THE CITY OF WINNIPEG

TENDER

TENDER NO. 24-2020

SHERWIN ROAD RECONSTRUCTION AND CULVERT REPLACEMENT OVER OMAND'S CREEK

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 Sherwin Road Reconstruction and Culvert Replacement over Omand's Creek

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, August 7, 2020.

B2.2 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. ENQUIRIES

B3.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.

B3.2 If the Bidder finds errors, discrepancies or omissions in the Tender, 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.

B3.3 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Tender will be provided by the Contract Administrator to all Bidders by issuing an addendum.

B3.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Tender will be provided by the Contract Administrator only to the Bidder who made the enquiry.

B3.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B3 unless that response or interpretation is provided by the Contract Administrator in writing.

B3.6 Any enquiries concerning submitting through MERX should be addressed to:
MERX Customer Support
Phone: 1-800-964-6379
Email: merx@merx.com

B4. CONFIDENTIALITY

B4.1 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.

B4.2 The Bidder shall not make any statement of fact or opinion regarding any aspect of the Tender to the media or any member of the public without the prior written authorization of the Contract Administrator.

B5. ADDENDA

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

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

B5.3 Addenda will be available on the MERX website at www.merx.com.

B5.4 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the MERX website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B5.5 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid/Proposal. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B5.6 Notwithstanding B3, enquiries related to an Addendum may be directed to the Contract Administrator indicated in D4.

B6. SUBSTITUTES

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

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

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

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

(a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;

(b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;

(c) identify any anticipated cost or time savings that may be associated with the substitute;

(d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;

(e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.

B6.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/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.

B6.6 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.

B6.6.1 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.

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

B6.8 If the Contract Administrator approves a substitute as an "approved alternative", any Bidder bidding that approved alternative may base his/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.

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

B7. BID COMPONENTS

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

(a) Form A: Bid;

(b) Form B: Prices;

(c) Form G1: Bid Bond and Agreement to Bond.

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

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

B7.4 The Bid shall be submitted electronically through MERX at www.merx.com.

B7.4.1 Bids will **only** be accepted electronically through MERX.

B7.5 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B17.1(a).

B8. BID

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

B8.2 Paragraph 2 of Form A: Bid/Proposal 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.

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

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

B8.4 Paragraph 13 of Form A: Bid/Proposal 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;

(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.

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

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

B9. PRICES

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

B9.1.1 Prices stated on Form B: Prices shall not include any costs which may be incurred by the Contractor with respect to any applicable funding agreement obligations as outlined in D34. Any such costs shall be determined in accordance with D34.

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

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

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

B9.5 The Bidder shall enter the Total Bid Price from Form B: Prices into the Total Bid Price field in MERX.

B9.5.1 Bidders are advised that the calculation indicated in B17.4 will prevail over the Total Bid Price entered in MERX.

B10. DISCLOSURE

B10.1 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.

B10.2 The Persons are:

(a) N/A

B11. CONFLICT OF INTEREST AND GOOD FAITH

B11.1 Further to C3.2, Bidders, by responding to this Tender, declare that no Conflict of Interest currently exists, or is reasonably expected to exist in the future.

B11.2 Conflict of Interest means any situation or circumstance where a Bidder or employee of the Bidder proposed for the Work has:

(a) other commitments;

(b) relationships;

(c) financial interests; or

(d) involvement in ongoing litigation;

that could or would be seen to:

(i) exercise an improper influence over the objective, unbiased and impartial exercise of the independent judgment of the City with respect to the evaluation of Bids or award of the Contract; or

(ii) compromise, impair or be incompatible with the effective performance of a Bidder's obligations under the Contract;

(e) has contractual or other obligations to the City that could or would be seen to have been compromised or impaired as a result of its participation in the Tender process or the Work; or

(f) has knowledge of confidential information (other than confidential information disclosed by the City in the normal course of the Tender process) of strategic and/or material relevance to the Tender process or to the Work that is not available to other bidders and that could or would be seen to give that Bidder an unfair competitive advantage.

