metal pipe, and wooden blocks, will not be permitted.

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

(v) Tie wire shall be black, soft-annealed 1.6 mm diameter wire or Nylon coated wire.

(vi) Approved products are as supplied by Con Sys Inc., Box 341, Pinawa, Manitoba, Canada R0E 1L0 (204) 753-2404, or equal as accepted by the Contract Administrator in accordance with B7, “Substitutes”.

(vii) Bar accessories are not included in the Drawings and shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices and are to be acceptable to the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E22.6 Equipment

(a) General

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

E22.7 Construction Methods

(a) Fabrication of Reinforcing Steel

(i) All reinforcing steel shall be fabricated in accordance with the latest edition of CAN/CSA G30.18M and the Reinforcement Steel Manual of Standard Practice by the RSIC, to the lengths and shapes as shown on the Drawings.

(ii) Black steel reinforcing shall be bent to the proper shape in a plant that has suitable devices for bending as recommended in Reinforcing Steel Institute of Canada (RSIC) Manual of Standard Practice.

(iii) Black steel reinforcement bars shall be bent at temperatures between 10°C and 100°C.

(iv) Heating shall not be used as an aid in bending of low carbon chromium steel reinforcing. The equipment used in the plant shall not cause any surface contamination or damage to the surface of the bars. Bar cutting shall be done by shearing or with a water-cooled saw. Torch cutting shall not be permitted.

(b) Placing of Reinforcing Steel

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

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

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

(iv) Place reinforcing bars to provide a clear space between the reinforcing bars as shown on the Drawings to accurately place preformed holes where necessary.

(v) Reinforcing steel shall not be straightened or re-bent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used.

(vi) Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator.

(vii) The Contractor shall supply and place all necessary support accessories to ensure proper placement of reinforcing steel. All reinforcement shall be accurately placed in the positions shown on the Drawings, and firmly tied and chaired before placing the concrete.

(viii) Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Spacers and supports for holding reinforcing steel at the required location and ensuring the specified concrete cover over the reinforcing steel shall be as specified in E22.5(d) “Bar Accessories”.

(ix) Welding or tack welding is not permitted.

(x) Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.

(xi) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections may be tied.

(xii) A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to the placing of any concrete to allow for inspection of the reinforcement.

(c) Splicing

(i) General

(i) Splices shall only be provided as shown on the Drawings. Splices other than as shown on the Drawings will not be permitted without the written approval of the Contract Administrator.

(ii) For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths shall be supplied as detailed on the Drawings. If this information is not detailed on the Drawings, a minimum of forty-five (45) bar diameters lap length shall be provided.

E22.8 Quality Control

(a) Inspection

(i) 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.

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

(iii) After all reinforcing steel has been placed; a final inspection shall be made prior to the placement of concrete to locate any damage or deficiencies. All visible damage or any deficiencies shall be repaired to the satisfaction of the Contract Administrator before concrete is placed.

(b) Access

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

E22.9 Quality Assurance

(a) Testing

(i) Quality Assurance testing shall be used to determine the acceptability of the reinforcing steel supplied by the Contractor.

(ii) The Contractor shall provide, without charge, the samples of reinforcing steel required for Quality Assurance Tests and provide such assistance and use of tools and construction equipment as is required.

E22.10 Measurement and Payment

(a) Supply and placing reinforcing steel shall be measured on a mass basis and shall be paid for at the Contract Unit Price per kilogram for “Supply and Place Reinforcing Steel” which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification, Drawings, and accepted and measured by the Contract Administrator.

E23. STRUCTURAL CONCRETE

E23.1 Description

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

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

E23.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) ACI 309 – Guide for Consolidation of Concrete;

(ii) ACI 347 – Guide to Formwork for Concrete;

(iii) American Concrete Publication SP4 – Formwork for Concrete;

(iv) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;

(v) ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;

(vi) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;

(vii) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;

(viii) ASTM C457 – Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete;

(ix) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;

(x) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;

(xi) ASTM C1202 – Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration;

(xii) ASTM C1399 – Standard Test Method for Obtaining Average Residual-Strength of Fibre-Reinforced Concrete;

(xiii) ASTM C1609 – Standard Test Method for Flexural Performance of Fibre-Reinforced Concrete (Using Beam with Third Point Loading);

(xiv) ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types);

(xv) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;

(xvi) CAN/CSA A3001 – Cementitious Materials for Use in Concrete;

(xvii) CAN/CSA G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;

(xviii) CAN/CSA G164-M92 – Hot Dip Galvanizing of Irregularly Shaped Articles;

(xix) CAN/CSA O121 – Douglas Fir Plywood;

(xx) CAN/CSA-S6 – Canadian Highway Bridge Design Code;

(xxi) CAN/CSA S269.1 – False Work for Construction Purposes;

(xxii) CAN/CSA S269.3 – Concrete Formwork;

(xxiii) ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers, and Polymer Overlays;

(xxiv) Ministry of Transportation Ontario MTO Lab Test Method LS 609 – Petrographic Analysis of Coarse Aggregate; and

(xxv) Ontario Provincial Standard Specification OPSS 1010 – Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material.

E23.3 Scope of Work

(a) The Work under this Specification involves the construction of cast-in-place concrete box culvert structures comprising of the following structural concrete Works:

(i) Cut-Off Walls;

(ii) Culvert Floor Slabs, Walls, and Roof Slabs;

(iii) Head Walls;

(iv) Wing Walls;

(v) Retaining Walls;

(vi) Strong Backs and Tie Back Slabs;

(vii) Barriers and Transition Barriers;

(viii) Approach Slabs;

(ix) Infill Slabs.

E23.4 Submittals

(a) General

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

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

(b) Concrete Mix Design Requirements

(i) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall

contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump) methods are to be used, the method of placement must include a clear description of the pumping methods (line, vertical drop, length of hose, etc.).

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

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

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

(iii) Aggregate source location(s);

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

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

(vi) The limits for slump;

(vii) The limits for air content; and

(viii) Quantity of other admixtures.

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

(iv) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the Contract Administrator, shall be in accordance with the requirements of the CAN/CSA A23.1 Clause 4.3.2.3.2.

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

(c) Concrete Mix Design Test Data

(i) Concrete

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

(ii) Testing for air void system shall be completed in accordance with E23.8(e)(iii).

(iii) Testing for rapid chloride permeability shall be completed in accordance with E23.8(e)(iv).

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

(ii) Aggregates

(i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled

commencement of concrete placement, the location of the sources where aggregate will be obtained in order that some may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract shall not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

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

(iii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on tests for organic impurities in fine aggregates for concrete, in accordance with CSA Standard Test Method A23.27A.

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

(v) The Contractor shall submit to the Contract Administrator for review and approval recent test information on petrographic examination of aggregates for concrete, in accordance with CSA Standard Test Methods A23.2-15A. The purpose of the petrographic analysis is to ensure the aggregates provided are of the highest quality for use in the production of concrete and will produce a durable overlay. An acceptable aggregate will have an excellent rating as judged by an experienced petrographer, with a (weighted) petrographic number typically in the range of 100 to 120.

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

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

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

(d) Notification of Ready Mix Supplier

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

(e) Temporary False Work, Formwork and Shoring Works

(i) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, detailed design calculations and Shop Drawings for any temporary Works, including false work, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.

(ii) Design Requirements

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

(ii) The false work, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. False work shall be designed according to the requirements of the requirements of the CAN/CSA

S269.1. The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.

(iii) The false work, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with the requirements of CAN/CSA S269.3. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval. Drilling into the precast concrete girders will not be accepted. Any inserts to remain the structure must be non-rusting and not dissimilar to metals within the structural element.

(iv) The loads and lateral pressures outlined in Part 3, Section 102 of ACI 347 and wind loads as specified by the Manitoba 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

(f) Temperature Management Plan

(i) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to scheduled commencement of concrete placement, a Temperature Management Plan for all mass concrete prior to commencement of any placing concrete.

(i) Mass concrete is defined as all structural concrete with a minimum thickness or dimension of 1.0 m or more.

(ii) The Temperature Management Plan shall include methods to control peak temperature and excessive temperature differentials, equipment used to monitor temperatures, corrective actions if readings are in non-conformance with the requirements of CAN/CSA A23.1, and reporting. At a minimum, the plan must include the following:

- A minimum of two groups of thermal monitors (thermocouples) shall be provided for each mass concrete component. More groups may be required based on shape of component, hoarding conditions, etc. With reference to the longest dimension of the component, one group shall be placed in the middle of the structure and the other near the edge. Generally each grouping will consist of a sensor in the core, edge of reinforcing, and exterior face of concrete (i.e. interior face of formwork). The core shall be defined as no less than 1.5 m into the component, or the middle if that dimension is less than 3.0 m;
- Unformed surfaces that will receive wet curing are typically covered with tarps or other insulating blankets. The surface temperature under the wet curing system shall also be taken;
- Ambient air temperatures shall be taken for each component. For components that are hoarded, the temperatures shall be taken inside the hoarding. External ambient air temperatures shall be taken for reference as well;
- Using the temperatures from the thermal monitors, surface temperatures, and ambient air temperatures, the temperature differentials of each grouping shall be provided for two directions of monitoring; core to formed concrete face (side), and core to unformed concrete face (top);
- The frequency of monitoring after final placement of concrete for each mass concrete component shall be as follows:
  - 0-48 hours: once every hour;
  - 48 hours to end of wet curing period (7 days): once every four hours; and,
  - In winter conditions: once every 12 hours until core temperature reaches 0°C.
  - It is recommended to use digital monitoring devices and standard spreadsheets for their ease of tracking. Upon completion of monitoring for each component, the information shall be saved and distributed to the Contract Administrator.

(ii) Peak concrete temperature and thermal differentials shall be maintained in accordance with CAN/CSA A23.1. The effect of mass concrete both in terms of cold weather and hot weather concreting should be addressed.

(iii) The Temperature Management Plan shall be prepared in accordance with the requirements of CAN/CSA A23.1 and shall include provisions for monitoring the temperature of the mass concrete pours and ambient temperature from time of placement until such time as management measures are no longer required.

E23.5 Materials

(a) General

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

(ii) 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.

(b) Handling and Storage of Materials

(i) 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 and all subsequent revisions of CAN/CSA-A23.1.

(c) Concrete

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

(i) Concrete shall have nominal compressive strengths (f'c) and meet the requirements for hardened concrete as specified in the following Table 23.1.

TABLE 23.1
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Cement Type
Type 1	Culverts, Head Walls, and Tie Back Slabs Below Top of Wall Construction Joint; Strong Backs; Wing Walls; Cut-Off Walls	35 @ 28 days	S-1	2	20 mm	HS
Type 2	Approach Slabs; Sidewalks; Barriers; Infill Slabs; Culverts, Headwalls and Tie Back Slabs Above Top of Wall Construction Joint	35 @ 28 days	C-1	1	20 mm	GU

(d) Working Base Concrete

(i) Working base concrete shall be placed in the locations as shown on the Drawings.

(ii) Working base shall be concrete meeting the requirements of the latest edition and all subsequent revisions of CAN/CSA A23.1, for Class S-1 exposure, except as follows:

(i) 20 MPa at 28 days.

(iii) Supplying and placing working base concrete shall be considered incidental to the Work and no separate payment will be made.

(e) Aggregates

(i) General

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

(ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA Standard Test Method A23.2-27A. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA Standard Test Method A23.2-1 4A or CSA A23.2-25A is required.

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

(ii) Fine Aggregate

(i) Fine aggregate shall meet the grading requirements of CAN/CSA A23.1, Table 10, FA1, be graded uniformly and not more than 3% shall pass a 75 um sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.

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

(iii) Coarse Aggregate - Standard

(i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CAN/CSA A23.1, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 um sieve Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.

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

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

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

(f) Admixtures

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

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

(iii) 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.

(g) Cementitious Materials

(i) Cementitious materials shall conform to the requirements of CAN/CSA A3001 and shall be free from lumps.

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

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

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

(h) Water

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

(i) Corrosion Inhibitor

(i) Corrosion inhibitor shall be MCI 2005 NS (https://www.cortecvci.com/Publications/PDS/MCI-2005%20NS.pdf) at a dosage of 1 L/m^3, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(j) Formwork

(i) Formwork materials shall conform to CAN/CSA A23.1, and American Concrete Publication SP4, “Formwork for Concrete.”

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

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

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

(v) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a nonrusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

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

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

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

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

(k) Form Coating

(i) Form coating shall be "SCP Strip Ease" by Specialty Construction Products Ltd. with product specification available in Appendix F, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(l) Permeable Formwork Liner

(i) Formwork liner shall be "Texel Drainaform" by Texel (http://texel.ca/fileadmin/medias/documents/en/geosynthetics/specifications-sheets/geotextiles/geot_drainaform_en_02.pdf), or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes". This formwork liner shall be used on all exposed formed surfaces.

(m) Curing Compound

(i) Curing compound shall conform to the requirements of ASTM C309, either Type D with fugitive dye or Type 2.

(ii) Type 2 shall only be used on surfaces that will not be exposed to view.

(iii) An approved product is "WR Meadows 1215 WHITE Pigmented Curing Compound" (https://www.wrmeadows.com/data/c3300-135.pdf), or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

(n) Curing Blankets

(i) Curing blankets for wet curing shall be 100 percent polyester, 3 mm thick, white in colour. An approved product is "TenCate Mirafi Geotextile" by TenCate (http://www.tencate.com/amer/geosynthetics/products/geotextiles/default.aspx), or equal in accordance with B7, "Substitutes". Alternately, a 10 oz burlap, 5 mil polyethylene, curing blanket white in colour shall be used; "Curelap 10" by Midwest Canvas Corp. (http://www.midwestcanvas.com/), together with a second layer of burlap, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

(o) Bonding Agents

(i) Latex Bonding Agent

(i) Latex bonding agent shall be "Acrl-Stix" by Specialty Construction Products Ltd. with product specification available in Appendix G, "Sikacem 810" by Sika (http://can.sika.com/en/solutions-and-products/document-download/Sikacem_PDS_Alpha.html), or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes". Polyvinyl acetate-based latexes will not be permitted. "Planicrete AC" by MAPEI (http://www.bondedmaterials.net/assets/data/mapei_planicrete_ac.pdf) is approved for use as a latex bonding agent on concrete greater than 28 days in age, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

(ii) Bonding Grout

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

- 1 part water;
- 1 part latex bonding agent; and
- 1 ½ parts Type GUSF Portland cement.

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

(p) Epoxy Adhesive

(i) Epoxy adhesive for bonding concrete to steel shall be one of the following approved products: "Dural Duralbond," by Euclid (http://www.euclidchemical.com/fileshare/ProductFiles/techdata/duralbond.pdf), "Sikadur 32 Hi-Mod" by Sika (http://can.sika.com/en/solutions-and-products/document-download/Sikadur_PDS_Alpha.html), "Rezi-Weld 1000" by W.R. Meadows (https://www.wrmeadows.com/data/390.pdf) or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

(q) Epoxy Grout

(i) Epoxy grout shall be one of the following approved products: “Sikadur 42” by Sika (https://irn.sika.com/dms/getdocument.get/b48b6574-091d-3573-a65f-1ab1cb90d1d4/Sikadur%2042.pdf), “Cipadite E-500 Grout” by Specialty Construction Products Ltd. with product specification available in Appendix H, “Rezi-Weld EG-96 HP” by W.R. Meadows (https://www.wrmeadows.com/eg-96-hp-high-strength-flowable-epoxy-grout/), or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(r) Cementitious Grout

(i) Cementitious grout shall be nonshrink and non-metallic. Approved products are “Sika M-Bed Standard” by Sika Canada (http://can.sika.com/en/solutions-and-products/document-download/Sika_M-Bed_PDS_Alpha1.html), “CPD Non-Shrink Grout” by CPD Construction Products (http://www.cpd.ca/wp-content/uploads/2015/09/Non-Shrink-Grout-Pre-Mix.pdf), “Sika 212 Non-Shrink Grout” by Sika Canada (http://can.sika.com/en/solutions-and-products/construction/grouting/grouting-products/non-metallic-non-shrink-grouting.html), or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

(s) Patching Mortar

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

(t) Flexible Joint Sealant

(i) Flexible joint sealant for all horizontal, vertical, and sloping joints shall be guaranteed non-staining, grey polyurethane, accepted by the Contract Administrator and applied in strict accordance with the details shown on the Drawings and the Manufacturer's instructions including appropriate primers if recommended. Approved products are “Vulkem 116” by Tremco (http://www.tremcosealants.com/fileshare/DataSheets_Hyland/Vulkem_116_DS.pdf), “MasterSeal NP-1” by BASF (http://www.bondedmaterials.net/assets/data/basf_np1.pdf), “Sikaflex 1a” by Sika Canada (http://can.sika.com/en/solutions-and-products/document-download/Joint_Sealant_CC.html), “Bostik 915” by Bostik (http://bostik-sealants.com/product/bonding-roof-tiles/915), or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(u) Fibre Joint Filler

(i) Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre such as “Flexcell” by Fosroc (http://www.talenta.co.id/PDS/FOSROC/(PDS)_Flexcell.pdf), and shall conform to the requirements of ASTM D1751 or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(v) Precompressed Foam Joint Filler

(i) Precompressed foam joint filler shall be “Emseal BEJS System” (https://www.emseal.com/bridge-expansion-joint-division/product/bejs-bridge-expansion-joint-system/) or “Emseal Submerseal” (https://cdn.emseal.com/wp-content/uploads/2016/06/submerseal-tech-data-joint-seal-pool-fountain-water-treatment-plant-expansion-joint-emseal.pdf) where shown on the drawings, satisfying the requirements of ASTM C711 and G155, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(ii) Precompressed foam joint filler shall be used around roadway approach slabs and approach sidewalk slabs, and shall be used also between barrier joints.