B11.3 In connection with its Bid, each entity identified in B11.2 shall:

(a) avoid any perceived, potential or actual Conflict of Interest in relation to the procurement process and the Work;

(b) upon discovering any perceived, potential or actual Conflict of Interest at any time during the Tender process, promptly disclose a detailed description of the Conflict of Interest to the City in a written statement to the Contract Administrator; and

(c) provide the City with the proposed means to avoid or mitigate, to the greatest extent practicable, any perceived, potential or actual Conflict of Interest and shall submit any additional information to the City that the City considers necessary to properly assess the perceived, potential or actual Conflict of Interest.

B11.4 Without limiting B11.3, the City may, in its sole discretion, waive any and all perceived, potential or actual Conflicts of Interest. The City's waiver may be based upon such terms and conditions as the City, in its sole discretion, requires to satisfy itself that the Conflict of Interest has been appropriately avoided or mitigated, including requiring the Bidder to put into place such policies, procedures, measures and other safeguards as may be required by and be acceptable to the City, in its sole discretion, to avoid or mitigate the impact of such Conflict of Interest.

B11.5 Without limiting B11.3, and in addition to all contractual or other rights or rights at law or in equity or legislation that may be available to the City, the City may, in its sole discretion:

(a) disqualify a Bidder that fails to disclose a perceived, potential or actual Conflict of Interest of the Bidder or any of its employees proposed for the Work;

(b) require the removal or replacement of any employees proposed for the Work that has a perceived, actual or potential Conflict of Interest that the City, in its sole discretion, determines cannot be avoided or mitigated;

(c) disqualify a Bidder or employees proposed for the Work that fails to comply with any requirements prescribed by the City pursuant to B11.4 to avoid or mitigate a Conflict of Interest; and

(d) disqualify a Bidder if the Bidder, or one of its employees proposed for the Work, has a perceived, potential or actual Conflict of Interest that, in the City's sole discretion, cannot be avoided or mitigated, or otherwise resolved.

B11.6 The final determination of whether a perceived, potential or actual Conflict of Interest exists shall be made by the City, in its sole discretion.

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 https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf

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™) in the form of:

(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 include in its Bid Submission bid security in the form of a digital 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 Form G1: Bid Bond and Agreement to Bond, available on The City of Winnipeg, Corporate Finance, Materials Management Division website at https://www.winnipeg.ca/MatMgt/templates/files/eBidsecurity.pdf.

B13.2 Bid security shall be submitted in a digital format meeting the following criteria:

(a) The version submitted by the Bidder must have valid digital signatures and seals;

(b) The version submitted by the Bidder must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.

(c) The version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.

(d) The verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.

(e) The results of the verification must provide a clear, immediate and printable indication of pass or fail regarding B13.2(a).

B13.3 Bonds failing the verification process will not be considered to be valid and the bid shall be determined to be non-responsive in accordance with B17.1(a).

B13.4 Bonds passing the verification process will be treated as original and authentic.

B13.4.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.

B13.5 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 formed with the successful Bidder and the contract securities are furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B13.6 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 Tender.

B14. OPENING OF BIDS AND RELEASE OF INFORMATION

B14.1 Bids will not be opened publicly.

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 MERX website at www.merx.com.

B14.3 After award of Contract, the name(s) of the successful Bidder(s) and their Contract amount(s) will be available on the MERX website at www.merx.com.

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).

B14.4.1 To the extent permitted, the City shall treat as confidential information, those aspects of a Bid Submission identified by the Bidder as such in accordance with and by reference to Part 2, Section 17 or Section 18 or Section 26 of The Freedom of Information and Protection of Privacy Act (Manitoba), as amended.

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/Proposal.

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 formed and the contract securities have been 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/Proposal.

B16. WITHDRAWAL OF BIDS

B16.1 A Bidder may withdraw his/her Bid without penalty prior to the Submission Deadline.

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 Tender, or acceptable deviation therefrom (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 B6.

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 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.

B17.4.1 Further to B17.1(a), in the event that a unit price is not provided on Form B: Prices, the City may determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B17.4.2 Bidders are advised that the calculation indicated in B17.4 will prevail over the Total Bid Price entered in MERX.

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 qualified, and the Bids are determined to be responsive.