(iii) The sealant system shall be comprise of three components:

(i) Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water-based emulsion, factory coated and highway-grade, fuel resistant silicone;

(ii) Field-applied epoxy adhesive primer; and

(iii) Field-injected silicone sealant bands.

(iv) Impregnation agent shall have proven non-migratory characteristics. Silicone coating shall be highway grade, low-modulus, fuel resistant silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a bellows. The depth of seal shall be as recommended by the Manufacturer.

(v) Material shall be capable, as a dual seal, of movements of +50% to -50% (100% total) of nominal material size. Changes in plan and direction shall be executed using factory fabricated transition assemblies. Transitions shall be watertight at the inside and outside corners through the full movement capabilities of the product.

(i) All substitute candidates shall be free in composition of any waxes or asphalts, wax compounds or asphalt compounds. All substitute candidates shall be:

- Capable of withstanding 65°C for three (3) hours while compressed down to the minimum movement capability (-50% nominal material size) without evidence of any bleeding of impregnation medium from the materials; and
- Capable of self-expanding to the maximum movement capability (+50% nominal material size) within twenty-four (24) hours at 20°C.

(w) Ethafoam Joint Filler

(i) Ethafoam joint filler shall be non-staining, polyethylene, closed-cell product for expansion and contraction and/or isolation joint application.

(x) Low Density Styrofoam

(i) Low density Styrofoam shall be the type accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(y) Backup Rod

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

(z) Void Form

(i) Void form shall be supplied by Void Form International (https://www.nca.ca/manufacturer/voidform-international), or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”.

(aa) Culvert and Retaining Wall Drainage System

(i) The drain pipes shall be 150 mm PVC drain pipe complete with filter sock and screens for the outlet ends, perforated on all sides.

(ii) The filter fabric shall be A Class II non-woven geotextile, as approved by the Contract Administrator.

(iii) The subsurface drainage fill shall be a coarse granular free draining material consisting of either gravel or crushed limestone aggregate conforming to the following gradation requirements:

TABLE 23.2
REQUIREMENTS FOR SUBSURFACE DRAINAGE

Sieve Size	% Passing Standard Sieve
40 mm	95-100
20 mm	35-70
10 mm	10-30
5 mm	0-5

(bb) Dampproofing

(i) Dampproofing materials shall be applied to all buried concrete surfaces in contact with the soil to within 300 mm of Finished Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Dampproofing materials shall be mineral colloid emulsified asphalt complying with Canadian General Standards Board Specification No. 37.16-M89. Acceptable product is "Henry/Bakor 710-11 Dampproofing and Waterproofing Asphalt Coating" as manufactured by Henry (https://www.nca.ca/manufacturer/voidform-international), "505 Sealmastic (Canada) Fibrated Foundation Coating" by W.R. Meadows (https://www.wrmeadows.com/data/505.pdf), "7103 Fibered Waterproofing" by Insulmastic (http://www.insulmastic.com/images/uploads/7103Lpds.pdf), or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

(ii) All damaged concrete, including tie holes to be filled with non-shrink grout prior to application of dampproofing.

(iii) Primer for dampproofing shall be asphalt primer, penetrating type conforming to CGSB 37-GP-9Ma. Acceptable products are " 910-01 Penetrating Asphalt Primer" by Henry/Bakor (http://ca.henry.com/fileadmin/pdf/current/tds/BK91001_techdata.pdf), "7501 C/B Roof & Foundation Primer" by Insulamatic (http://www.insulmastic.com/images/uploads/7501Lpds.pdf), or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

(cc) Anchor Units for Barrier Aluminum Top Rail

(i) Anchor units for the aluminum top rail shall be stainless steel Acrow-Richmond Type (https://www.nca.ca/manufacturer/acrow-richmond), or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

(dd) Galvanized Steel Dowels and Expansion Sleeves for Transition Barrier Expansion Assembly

(i) Dowels and expansion sleeves shall be fabricated in accordance with CAN/CSA G40.21, Grade 300W.

(ii) The dowels shall be galvanized in accordance with CAN/CSA G164-M92, to a minimum net retention of 610 g/m^2.

(iii) Field-applied galvanizing, to touch-up damaged hot-dip galvanizing, metallizing, or field welds, shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780.

(iv) Approved products are:

(i) "Gal-Viz Galvanizing Solder" by Harris (http://www.harrisproductsgroup.com/en/Products/Alloys/Soldering/Lead-Bearing-Solders/Gal-Viz.aspx), or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes". The referenced product is available locally from Welder Supplies Limited, 150 McPhillips Street, Winnipeg.

(ee) Miscellaneous Materials

(i) Miscellaneous materials shall be of the type specified on the Drawings or as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E23.6 Equipment

(a) General

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

(b) Vibrators

(i) 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.

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

(c) Placing and Finishing Concrete for Culverts, Head walls, Wing walls, Retaining Wall, Tie Back Slabs, Strong Backs, and Barriers

(i) Adjacent exposed reinforcing steel shall be adequately protected during concrete placement.

E23.7 Construction Methods

(a) General

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

(b) Temporary False Work, Formwork, and Shoring

(i) Construction Requirements

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(v) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 30 mm in diameter. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in colour to match the surrounding concrete.

(vi) 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.

(vii) It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and his decision shall be final regarding the use of them again.

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

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

(c) Concrete Construction Joints

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

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

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

(iv) Refer to, E23.7(l) “Preparation for Concreting Against Hardened Concrete”, for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

(d) Permeable Formwork Liner

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

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

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

(e) Bridge Traffic Barrier Joints

(i) Finishing of Concrete Barrier Joints

(i) Finishing of concrete barrier joints shall be completed prior to application of any waterproofing membrane and asphalt overlay.

(ii) The installation of the precompressed foam joint filler and fibre joint filler shall be undertaken as shown on the Drawings.

(iii) Furnish fibre joint filler for each joint in a single piece for the required depth and width for each joint, unless otherwise approved by the Contract Administrator. If permitted, multiple pieces shall be fastened together for a given joint by butting

ends and securing in place by stapling or other positive fastening methods. Polyethylene bond breaker tap shall be installed between joint fillers and sealants.

(iv) The precompressed foam joint filler shall be installed at barrier joints in accordance with the Manufacturer's recommended methods to fully seal the joint.

(v) The supply and installation of all materials required for the barrier joints shall be considered incidental to the Work, and no additional measurement or payment shall be made for this work.

(f) Anchor Units for Aluminum Pedestrian Handrail/Bicycle Rail

(i) All anchor units shall be installed as shown on the Drawings.

(ii) All anchor units shall be held securely in place so as not to become displaced during concrete placement operations.

(iii) The Contractor shall coordinate the installation of barrier aluminum top rail posts as described in E27, "Culvert Barrier Aluminum Top Rail".

(g) Galvanized Steel Dowels and Expansion Sleeves for the Bridge Traffic Barrier Expansion Joint Assembly

(i) All galvanized steel dowels and expansion sleeves shall be installed as shown on the Drawings.

(ii) A Barrier Expansion Joint Assembly consists of two galvanized plain steel dowels and two galvanized expansion sleeves.

(iii) Each galvanized steel dowel and expansion sleeve shall be held in place securely by a wooden template during concrete placement operations.

(iv) Expansion assemblies shall be installed in a sequential fashion into the concrete barrier panel cast first.

(h) Control Joint Seals

(i) Formed control joint sealant for all horizontal, vertical, and sloping joints shall be completed in strict accordance with the details shown on the Drawings and in accordance with the Manufacturers recommended methods.

(i) Culvert , Head Wall, Wing Wall, and Retaining Wall Drainage

(i) Drainage details shall be installed as shown on the Drawings.

(ii) The installation of culvert, head wall, wing wall, and retaining wall drainage shall be considered incidental to culvert works.

(j) Application of Dampproofing

(i) Brush or spray primer on all surfaces, brushing into all corners. Apply two (2) coats of dampproofing allowing the first coat to dry before applying the second coat. Minimum application rate per coat shall be 0.6 L/m^2.

(ii) Following completion of the curing period, concrete surfaces shall dry for three days prior to application of dampproofing.

(iii) After application of the second coat, dampproofed areas shall be allowed to dry a minimum of forty-eight (48) hours prior to backfilling.

(iv) The application of dampproofing shall be considered incidental to culvert works.

(k) Supply of Structural Concrete

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

(ii) All mixing of concrete must meet the provisions of CAN/CSA A23.1, Clause 5.2, Production of Concrete.

(iii) Time of Hauling

(i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed

120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.