B18.2.1 Without limiting the generality of B18.2, the City will have no obligation to award a Contract where:

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

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

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

(d) only one Bid is received; or

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

B18.3 The Work of this Contract is contingent upon Council approval of sufficient funding in the 2020 and 2021 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 If funding for the Work is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, Bidders are advised that the terms of D34 shall immediately take effect upon confirmation of such funding, regardless of when funding is confirmed.

B18.5 Where an award of Contract is made by the City, the award shall be made to the qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B17.

B18.5.1 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 2020-01-31) are applicable to the Work of the Contract.

C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm

C0.2 A reference in the Tender 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. FORM OF CONTRACT DOCUMENTS

D2.1 Notwithstanding C4.1(c) and C4.4, the Contract Documents will be provided to the Contractor electronically and there will be no requirement for execution and return to the City by the Contractor. Accordingly, the provisions under C4.4(a) and C4.4(b) and no longer applicable.

D3. SCOPE OF WORK

D3.1 The Work to be done under the Contract shall consist of:

(a) Watermain Renewal
  (i) Sherwin Road from south of Dublin Avenue to north of Omand's Creek.

(b) Culvert Replacement
  (i) Sherwin Road at Omand's Creek.

(c) Concrete Road Reconstruction
  (i) Sherwin Road from Saskatchewan Avenue to Notre Dame Avenue.

D3.2 The major components of the Work are as follows:

(a) Watermain Renewal
  (i) Installation of approximately 95 metres of 300 mm diameter PVC water main and appurtenances by trenchless methods;
  (ii) Installation of approximately 20 metres of 300 mm diameter water main within a 500 mm diameter PVC encasement pipe under Omand's Creek;
  (iii) Removal/abandonment of existing gate valves;
  (iv) Abandonment of existing water main;
  (v) Reconnection and or renewal of water and fire service connections;
  (vi) Hydrostatic pressure testing of the new water main;
  (vii) Disinfection of the new water main; and
  (viii) Final tie-ins of the water main.

(b) Culvert Replacement - Winter Work
  (i) Implement environmental control measures;
  (ii) Construct temporary coffer dams (upstream and downstream) and provide pumping;
  (iii) Implement utility protection measures;
  (iv) Install temporary shoring;
  (v) Demolish and dispose of existing CSP culvert and headwall;
  (vi) Perform excavation for new culvert;
  (vii) Perform creek excavation and slope stabilization;
  (viii) Prepare bearing surfaces for structure;
  (ix) Construct cast-in-place culvert, headwalls, retaining walls, and wingwalls;
  (x) Supply and install subdrains;
  (xi) Pour cellular concrete;
  (xii) Backfill excavation;

(xiii) Install rip rap on geotextile fabric;
(xiv) Supply and install chain link fence;

(c) Culvert Replacement - Spring Work
(i) Construct approach slabs, waterproofing membrane, compacted granular fill, infill slab, safety curb and asphalt path;
(ii) Install clay cap on slope stabilization works; and
(iii) Topsoil, natural seeding and sod.

(d) Concrete Road Reconstruction
(i) Removal of existing pavement;
(ii) Excavation;
(iii) Installation of catch basins, sewer service pipe and subdrains;
(iv) Insulation of water services;
(v) Compaction of sub-grade;
(vi) Placement of separation/ filtration geotextile fabric and Class A geogrid;
(vii) Placement of sub-base and base course materials;
(viii) Adjustment of existing manholes and appurtenances;
(ix) Construction of 230 mm plain dowelled concrete pavement (utilizing slip form paving equipment wherever possible);
(x) Construction of 200 mm reinforced concrete approaches;
(xi) Construction of 180 mm integral and dowelled barrier curb, monolithic concrete splash strip, modified barrier curb and safety curb;
(xii) Placement of Type 1A asphalt pavement on AT path (thickness – 125 mm(two lifts)); and
(xiii) Boulevard restoration and sod.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is Morrison Hershfield Limited, represented by:

Bill Ebenspanger, P.Eng.
Senior Bridge Engineer

Telephone No. 204-977-8370
Email Address bebenspanger@morrisonhershfield.com

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

D5. CONTRACTOR'S SUPERVISOR

D5.1 At the pre-construction meeting, the Contractor shall identify his/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 where the supervisor identified in D5.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

D6. NOTICES

D6.1 Except as provided for in C22.4, 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/Proposal.