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

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

(iv) Unless otherwise noted in Table 23.1, “Requirements for Hardened Concrete”, no retarders shall be used.

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

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

(iv) Delivery of Concrete

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

(v) Concrete Placement Schedule

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

- Limit the amount to be placed at any time (using adequate construction joints);
- Augment his facilities and Plant in order to complete the proposed placement;
- In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting; and

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

(l) Preparation for Concreting Against Hardened Concrete

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

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

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

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

(iv) For the Bridge traffic and median barriers, during concreting of the deck slab, the top surface of the concrete shall be roughened using a small rake running longitudinally between barrier dowels.

(m) Placing Structural Concrete

(i) General

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

(ii) Placing Structural Concrete

(i) 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. All equipment and processes are subject to acceptance by the Contract Administrator.

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

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

(iv) 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.

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

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

(vii) When the Contractor chooses to pump the concrete, the operation of the pump shall produce a continuous flow of concrete without air pockets. The equipment shall be arranged such that vibration is not transmitted to freshly placed concrete that may damage the concrete. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

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

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

(x) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms,

eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute immersed.

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

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

(n) Finishing of Concrete Surfaces

(i) Finishing Operations for Unformed Surfaces

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

(ii) Type 1 Finish – Exposed Formed Surfaces

(i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, finishes, but excluding soffit surfaces where an architectural form finish is specified.

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

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

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

(iii) Type 2 Finish – Unformed Surfaces

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

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

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

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

(iv) Type 3 Finish - Surfaces Below Finished Grade

(i) All surfaces below 300 mm below finished grade except underside of structural concrete shall be patched in accordance with the requirements of Sections E23.5(s) “Patching Mortar”, E23.5(o) “Bonding Agents”, and E23.7(q) “Patching of Formed Surfaces” of this Specification.

(v) Working Base Concrete Finish

(i) During placing, concrete working base shall be vibrated, screeded and floated.

(ii) The supply, set up, operation, and finishing of working base concrete shall be considered incidental to the placement of working base concrete, and no separate measurement or payment shall be made for this Work.

(o) General Curing Requirements

(i) Refer to E23.7(r) “Cold Weather Concreting” for cold weather curing requirements and E23.7(s) “Hot Weather Concreting” of this Specification for hot weather curing requirements.

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

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

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

(v) All concrete shall be cured for a period of seven (7) days. Freshly finished concrete shall have either a curing compound applied, or shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only. Water shall be applied as necessary to keep the concrete and curing blankets saturated. The Contractor must ensure the concrete and curing blankets are kept saturated with water for the entire seven (7) days.

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

(vii) For curing of barriers, formwork shall remain in place for six (6) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe.

(viii) The sidewalk slabs shall be moist cured in accordance with E23.7(o)(v).

(ix) Curing compound shall be applied at the rate specified by the Manufacturer for the accepted product. The compound must be applied uniformly and by roller.

(x) Where curing compound is permitted, and following the completion of finishing operations, the surface shall be sprayed with an initial coating of curing compound, in accordance with the Manufacturer’s recommended methods. As soon as initial set has occurred, the surface shall receive a second roller-applied application of curing compound, to the satisfaction of the Contract Administrator.

(xi) Minimum curing periods as required by the Manufacturer shall be met prior to application of waterproofing membrane or damp-proofing. Many suppliers require a minimum curing of twenty-eight (28) days prior to application of the waterproofing membrane and should be considered during the scheduling of the Contractor’s work activities.

(p) Form Removal

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

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

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

(q) Patching of Formed Surfaces

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

(ii) Any repair or surface finishing started before this inspection may be rejected and required to be removed.

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

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

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

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

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

(r) Cold Weather Concreting

(i) The requirements of CAN/CSA A23.1 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.

(s) Hot Weather Concreting

(i) General

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

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

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

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

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

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

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

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

(ii) Hot-Weather Curing

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

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

(iii) Job Preparation

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

(iv) Concrete Temperature

(i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table E23.3, “Acceptable Concrete Temperatures”, for the indicated size of the concrete section.

TABLE 23.3
ACCEPTABLE CONCRETE TEMPERATURES

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

(t) Cleanup

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

E23.8 Concrete Quality

(a) Inspection

(i) 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.

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

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

(b) Access

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

(c) Materials

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

(ii) All materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.1.

(iii) All testing of materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.2.

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

(d) Quality Assurance and Quality Control

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

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

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

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

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

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

(e) Concrete Testing

(i) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits in E23.4(b), “Concrete Mix Design Requirements” of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

(ii) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in, E23.4(c), “Concrete Mix Design Test Data” of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

(iii) The air-void system shall be proven satisfactory by data from tests performed in accordance with the latest edition and all subsequent revisions of ASTM Standard Test Method C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C, shall be determined prior to the start of construction on cylinders of concrete made with the

same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.

(iv) Rapid chloride permeability testing shall be performed in accordance with ASTM C1202 or CAN/CSA A23.2-23C, with testing performed at 56 days for all types of concrete.

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

(vi) Compressive strength tests on specimens cured under the same conditions as the concrete Works shall be made to check the strength of the in-place concrete so as to determine if the concrete has reached the minimum allowable working compressive strength as specified in Table 20.1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field cured strength test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

(vii) Should the Contractor propose to introduce loads to the permanent concrete structure prior to the concrete obtaining its specified design strength (e.g. stripping formwork for cast-in-place suspended slabs (dead load), or permitting traffic on a structure (live load), etc., the Contractor shall determine the current concrete strength by a strength test and submit his proposed procedure to the Contract Administrator. The Contractor shall only proceed with the written acceptance of the Contract Administrator.

(f) Corrective Action

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

E23.9 Measurement and Payment

(a) Structural Concrete

(i) Supplying and placing structural concrete shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for “Supply and Place Structural Concrete”, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

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

(iii) The transition barriers are not considered Structural Concrete. The curb to traffic barrier transition including dowels and reinforcing will be paid per linear meter as pay item “Construction of Curb to Traffic Barrier Transition”.

(b) Anchor Units for Culvert Barrier Aluminum Top Rail

(i) Supplying and installing anchor units for the culvert barrier aluminum top rail shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for “Supply and Install Anchor Units for Culvert Barrier Aluminum Top Rail”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.

(c) Concrete Heating and Hoarding

(i) Heating concrete and supplying, setting up, heating, and removing the hoarding will not be measured and will be paid for at the Contract Lump Sum Price for “Concrete Heating and Hoarding”, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E24. BOARD INSULATION

E24.1 Description

(a) This Specification shall cover the supply and installation of board insulation.

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

E24.2 Referenced Specifications

(a) The latest edition and subsequent revisions of the following:

(i) ASTM D1621 – Standard Test Method for Compressive Properties Of Rigid Cellular Plastics;

(ii) CGSB 71 – Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation; and

(iii) CAN/ULC-S701 – Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

E24.3 Submittals

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

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

E24.4 Materials

(a) General

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

(ii) 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.

(b) Handling and Storage of Materials

(i) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

(c) Board Insulation

(i) Board insulation shall be moisture resistant closed cell extruded polystyrene designed for direct burial underground.

(i) Total insulation thickness shall be as specified on the Drawings.

(ii) Minimum compressive strength shall be 275 kPa (40 psi), in accordance with ASTM D1621.

(d) Adhesive for Insulation

(i) Adhesive (for polystyrene insulation): to CGSB 71 GP 24.

(i) Type: One part polyurethane.

(ii) VOC emission: 0

E24.5 Equipment

(a) General

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

E24.6 Construction Methods

(a) Insulation Installation

(i) Supply and install rigid insulation at locations identified on the Drawings or where directed by the Contract Administrator. Construct as noted on the Drawings.

(ii) Prior to installation of insulation boards, ensure that substrates are firm, straight, smooth, dry, free of snow, ice or frost and clean of debris. If necessary, install a levelling layer of sand to surface to achieve a smooth substrate.

(iii) Install installation to completely maintain the continuity of thermal protection.

(iv) Cut and trim insulation to fit all spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

(v) Offset both vertical and horizontal joints in multiple layer applications.

(vi) In concealed spaces, do not cover insulation until it has been observed by the Contract Administrator.

(vii) At joints between rigid insulation boards and at other small voids, fill gaps with closed cell spray foam insulation to achieve a continuous insulated surface.

E24.7 Quality Control

(a) Inspection

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

(ii) 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.

(b) Access

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

E24.8 Measurement and Payment

(a) Board Insulation

(i) Supplying and installing board insulation shall be measured on an area basis based on the surface area in square metres, as noted on the Drawings. Supplying and installing board insulation shall be paid for at the Contract Unit Price per square

metre for the "Items of Work" listed here below, measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

(ii) Items of Work

(i) Board Insulation

- 75 mm thick

E25. PROTECTION OF EXISTING TREES

E25.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities:

(a) All trees will have a 3 m radius protective zone calculated from the circumference at the base of the trunk which will remain free of digging, trenching, grade changes, stock piling of materials and soil compaction, except as minimum to construct berm or swales throughout the duration of the Contract. Protective fencing around these areas is required.

(b) Trees within and immediately adjacent to proposed construction and those identified to be at risk by the Contract Administrator are to be strapped with 25 mm x 100 mm x 2400 mm wood planks, or suitably protected as approved by the Contract Administrator. Do not use nails or other fasteners that penetrate the tree trunk. The width and length of strapping may be reduced to suit the tree being 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) where 1 inch diameter equals 1 foot measured from the outside edge of the trunk of the tree at 6 inches above grade. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation. They must be properly trimmed with sharp tools to prevent crushing or being pulled by construction equipment. No paint is required. All exposed roots must be mulched until the excavated area is filled with clean earth to avoid exposure to sunlight and desiccation.

(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, refuelled; 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.

(f) Repair, replace and maintain tree protection materials during construction until the Project completion.

(g) Carefully remove safety fencing and strapping material without harming the tree as soon as the construction and restoration Work is complete.

(h) Elm trees shall not be pruned at any time between April 1 and July 31.

E25.2 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.

E25.3 Measurement and Payment

(a) Protection of existing trees will considered incidental to E5, "Mobilization and Demobilization." No measurement and payment will be made within this section.

E26. TREE REMOVAL

E26.1 Description

(a) Further to CW 3010 and the City of Winnipeg "Tree Removal Guidelines", this specification shall cover the removal of trees as specified on the Contract Drawings.

E26.2 Construction Methods

(a) Remove trees in accordance with CW 3010.

E26.3 Tree stumps will be ground out to a depth of 150 mm below the normal surface level including all surface roots. Immediately after grinding each stump, the grindings must be removed from the work area. See drawings for tree removal locations.

E26.4 Before commencement of any Work, the Contractor shall consult with the Contract Administrator regarding which trees are designated to be removed. The Contractor shall cut down only trees and shrubs designated for removal.

E26.5 Measurement and Payment

(a) Tree removal will be measured on a unit basis and will be paid for at the Contract Unit Price per unit for "Removal of Existing Trees," which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E27. CULVERT BARRIER ALUMINUM TOP RAIL

E27.1 Description

(a) This Specification shall cover all operations relating to the supply and installation of the culvert barrier aluminum top rail as specified herein and as shown on the Drawings.

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

E27.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(i) ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate;

(ii) ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes;

(iii) ASTM B276 – Standard Specification for Stainless Steel Bars and Shapes;

(iv) ASTM D1187 – Standard Specification for Asphalt-Base Emulsions for use as Protective Coatings and Metal;

(v) CAN/CSA W47.2 – Certification of Companies for Fusion Welding of Aluminum;

(vi) CAN/CSA W59.2 – Welded Aluminum Construction; and

(vii) CAN/CSA S157 – Strength Design in Aluminum.

E27.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supplying and installing the aluminum top barrier rail; and

(ii) Supplying and installing miscellaneous steel items and other items associated with the Work.

E27.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed Shop Drawings showing all fabrication details of the aluminum pedestrian handrail/bicycle rail. Fabrication shall take place as shown on the Drawings.

(c) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of any fabrication, the operator's qualifications detailed in E27.7, "Quality Control" and mill certificates.

(d) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of any fabrication, the proposed welding procedures and welding consumable certificates. The Contractor shall submit copies of the welding procedures which he intends to use, for examination and acceptance by the Contract Administrator.

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

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

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

E27.5 Materials

(a) General

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

(ii) 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.

(b) Material for the Aluminum Top Rail

(i) Extruded Shapes or Drawn Tubing for Rails and Posts: shall conform to the latest edition and all subsequent revisions of CAN/CSA Aluminum Alloy and Temper HA.5 SG 11 R-T6 (ASTM B221 Alloy 6351-T6), or HA.7 GA 11 M-T6 (ASTM B221 Alloy 6061-T6).

(ii) Aluminum sheet, bar, support pin, angle, and plate shall conform to the latest edition and all subsequent revisions of ASTM B221- Alloy 5083, ASTM B209 Alloy 6061-T6 or Alloy 6351-T6.

(iii) Bolts and cap screws, nylon lock nuts, and washers - stainless steel conforming to ASTM A276, Type 316.

(c) Bituminous Paint

(i) Bituminous paint shall be an alkali-resistant coating and conform to the requirements of ASTM D1187. Supply of bituminous paint shall be considered incidental to the supply of aluminum top rail.

(d) The Rail Anchorage System

(i) The handrail anchorage system is specified and paid for in accordance with E23, "Structural Concrete".

(e) Aluminum Shims

(i) Aluminum shims shall conform to ASTM Standard B221, Alloy 6061-T6, and shall be supplied as required to facilitate the installation of the rail posts as shown on the

Drawings. Supply of shims will be considered incidental to the supply of aluminum pedestrian handrail.

(f) Aluminum Filler Alloys for Welded Construction

(i) Aluminum filler alloys for welded construction shall be one of the following: ER4043, ER5183, ER5356, ER5554, ER5556, or ER5654.

(g) Hinges

(i) Hinges shall be stainless steel and manufactured by Angama, Type STBB 460, or equal as approved by the Contract Administrator in accordance with B7, "Substitutes".

(h) Equipment

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

E27.6 Construction Methods

(a) Layout

(i) Before fabrication and/or installation of the aluminum pedestrian handrail, the Contractor shall satisfy himself of all required aluminum rail and enclosure section dimensions, by field measurements.

(b) Fabrication

(i) General

(i) No fabrication shall commence until permission to do so has been received from the Contract Administrator.

(ii) All fabrication shall be carried out in accordance with this Specification and the Drawings.

(iii) The Fabricator shall fabricate the entire aluminum pedestrian handrail/bicycle rail in sections, to permit the installation of the rail sections onto the concrete.

(iv) The punching of identification marks on the members will not be allowed.

(v) Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may accept remedial measures.

(vi) Dimensions and fabrication details which control the field matching of parts shall receive very careful attention in order to avoid field adjustment.

(vii) Components of the railings and enclosures shall be joined by means of bolt, cap screws, and welds as called for on the Drawings.

(ii) Cutting

(i) Material 13 mm thick or less may be sheared, sawn, or cut with a router. Materials more than 13 mm thick shall be sawn or routed. Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided whenever possible. If used, they shall be filleted by drilling prior to cutting. Flame cutting of aluminum alloys is not permitted.

(iii) Welding

(i) Welded construction shall conform to the requirements of the latest edition and all subsequent revisions of CAN/CSA W59.2, Welded Aluminum Construction and W47.2, Certification of Companies for Fusion Welding of Aluminum.

(ii) Welding will be done by qualified welders using the Metal Inert Gas (MIG) process. All areas to be welded should be thoroughly cleaned with a suitable solvent followed by wire brushing if surfaces are heavily oxidized. The size of fillet for equal leg fillet welds is defined as the leg length of the largest isosceles right angle triangle which can be inscribed within the fillet weld section. Welds must penetrate into the root corner. All butt welds should have full penetration to ensure maximum strength. Defective welds should be repaired by chipping out the defective area and rewelding. Particular care must be paid to the elimination of craters and cold starts.

(iii) Welders and procedure should be qualified as agreed between the Contract Administrator and the Fabricator. The minimum requirements for mechanical test results of joints butt welded with Alcan 56S filler alloy shall be 259 MPa for Alcan D45S-H1 1A and 165 MPa for Alcan B51S-T4 alloy. In addition to the mechanical tests, soundness tests should be made as follows:

- Guided Bend Test: All bend tests should be fully guided through an angle of 1800. Root, face, and side bend tests in Alcan D54S parent alloy welded in Alcan 56S filler wire require a bend radius of 2T where T is the thickness of the material. For Alcan B51S parent alloy welded with 56S filler wire, a bend radius of 4T is required. Root bend and face bend specimens on material 10 mm thick and less should be 305 mm long and a minimum of 25 mm in width and cut from a plate having a minimum butt weld length of 450 mm. No test piece should be taken within 25 mm of the ends of the weld. Side bend tests should be carried out on material over 10 mm in thickness.
- Specimens should be 10 mm in width. Longitudinal edges should be given in 2 mm radius. There should be no crack greater than 3 mm in length. If a crack starts from an edge, the specimen should be disregarded.
- Fracture Test: The butt-welded joint shall have a notch not exceeding 2 mm in depth sawn on the four sides of the weld bend and the weld broken. Inspection of the fracture should reveal no gas pockets or inclusions greater than 2 mm in diameter and the area lost due to scattered gas, porosity or voids should not exceed 3% of the area under inspection.