D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator identified in D4.

D6.3 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. FURNISHING OF DOCUMENTS

D7.1 Upon award of the Contract, the Contractor will be provided with “Issued for Construction” Contract Documents electronically, including Drawings in PDF format only.

SUBMISSIONS

D8. AUTHORITY TO CARRY ON BUSINESS

D8.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D9. SAFE WORK PLAN

D9.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.

D9.2 The Safe Work Plan shall be prepared and submitted in the format shown in the City’s template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/safety/default.stm

D9.3 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.

D10. INSURANCE

D10.1 The Contractor shall provide and maintain the following insurance coverage:

(a) wrap-up liability insurance, in the amount of at least two million dollars ($2,000,000.00) inclusive, with the City added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, sudden

and accidental pollution insurance, non-owned automobile liability, broad form property damage cover and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;

(b) Automobile Liability Insurance 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) an all risks Installation Floater carrying adequate limits to cover all machinery, equipment, supplies and/or materials intended to enter into and form part of any installation.

(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 covering third party injury and property damage claims, and including clean-up costs and transported cargo as a result of pollution conditions arising suddenly or gradually from the Contractor operations and completed operations. Such policy to name the City as an additional insured until Total Performance.

D10.2 Deductibles shall be borne by the Contractor.

D10.3 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in the C4.1 for the return of the executed Contract Documents, as applicable.

D10.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D10.5 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D11. CONTRACT SECURITY

D11.1 The Contractor shall provide and maintain the performance bond and the labour and material payment bond 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; and

(b) a labour and material payment bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H2: Labour and Material Payment Bond), in an amount equal to fifty percent (50%) of the Contract Price.

D11.2 The Contractor shall provide the City Solicitor with the required performance and labour and material payment bonds within seven (7) Calendar Days of notification of the award of the Contract by way of an award letter 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 Documents, if applicable.

D11.3 The Contractor shall, as soon as practicable after entering into a contract with a Subcontractor:

(a) give the Subcontractor written notice of the existence of the labour and material payment bond in D11.1(b); and

(b) post a notice of the bond and/or a copy of that bond in a conspicuous location at the Site of the Work.

D12. SUBCONTRACTOR LIST

D12.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at 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 the C4.1 for the return of the executed Contract Documents, if applicable.

D13. EQUIPMENT LIST

D13.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at 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 the C4.1 for the return of the executed Contract Documents, if applicable.

D14. DETAILED WORK SCHEDULE

D14.1 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 the General Conditions for the return of the executed Contract Documents, as applicable.

D14.2 The detailed work schedule shall consist of the following:

(a) a Gantt chart for the Work acceptable to the Contract Administrator.

D14.3 Further to D14.2(a), 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.

SCHEDULE OF WORK

D15. COMMENCEMENT

D15.1 The Contractor shall not commence any Work until he/she is in receipt of an award letter from the Award Authority authorizing the commencement of the Work.

D15.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:
  (i) evidence of authority to carry on business specified in D8;
  (ii) evidence of the workers compensation coverage specified in C6.15;
  (iii) the twenty-four (24) hour emergency response phone number specified in D5.2.
  (iv) the Safe Work Plan specified in D9;
  (v) evidence of the insurance specified in D10;
  (vi) the contract security specified in D11;
  (vii) the subcontractor list specified in D12;
  (viii) the equipment list specified in D13; and
  (ix) the detailed work schedule specified in D14.

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

D15.3 The Contractor shall not commence the Work on the Site before October 13, 2020, and shall commence the Work on Site no later than October 19, 2020, as directed by the Contract Administrator and weather permitting.

D15.3.1 The Contractor shall not commence the Concrete Road Reconstruction D2.1(c) on the Site before May 25, 2021, and no later than May 31, 2021, as directed by the Contract Administrator and weather permitting.

D15.4 The City intends to award this Contract by October 7, 2020.