(iv) Bolting

(i) Bolt holes in 10 mm or thinner material may be drilled or punched to finished size. In material thicker than 10 mm, the holes shall be drilled to finished size or subpunched smaller than the normal diameter of the fastener and reamed to size.

(ii) The finished diameter of the holes shall be not more than 7 percent greater than the nominal diameter of the fastener, except:

- Slotted holes for expansion purposes shall be provided as required on the Drawings
- Holes for anchor bolts may be up to 50 percent greater than the nominal bolt diameter with a maximum of 13 mm greater than the nominal bolt diameter.
- Holes shall not be drilled in such a manner as to distort the metal, but holes only slightly misaligned may be reamed to render a reasonable fit.
- In all bolts, the finished shank shall be long enough to provide full bearing, and washers shall be used under the nuts to give full grip when the nuts are tightened.

(c) Installation of Aluminum Top Rail

(i) The aluminum top rail shall be brought on-site and accurately installed as shown on the Drawings.

(ii) The rails shall be set true to the line and grade as shown on the Drawings or as required by the Contract Administrator.

(iii) The material shall be carefully handled so that no parts will be bent, broken or otherwise damaged. Hammering which will injure or distort the member is not permitted. The Contractor shall report to the Contract Administrator any corrective measures.

(iv) Except where shown on the Drawings, field welding shall not be permitted unless acceptable to the Contract Administrator. The rail posts shall be set on aluminum shims, as required, to achieve the correct elevation and grade. Additional aluminum shims shall be installed as required to achieve the correct elevation and grade. The

surface of the bottom shim that is in contact with concrete shall be separated with a minimum of two (2) coats of bituminous paint. A minimum 3 mm aluminum shim shall be installed under each post.

E27.7 Quality Control

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

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

(c) Access

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

(d) Testing

(i) 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.

E27.8 Measurement and Payment

(a) Culvert Barrier Aluminum Top Rail

(i) Supplying and Installing the culvert barrier aluminum top rail shall be paid for at the Contract Unit Price per metre for “Supply and Install Culvert Barrier Aluminum Top Rail”, measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E28. HOT-POURED RUBBERIZED ASPHALT WATERPROOFING

E28.1 Description

(a) This Specification shall cover the supply of labour, equipment, tools, and material necessary for the application of hot poured rubberized asphalt waterproofing on the concrete culvert roof slab, as specified herein and as shown on the Drawings.

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

E28.2 Referenced Specifications and Drawings

(a) The latest version of the City of Winnipeg Standard Construction Specifications and the latest edition and all subsequent revisions of the following standards

(i) CAN/CGSB-27.9M – Primer, Asphalt, Unfilled for Asphalt Roofing, Dampproofing and Waterproofing;

(ii) CGSB-37-GP-50M – Hot Applied Rubberized Asphalt for Roofing and Waterproofing;

(iii) CGSB-37-GP-51M – Application of Hot Applied Rubberized Asphalt for Roofing and Waterproofing; and

(iv) CGSB-37-GP-56M – Membrane, Bituminous, Prefabricated and Reinforced for Rooting.

E28.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Preparing the concrete culvert roof slab surface to receive the waterproofing membrane;

(ii) Applying primer to the concrete culvert roof slab surface;

(iii) Placing the asphalt waterproofing membrane on the concrete culvert roof slab surface; and

(iv) Placing polyester fabric protection layers and protection board.

E28.4 Submittals

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

(b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work. Data submitted shall summarize the physical, mechanical, and chemical characteristics of the material.

E28.5 Materials

(a) General

(i) 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.

(ii) 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.

(b) Hot Poured Rubberized Asphalt Waterproofing

(i) 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; and

(iv) Protection board.

(ii) The hot poured rubberized asphalt waterproofing membrane shall be a two layer, fabric-reinforced system. Each layer shall be 2.0 mm to 3.0 mm in thickness. The intermediate fabric reinforcement shall be placed between the layers.

(iii) The Contractor shall supply and install approved protection board to cover the hot poured rubberized asphalt waterproofing membrane

(c) Primer

(i) The entire concrete surface to be waterproofed shall receive a prime coat of CGSB37GP-9Ma, 930-18 (BAKOR) or approved equivalent in accordance with in accordance with B7, “Substitutes”, at an application rate in accordance with the Manufacturer’s recommended methods.

(ii) Primer shall be stored at temperatures of 5°C and above to facilitate handling. Materials shall be stored in a dry location and shall be kept in an upright position.

(d) Hot Poured Rubberized Asphalt Waterproofing Membrane (Two layers)

(i) The hot poured rubberized asphalt waterproofing membrane shall be "MACSEAL BDM" by McAsphalt (http://www.mcasphalt.com/sites/default/files/MCA%20PDS%20-%20Macseal%20BDM_0.pdf) or "790-11" by Henry/BAKOR (http://ca.henry.com/fileadmin/pdf/current/tds/BH79011C_c_techdata.pdf), or an approved equivalent, in accordance with B7, "Substitutes".

(ii) The waterproofing membrane shall be melted, mixed, and applied according to the Manufacturer's recommendations.

(iii) The layering operation shall be such that the waterproofing membrane is applied in two 2.0 – 3.0 mm thick layers.

(iv) Discontinuities in the waterproofing membrane shall be avoided and joints lapped a minimum of 150 mm. The waterproofing membrane shall be applied to the entire bridge deck surface and north abutment roof slab (excluding approach slabs) and shall extend up the face of the barriers to the top (proposed elevation) of the asphalt pavement.

(v) At the Contract Administrator's discretion, samples from the kettles shall be tested by the Contractor.

(e) Polyester Fabric

(i) 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 "Reemay 2016 Grade" by Reemay (https://spec-chem.com/product/2016-reemay%c2%ae/), "Polyester Fabric Reinforcing Sheet" by Henry/BAKOR (http://ca.henry.com/fileadmin/pdf/current/tds/BKPF600_techdata.pdf), "Fabric Reinforcement BP-16" by McAsphalt (http://www.cantat-associates.com/sites/default/files/waterproofing/Fabric%20Reinforcement%20product%20data.pdf), or approved equivalent in accordance with B7, "Substitutes", and set into the first layer of waterproofing membrane to achieve a minimum of 50% bleed through. Maximum overlap or gap between sheets of 6 mm.

(f) Protection Board

(i) The protection board shall be a durable panel of 3 mm thickness specifically designed to provide a protective cushion between the hot mix asphalt pavement and the hot applied rubberized asphalt waterproofing membrane for culverts and shall be approved by the Contract Administrator.

(ii) The protection board shall be "990-31 Polypropylene Protection Board" by Henry/BAKOR (http://ca.henry.com/fileadmin/pdf/current/tds/BK99031_techdata.pdf), or approved equivalent in accordance with B7, "Substitutes".

(iii) 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 25 mm both longitudinally and transversely. The protection board's edge shall be within 5 mm of all barriers. Protection boards shall be placed such that the longitudinal (direction of traffic) joints are staggered at least 150 mm. 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.

(g) Surface Conditioner

(i) Surface conditioner shall be applied to the concrete surfaces of the bridge deck and shall conform to the Manufacturer's recommended methods.

E28.6 Equipment

(a) General

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

E28.7 Construction Methods

(a) General

(i) No installation work shall be performed during rainy or inclement weather and on frost or wet covered surfaces.

(ii) Temporary protection of the membrane shall be provided to prevent mechanical damage or damage from spillage of oil or solvents until such time as permanent protection is provided.

(b) Melting On-Site

(i) Cakes of rubberized asphalt waterproofing shall be melted in an approved double shell melter under continuous agitation until the material can be drawn free flowing and lump free from the melter.

(ii) The temperature of the rubberized asphalt waterproofing shall not exceed 218°C at any time during the entire melting procedure.

(c) Application

(i) The entire concrete surface area onto which the hot poured rubberized asphalt waterproofing is to be applied shall be thoroughly cleaned by means of sand blasting. The sand blasted 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 shall contain and collect all products of the sand blasting operation including dust, debris, and spent abrasive so as to ensure that all of these materials are prevented from entering into and being deposited into Truro Creek. All debris and spent abrasive shall be collected and disposed of off-site by the Contractor at a proper disposal facility. 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.

(ii) The Contractor shall ensure that the concrete surfaces onto which the hot poured rubberized asphalt waterproofing is to be applied is prepared (including supply and application or waterproofing primer) to the degree that the hot poured rubberized asphalt waterproofing can be installed in accordance with the Manufacturer's requirements.

(iii) After the concrete culvert top of roof slab has been cleaned, they shall be covered with surface conditioner. The quantity used shall be 160 mL/m^2, or as recommended by the Manufacturer. The surface conditioner shall be allowed to dry before the application of the rubberized asphalt waterproofing.

(iv) The primer shall be applied at a uniform rate, as recommended by the Manufacturer, avoiding over-spraying or ponding of material. The primer shall be dry before applying the rubberized asphalt waterproofing.

(v) The rubberized asphalt waterproofing shall be brought to a temperature of between 190°C and 218°C.

(vi) The application of the rubberized asphalt waterproofing shall be carried out under the supervision of experienced personnel.

(vii) Apply membrane in a smooth fashion, free from air pockets, wrinkles, or tears, and in accordance with the Manufacturer's recommended methods. Ensure full bond of membrane to substrate.

(viii) Apply the first layer of hot rubberized asphalt membrane evenly to a minimum thickness of 2 mm to form a continuous monolithic coating over horizontal and vertical surfaces.

(ix) Apply fabric reinforcing sheet and firmly press into first layer of hot membrane. Overlap fabric approximately 6mm ensuring that a layer of membrane is present

between overlaps. Apply a second layer of membrane over the fabric to a minimum thickness of 3 mm.

(x) The Contractor shall supply and install an elastomeric sheet membrane which is compatible with the hot-poured rubberized asphalt waterproofing material. The elastomeric sheet membrane shall be installed at the designated locations shown on the Drawings. Installation of the heavy-duty elastomeric sheet membrane shall be in accordance with the Manufacturer's recommendations.

(xi) Protection course shall be rolled onto hot applied rubberized asphalt membrane surface while still warm and tacky.

(xii) Lap protection course shall be 50 mm on side laps and 150 mm on end laps, staggering laps.

E28.8 Quality Control

(a) Inspection

(i) 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.

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

(b) Access

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

E28.9 Measurement and Payment

(a) Hot-Poured Rubberized Asphalt Waterproofing

(i) Hot-poured rubberized asphalt waterproofing shall be paid for at the Contract Unit Price per square metre for "Hot-Poured Rubberized Asphalt Waterproofing", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The area to be paid for shall be the waterproofed surface area as shown on the Drawings and herein specified.

E29. ALUMINUM BALANCED BARRIERS

E29.1 Description

(a) General

(i) This Specification shall cover all operations related to the supply and installation of aluminum balanced barriers, as specified herein and as shown on the Drawings.

(ii) 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.

E29.2 Referenced Specifications and Drawings

(i) The latest edition and all subsequent editions of the following:

(i) Aluminum Balanced Barrier in accordance with Standard Construction Specification CW 3650 and as shown on the Drawings.

(ii) Granular Backfill is in accordance with Standard Construction Specification CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.

(iii) Asphaltic concrete is in accordance with Standard Construction Specification CW 3410-R2.

E29.3 Scope of Work

(a) The Scope of Work under this Specification shall involve:

(i) Supplying Aluminum Balanced Barrier and related components as specified herein and on the Drawings;

(ii) Preparing the site and existing surface to install components; and

(iii) Installing Aluminum Balanced Barrier and components as specified herein and on the Drawings.

E29.4 Submittals

(a) The Contractor shall submit to the Contract Administrator for review prior to commencement of any scheduled Work on the site, product data showing evidence that the proposed material meets the specified product.

E29.5 Materials

(a) General

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

(ii) All materials shall be stored in neat regular piles, on blocks or built up platforms, in order to avoid damage or contamination, and for ease of checking, handling and inspection.

E29.6 Aluminum Balanced Barrier Components

(a) Aluminum balanced barrier components shall be aluminum barrier rail section, barrier posts, splice bars and rail clamp bars conforming to ASTM Standard B22l, Alloy 6061-T6 or Alloy 6351-T6; end caps shall conform to ASTM cast alloy 535.2.

(b) All barrier rails that are to be installed around radii less than 50 m shall be pre-bent by mechanical methods prior to delivery to the site.

(c) The top edges and corners of barrier posts shall be rounded smooth as per Standard Construction Specification CW 3650. Rounded edges damaged during installation shall be repaired by the Contractor to the satisfaction of the Contract Administrator.

(d) End caps shall be permanently welded onto the ends of all barrier rail installations, as per Standard Construction Specification CW 3650.

(e) Steel washers shall conform to ASTM A743/A743M, Type 316 Stainless Steel.

(f) Cap screws shall conform to ASTM A743/A743M, Type 316 Stainless Steel.

(g) All other materials not specifically described but required for a complete and proper installation are to be selected by the Contractor subject to the approval of the Contract Administrator.

(h) All Aluminum Balanced Barrier components shall be in accordance with Standard Construction Specification CW 3650 and as shown on the Drawings.

E29.7 Granular Backfill

(a) Granular backfill for post holes shall conform to the requirements of granular base course in CW 3110. Crushed limestone base course is not allowed for use.

E29.8 Alkali-Resistant Bituminous Paint

(a) Alkali-resistant bituminous paint shall meet the requirements of CGSB Specification 31-GP-3M.

E29.9 Construction Methods

(a) Guardrail Components

(i) The guardrail shall be accurately set to the required depth and alignment, in a manner resulting in a smooth continuous installation, as shown on the Drawings. Permissible tolerance for plumb and grade of posts shall be 5 mm in any direction.

(ii) Any guardrail material requiring field modification to fit shall be reported to the Contract Administrator for its acceptance of the modification prior to the work being carried out. Modification by flame cutting method is prohibited. Modification by cold cutting method with a suitable drill press may be allowed. Adequate edge distances of guardrail material shall be maintained during the modification process. All exposed steel areas shall be patched with two coats of zinc-rich paint.

(iii) Guardrail laps shall be in the direction of traffic flow, such that the upstream guardrail panel laps over top of the next guardrail panel.

(iv) Bolts shall be tightened to a torque of 100 N-m.

(v) The Contractor shall take all necessary precautions to prevent damage to galvanizing. Field-applied galvanizing and touch-up galvanizing shall be done with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780-01. “Gal-Viz Galvanizing Solder” by Harris (http://www.harrisproductsgroup.com/en/Products/Alloys/Soldering/Lead-Bearing-Solders/Gal-Viz.aspx) is an acceptable product, or equal as accepted by the Contract Administrator, in accordance with B7, “Substitutes”. The referenced products is available locally from Welder Supplies Limited, 150 McPhillips Street, Winnipeg.

(vi) Holes for the guardrail posts shall be 300 mm in diameter and be excavated by auger.

(vii) Excavated material and debris shall be removed from the Site.

(viii) Post holes shall be backfilled with granular material meeting the requirements of Section 2.2 of Specification CW 3110 for base course material. Crushed limestone base course is not allowed for use. The guardrail posts shall rest directly and solidly on the bottom of the hole. After the post is installed, it shall be backfilled. Backfill shall be thoroughly compacted, using pneumatic tampers, in layers not exceeding 150 mm.

(ix) Surplus excavated material and debris shall be removed from the Site and appropriately disposed of.

(x) After the post hole is backfilled and compacted, the post hole cut-out shall be filled with asphaltic concrete.

E29.10 Quality

(a) General

(i) All workmanship and all materials furnished and supplied under this specification are subject to close and systematic inspection and testing by the Contract Administrator. 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.

(ii) The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Specification.

(iii) Roadside hazard protection components installed with inaccurate alignment and/or poor grade or curvature shall be corrected by the Contractor to the satisfaction of the Contract Administrator.

E29.11 Measurement and Payment

(a) Supply and installation of guardrail, posts, and all related appurtenances will be measured on a length basis and paid for at the Contract Unit Price for the “Aluminum Balanced Barrier Guardrail”. The length to be paid for will be the total number of meters of Aluminum

Balanced Barrier Guardrail in accordance with this specification, accepted and measured by the Contract Administrator.

E30. STRAW WATTLES

E30.1 Description

(a) This Specification shall cover the supply and installation of straw wattles required as erosion control measures to mitigate any deleterious materials from entering the existing Land Drainage System, as herein specified.

E30.2 Materials

(a) Straw Wattles

(i) The 300 mm diameter straw roll shall consist of straw or wood fibre that has been compressed and placed onto a biodegradable poly or plastic netting. Stenlog is an approved product. Submit proposed straw wattle data sheet for review and acceptance at least five (5) Working Days prior to installation.

(ii) Wooden stakes shall be provided to secure the straw wattles. These wooden stakes shall have a minimum 50 mm x 50 mm cross section, a minimum length of 600 mm and be pointed at one end.

E30.3 Construction Methods

(a) Install 300 mm Stenlog or other straw wattle sediment control material in accordance with the manufacturer's specifications around all rip rap areas related to drainage inlets and outlets, and catch basins within seeded areas.

(b) Install 300 mm Stenlog or other straw wattle sediment control material in accordance with the manufacturer's specifications wherever the Contract Administrator directs to prevent sediment from entering the Truro Creek.

(c) Install straw wattles so that no gaps exist between the soil and the bottom of the wattle, and the ends of adjacent wattles are overlapped 150 mm minimum to prevent water and sediment passing. Achieve a tight seal between the wattle segments.

(d) Dogleg terminal ends of straw wattle up the slope to prevent channelling of sedimentation.