D15.4.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D16. RESTRICTED WORK HOURS

D16.1 Further to clause 3.10 of CW 1130, the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed between 2000 hours and 0700 hours, or on Saturdays, Sundays, Statutory Holidays and or Civic Holidays.

D17. WORK BY OTHERS

D17.1 Further to C6.25, the Contractor's attention is directed to the fact that other contractors, the personnel of other utilities, and staff of the City of Winnipeg will be working in the same area as this Contract. 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 agencies working in the area, and such cooperation is an obligation of the Contractor under the terms of this Contract.

D17.2 Work by others on or near the Site will include but not necessarily be limited to:

(a) Manitoba Hydro – Relocation of street light standard(s) and guide wires (as required);

(b) Manitoba Hydro, Gas Division – lowering and/ or rock wrapping of underground main and services as required;

(c) Manitoba Hydro Telecom – relocations, protection and adjustments as required;

(d) BellMTS – relocating and/ or adjusting vaults as required;

(e) Shaw – relocations, protection and adjustments as required;

(f) City of Winnipeg Geomatics Branch – various work on survey infrastructure.

D17.3 Further to D17.1 the Contractor is expected to cooperate and coordinate all activities with parties performing required works to facilitate their own works. The Contractor must include and accommodate work by others identified in D17.2 in their construction schedule to complete the Work.

D18. SEQUENCE OF WORK

D18.1 Further to C6.1, the sequence of work shall be as follows:

D18.1.1 A recommended traffic staging plan has been included in the Drawings and is generally as follows:

(a) Watermain renewal and temporary access construction in the fall of 2020;

(b) Culvert replacement from fall 2020 to spring 2021;

(c) Construction of culvert approach roadworks and temporary asphalt widening in east boulevard in spring 2021;

(d) Construction of southbound lanes;

(e) Temporary widening in west boulevard;

(f) Construction of northbound lanes with integral barrier curb;

(g) Construction of southbound dowelled barrier curb and monolithic concrete splash strip; and

(h) Construction of asphalt path.

D18.1.2 Placing the topsoil and finished grading of all boulevard and median areas shall be completed prior to commencing construction of asphaltic concrete pavements.

D19. CRITICAL STAGES

D19.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) Watermain Renewal – The Watermain Renewal (all items listed in D3.2(a)) shall be complete by October 20, 2020.

(b) Culvert Replacement Winter Work – The Culvert Replacement winter work (all items listed in D3.2(b)) shall be complete by March 31, 2021.

(c) Culvert Replacement Spring Work - The Culvert Replacement spring work (all items listed in D3.2(c)) shall be complete by June 8, 2021.

D19.2 When the Contractor considers the Work associated with the Critical Stages 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 instance and the Contract Administrator notified so that the Work can be re-inspected.

D19.3 The date on which the Critical Stages 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 Stages have been achieved.

D20. SUBSTANTIAL PERFORMANCE

D20.1 The Contractor shall achieve Substantial Performance by September 14, 2021.

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

D20.3 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.

D21. TOTAL PERFORMANCE

D21.1 The Contractor shall achieve Total Performance by September 21, 2021.

D21.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.

D21.3 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.

D22. LIQUIDATED DAMAGES

D22.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:

(a) Watermain Renewal – one thousand dollars ($1,000);

(b) Culvert Replacement Winter Work – three thousand dollars ($3,000);

(c) Culvert Replacement Spring Work – three thousand dollars ($3,000);

(d) Substantial Performance – three thousand five hundred dollars ($3,500);

(e) Total Performance – one thousand five hundred dollars ($1,500).

D22.2 The amounts specified for liquidated damages in D22.1 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.

D22.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D23. COVID-19 SCHEDULE DELAYS

D23.1 The City acknowledges that the schedule for this Contract may be impacted by the COVID-19 pandemic. Commencement and progress of the Work shall be performed by the Contractor with due consideration to the health and safety of workers and the public and directives from health authorities and various levels of government, and in close consultation with the Contract Administrator.

D23.2 If the Contractor is delayed in the performance of the Work by reason of the COVID-19 pandemic, the Work schedule may be adjusted by a period of time equal to the time lost due to such delay and costs related to such delay will be determined as identified herein.