(e) Use 300 mm wooden stakes to fasten straw wattle to the soil. Place stakes on each side of the straw wattle, lying across the natural fibre twine, spaced 1200 mm on centre. Leave 30 mm to 50 mm of wood stake exposed above the wattle.

(f) Avoid damage to wattles. Damaged areas of wattles should be cut and tied off, then treated as terminal ends.

(g) At the direction of the Contract Administrator, the straw wattles shall be removed after seeding has established and before the end of the warranty period.

E30.4 Measurement and Payment

(a) The supply and installation of straw wattles shall be considered incidental to the Work and no additional measurement or payment will be made.

E31. ASPHALTIC CONCRETE PAVING ON WINCHESTER STREET

E31.1 Description

(a) This Specification shall cover all operations relating to the supply of labour, equipment, tools, and material necessary for the application of tack coat and the placing and compaction of the asphaltic hot mix overlay on the Winchester Street culvert infill slab, approach slabs, and roadway slabs.

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

E31.2 Referenced Specifications and Drawings

(a) The latest edition and subsequent revisions of the following:

(b) City of Winnipeg CW 3410 – Asphaltic Concrete Pavement Works;

E31.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Preparing the surface of the Winchester Street culvert infill slab, approach slabs, and roadway slabs;

(ii) Supplying and applying the tack coat; and

(iii) Supplying, hauling, placing, and compacting the asphaltic hot mix overlay on the Winchester Street culvert infill slab, approach slabs, and roadway slabs.

E31.4 Submittals

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

(b) In accordance with CW 3410, the Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed approved materials to be used and mix design statement.

E31.5 Materials

(a) General

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

(ii) 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.

E31.6 Equipment

(a) General

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

E31.7 Construction Methods

(a) Surface Preparation

(i) All concrete slabs listed above shall be thoroughly cleaned by means of a power broom and compressed air. All surfaces to which the tack coat is to be applied shall be dry and free from scale, dirt, grime, grease, oil, or other contaminants.

(ii) Care shall be taken to protect and avoid damaging the hot-pour rubberized asphalt waterproofing membrane and protection board. Any damage incurred shall be corrected at the Contractor's own expense.

(b) Application of Tack Coat

(i) The tack coat shall be applied to the entire surface of the Winchester Street infill slab, approach slabs, and roadway slabs. The quantity used shall not exceed 550 mL/m^2.

(ii) Barriers and other structural elements with a vertical face shall receive a brushed-on application of tack coat for the total asphalt thickness. These surfaces shall also receive a further coating of paving grade (150/200 penetration) asphalt cement.

(iii) Any puddles or excess material shall be thoroughly spread by brushing material over the surrounding concrete surface.

(iv) The treated surface shall be fully cured, until it becomes tacky, prior to application of the asphalt overlay.

(c) Placing Asphaltic Concrete Paving Mixture

(i) The paver shall produce a uniformly textured surface free from tearing, tracking, or other objectionable surface irregularities. If the surface condition is not deemed to be acceptable by the Contract Administrator, operations shall cease until equipment adjustments, repairs or replacement are made. Spreading operations shall not recommence without the approval of the Contract Administrator. Delays and expense associated with adjustments, repairs, or replacement of equipment shall be the responsibility of the Contractor.

(ii) The paver shall proceed in the same direction as the lap of the protection board.

(iii) The sequence of spreading operations with respect to lanes and lifts shall be approved by the Contract Administrator.

(iv) The spreader shall be capable of spreading the mixture true to the elevations, grades, and crown, as shown on the Drawings. The allowable variation in the bituminous pavement surface shall not exceed 6 mm when measured using a three metre straight edge. Particular attention shall be paid to the setting of the spreader when laying the mixture in the areas adjacent to protruding joints in order to avoid bumps in the areas of such joints. In correcting the areas adjacent to a joint or when removing excess mixture, the material shall be picked up and not cast on the surface of the freshly spread bituminous pavement.

(v) Immediately after the course is screeded, and before roller compaction begins, the remainder of the surface shall be verified, with all inequalities addressed and corrected, high spots removed, and low spots replaced. Irregularities in alignment and grade along the barrier shall be corrected by the addition or removal of mixture before the edge is rolled.

(vi) The speed of the spreader shall be maintained at a uniform rate that is in balance with the amount of bituminous pavement mixture being delivered to the site.

(d) Construction Joints in Asphalt Overlay

(i) Longitudinal and transverse joints shall be made in a careful manner in order to assure a well-bonded, sealed, and level joint. A transverse joint shall be cut back to its full depth perpendicular to the mat at the end of the run. On resuming laying of the paving mixture, the exposed edges shall be painted with a thin coat of hot asphalt cement.

(ii) Before placing the paving mixture against them, all contact surfaces of longitudinal joints, curbs, barriers, etc. shall be painted with a thin coat of hot asphalt cement, and heated with a propane joint heater.

(iii) The allowable variation in the surface across a transverse joint shall not exceed 6 mm when measured using a three metre straight edge centered on the joint.

(iv) In raking joints, excess mix material shall be picked up and removed from the surface of the freshly spread asphalt.

(e) Joints in Asphalt Overlay

(i) When called for on the Drawings, the Contractor shall, after the completion of the asphalt paving, sawcut the asphalt in the transverse direction for the full roadway width.

(f) Weather

(i) Paving asphalt of thickness less than 40 mm shall not begin until the ambient air temperature is at least 10°C and rising. Paving operations shall not begin until all frost and moisture has evaporated from the concrete surfaces. For thicker asphalt pavement layers, the minimum ambient air temperature must be 5°C and rising.

(g) Protection of Culvert Components and Appurtenances

(i) Utmost care shall be taken to protect culvert components and appurtenances, such as barriers, sidewalks, curbs, and railings from disfiguration by asphalt materials, including tack coat, caulking compound, cement, and asphalt mixture.

(ii) If exposed surfaces are marred as a result of the Contractor's operations, restoration shall be made by the Contractor at his own expense, to the satisfaction of the Contract Administrator.

E31.8 Quality Control

(a) Inspection

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

(ii) 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.

(b) Access

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

(c) Materials

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

E31.9 Measurement and Payment

(a) Asphalt paving on the Winchester Street infill slab, approach slabs, and as part of Winchester Street roadworks shall be paid at the Contract Unit Price per tonne for "Construction of Asphaltic Concrete Overlay", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E32. ROADWAY LIGHTING

E32.1 The roadway lighting relocations will be performed by Manitoba Hydro. The Contractor shall coordinate the work of Manitoba Hydro with his and ensure that they have sufficient time to complete their works before opening the culverts to the public.

E33. PAVEMENT REMOVAL

E33.1 Further to clause 3.1.2 of CW 3110, removal of existing asphalt pavement shall include removal of concrete curbs adjacent to the existing asphalt pavement.

E34. CONSTRUCTION OF CURB TO TRAFFIC BARRIER TRANSITION

E34.1 The Contractor shall construct curb to traffic barrier transitions as shown on the Drawings and in accordance with CW 3310 "Portland Cement Concrete Pavement Works".

E34.2 Measurement and Payment

(a) Construction of Curb to Traffic Barrier Transition

(i) Construction of Curb to Traffic Barrier Transitions shall be measured on a unit length basis.

(ii) Construction of Curb to Traffic Barrier Transitions shall be paid at the Contract Unit Price per unit length for "Construction of Curb to Traffic Barrier Transition", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying

all materials and for performing all operations herein described and all other items incidental to the Work.

E35. HYDRO EXCAVATION

E35.1 Description

(a) This specification shall cover the removal of earthen material immediately adjacent to underground utilities infrastructure by means of high pressure water spray, and the recovery of excavated material by vacuum type means or equivalent method as approved by the Contract Administrator.

E35.2 Equipment

(a) Hydro-Excavation equipment shall be capable of maintaining a minimum working pressure of 10,000 psi, at a rate of flow of 10 to 12 gallons per minute. The unit should be adjustable, so as to provide adequate pressure to remove earthen material identified by the Contract Administrator.

(b) Spray head shall be equipped with a rotating type nozzle in order to provide a wider path of cut.

E35.3 Construction Methods

(a) Hydro-Removal of Earthen Material

(i) Earthen material adjacent to utility entity shall be sprayed with high pressure water so as to remove all such material identified by the Contract Administrator.

E35.4 Recovery of Excavated Material

(a) The recovery of excavated material shall be done using a vacuum type method, or other type method as approved by the Contract Administrator.

(b) The recovery of material shall follow immediately behind the excavation, to avoid excavated areas from filling with excavated material.

(c) The use of mechanical sweepers will not be allowed.

(d) Dispose of material in accordance with Section 3.4 of CW 1130-R2.

E35.5 Measurement and Payment

(a) Hydro-Excavation

(i) Hydro-Excavation of earthen material and its recovery and disposal shall be considered incidental to the Work and no additional measurement or payment will be made.