D23.3 A minimum of seven (7) Calendar Days prior to the commencement of Work, the Contractor shall declare whether COVID-19 will affect the start date. If the Contractor declares that COVID-19 will affect the start date, the Contractor shall provide sufficient evidence that the delay is directly related to COVID-19, including but not limited to evidence related to availability of staff, availability of Material or work by others.

D23.4 For any delay related to COVID-19 and identified after Work has commenced, the Contractor shall within seven (7) Calendar Days of becoming aware of the anticipated delay declare the additional delay and shall provide sufficient evidence as indicated in D23.3. Failure to provide this notice will result in no additional time delays being considered by the City.

D23.5 The Work schedule, including the durations identified in D18 to D20 where applicable, will be adjusted to reflect delays accepted by the Contract Administrator. No additional payment will be made for adjustment of schedules except where seasonal work, not previously identified in the Contract, is carried over to the following construction season.

D23.6 Where Work not previously identified is being carried over solely as a result of delays related to COVID-19, as confirmed by the Contract Administrator, the cost of temporary works to maintain the Work in a safe manner until Work recommences, will be considered by the Contract Administrator. Where the Work is carried over only partially due to COVID-19, a partial consideration of the cost of temporary works will be considered by the Contract Administrator.

D23.7 Any time or cost implications as a result of COVID-19 and in accordance with the above, as confirmed by the Contract Administrator, shall be documented in accordance with C7.

D24. SCHEDULED MAINTENANCE

D24.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Sodding as specified in CW 3510;

(b) Native Grass Plantings and Weed Control as specified in E37; and

(c) Reflective Crack Maintenance during warranty period as specified in CW 3250.

D24.2 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

D25. JOB MEETINGS

D25.1 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.

D25.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D26. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D26.1 Further to C6.26, 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).

D27. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D27.1 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.

D28. WORK PRACTICES ON ASBESTOS CEMENT PIPE

D28.1 Further to C6.28(d), the Contractor's attention is directed to the possible health dangers associated with working with asbestos cement pipe. All work associated with the existing Asbestos-Cement (AC) water mains shall conform to the following publications:

(a) "Work Practices for Asbestos-Cement Pipe", AWWA No. M16, published by the American Water Works Association.

(b) "Recommended Work Practices for AC Pipe", 1977, published by the AC Pipe Producers Association.

D28.2 The Contractor shall state in the "job specific safe work plan" the proposed procedure for working with AC pipe. The Contractor shall also provide proof of asbestos handling training or certification.

D28.3 Asbestos Cement pipe shall be disposed at the City of Winnipeg's Brady Road Landfill site at an approved location in the landfill. Disposal of the Asbestos-Cement pipe, including any fees charged at the Brady Road Landfill will be considered incidental to the installation of the new PVC water main.

D29. ENVIRONMENTAL PROTECTION PLAN

D29.1 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.

D29.2 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;

(vii) The City of Winnipeg By-law No. 5888/92; and

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

D29.3 Applications for a City of Winnipeg Waterways permit, Manitoba Water Resources Authorization permit, and DFO Authorization permit are currently underway for this Work. The permits shall be provided to the Contractor when they are formally issued. The Contractor shall comply with the requirements outlined in the permits.

D29.4 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 Drawings or at a location approved by the Contract Administrator.

(ii) Any construction staging and material stockpiles are to be well removed from the riverbank and located in an area as approved by the Contract Administrator so that riverbank stability is not compromised. Under no circumstances are construction supplies or materials to be stored or stockpiled close to or on the riverbank. In general, stockpile locations should be located no closer to the creek than the southbound lane of Empress Street, or as otherwise directed by the Contract Administrator.

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

(iv) 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.

(v) 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 impervi8ous 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, refueling, 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 28.1 below) to 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 28.1
SPILLS THAT MUST BE REPORTED TO
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	K 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

TABLE 28.1 SPILLS THAT MUST BE REPORTED TO MANITOBA SUSTAINABLE DEVELOPMENT AS ENVIRONMENTAL ACCIDENTS		
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, 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 License 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 the Red River 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.

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

(iii) 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 unless otherwise approved by the Contract Administrator.

(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) 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 on City Streets of The City of Winnipeg, Public Works Department.

(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.

(n) Access

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

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

D30. WATER MANAGEMENT PLAN

D30.1 Provide the Contract Administrator with a water management plan at least five (5) Business Days prior to commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract.

D30.2 The Water Management Plan shall be prepared and submitted in a format that clearly identifies how the Contractor will undertake dewatering activities at the Site during construction.

D30.3 The Water Management Plan shall include provisions for drawing down the water table sufficiently to dewater the excavation to maintain dry conditions for construction. This will require the use of wells. The Water Management Plan shall be further updated or altered as dictated by Site conditions. The Water Management Plan shall remain in effect until all construction and backfill activities are completed.

(a) Subject to the approval of the Contract Administrator, water with negligible suspended solids may be pumped into the LDS sewer.

(b) For water containing suspended solids, provide alternative means to remove the water from the Site.

(c) Formal approval for pumping water into the LDS sewer system must be obtained from the Contract Administrator in writing seven (7) days prior to commencement of pumping.

D31. DEWATERING AND DRAINAGE DURING CONSTRUCTION

D31.1 In addition to C6, in coordination to D21 the Contractor is solely responsible for planning, implementing, maintaining and monitoring an effective dewatering and drainage system for the Site during performance of the Work.

D31.2 The Contractor is responsible for the control, diversion, storage and pumping of all water including without limitation rain, snow melt, groundwater, leaking infrastructure and water in pipes throughout all stages of the Work.

D31.3 Be aware, a portion of the Work involves excavation for the Primary Dike and it is anticipated that the excavation will penetrate a silt layer that may result in higher than average groundwater flows.

D31.4 Contractor shall only discharge to the land drainage system meeting in accordance with the requirements specified. The combined sewer system is ineligible to use for discharge.

D31.5 Do not pump or drain any water containing excessive suspended materials or harmful substances into waterways, sewers or other drainage systems. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with governing authority's limitations and requirements.

D31.6 The Contractor shall be responsible for all damages within or outside the Site directly resultant from Contractor's actions, omissions or neglect which may be caused by or which may result from water backing up, flowing through, overflowing or excessive surcharge of drainage systems.

D31.7 The Contractor shall organize and bear all costs related to the effective dewatering of excavations and all other pumping and drainage necessary for the proper execution of the Work, including keeping the pipes, structures, shafts, excavations and trenches free of undesirable accumulations of groundwater, seepage, surface water, melt water or rainwater.

D31.8 Dispose of all water drained or pumped as above by discharging it to drainage ditches or natural water course as reviewed by the Contract Administrator, and in compliance with all local, Municipal, Provincial and Federal environmental regulations, ordinances, bylaws, etc., and provide documentation indicating that authority has been granted to discharge effluent water into any drainage ditch, brook, creek or river. Contractor shall develop and implement at their own cost any filtration, settlement or other acceptable treatment methods required prior to disposal.

D31.9 Keep all drainage channels, gutters, swales, ditches, sewers, culverts and disposal areas free of silt, sand, debris and gravel and remove such deposits as required.

D31.10 Accept responsibility for any actionable damage, inconvenience or interference caused by the dewatering and drainage operations to the surrounding properties, yards, businesses, fields, houses, other buildings, roads, streets, approaches, driveways, utilities, services or other improvements which may be affected by a lowering or raising of the water table and bear all costs of repair, replacement, reinstatement or alteration of same.

D31.11 Dewatering and drainage during construction, including groundwater, will be considered incidental to the Contract and there will be no measurement and payment item for this portion of the Work

MEASUREMENT AND PAYMENT

D32. PAYMENT

D32.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D33. WARRANTY

D33.1 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.

D33.2 Notwithstanding C13.2 or D33.1, 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.

D33.2.1 In such case the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

THIRD PARTY AGREEMENTS

D34. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

D34.1 In the event that funding for the Work of the Contract is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, the following terms and conditions shall apply, as required by the applicable funding agreements.

D34.2 Further to D34.1, in the event that the obligations in D34 apply, actual costs legitimately incurred by the Contractor as a direct result of these obligations ("Funding Costs") shall be determined by the actual cost to the Contractor and not by the valuation method(s) outlined in C7.4. In all other respects Funding Costs will be processed in accordance with Changes in Work under C7.

D34.3 For the purposes of D34:

(a) **"Government of Canada"** includes the authorized officials, auditors, and representatives of the Government of Canada; and

(b) **"Government of Manitoba"** includes the authorized officials, auditors, and representatives of the Government of Manitoba.

D34.4 Modified Insurance Requirements

D34.4.1 If not already required under the insurance requirements identified in D10, the Contractor will be required to provide wrap-up liability insurance in an amount of no less than two million dollars ($2,000,000) inclusive per occurrence. Such policy will be written in the joint names of the City, Contractor, Consultants and all sub-contractors and sub-consultants and include twelve (12) months completed operations. The Government of Manitoba and its Ministers, officers, employees, and agents shall be added as additional insureds.

D34.4.2 If not already required under the insurance requirements identified in D10, the Contractor will be required to provide builders' risk insurance (including boiler and machinery insurance, as applicable) providing all risks coverage at full replacement cost, or such lower level of insurance that the City may identify on a case-by-case basis, such as an installation floater.

D34.4.3 The Contractor shall obtain and maintain third party liability insurance with minimum coverage of two million dollars ($2,000,000.00) per occurrence on all licensed vehicles operated at the Site. In the event that this requirement conflicts with another licensed vehicle insurance requirement in this Contract, then the requirement that provides the higher level of insurance shall apply.

D34.4.4 Further to D10.3, insurers shall provide satisfactory Certificates of Insurance to the Government of Manitoba prior to commencement of Work as written evidence of the insurance required. The Certificates of Insurance must provide for a minimum of thirty (30) days' prior written notice to the Government of Manitoba in case of insurance cancellation.

D34.4.5 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D34.5 Indemnification By Contractor

D34.5.1 In addition to the indemnity obligations outlined in C17 of the General Conditions for Construction, the Contractor agrees to indemnify and save harmless the Government of Canada and the Government of Manitoba and each of their respective Ministers, officers, servants, employees, and agents from and against all claims and demands, losses, costs, damages, actions, suit or other proceedings brought or pursued in any manner in respect of any matter caused by the Contractor or arising from this Contract or the Work, or from the goods or services provided or required to be provided by the Contractor, except those resulting from the negligence of any of the Government of Canada's or the Government of Manitoba's Ministers, officers, servants, employees, or agents, as the case may be.

D34.6 Records Retention and Audits

D34.6.1 The Contractor shall maintain and preserve accurate and complete records in respect of this Contract and the Work, including all accounting records, financial documents, copies of contracts with other parties and other records relating to this Contract and the Work during the term of the Contract and for at least six (6) years after Total Performance. Those records bearing original signatures or professional seals or stamps must be preserved in paper form; other records may be retained in electronic form.

D34.6.2 In addition to the record keeping and inspection obligations outlined in C6 of the General Conditions for Construction, the Contractor shall keep available for inspection and audit at all reasonable times while this Contract is in effect and until at least six (6) years after Total Performance, all records, documents, and contracts referred to in D34.6.1 for inspection, copying and audit by the City of Winnipeg, the Government of Manitoba and/or the Government of Canada and their respective representatives and auditors, and to produce them on demand; to provide reasonable facilities for such inspections, copying and audits, to provide copies of and extracts from such records, documents, or contracts upon request by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada and their respective representatives and auditors, and to promptly provide such other information and explanations as may be reasonably requested by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada from time-to-time.

D34.7 Other Obligations

D34.7.1 The Contractor consents to the City providing a copy of the Contract Documents to the Government of Manitoba and/or the Government of Canada upon request from either entity.

D34.7.2 If the Lobbyists Registration Act (Manitoba) applies to the Contractor, the Contractor represents and warrants that it has filed a return and is registered and in full compliance with the obligations of that Act, and covenants that it will continue to comply for the duration of this Contract.

D34.7.3 The Contractor shall comply with all applicable legislation and standards, whether federal, provincial, or municipal, including (without limitation) labour, environmental, and human rights laws, in the course of providing the Work.

D34.7.4 The Contractor shall properly account for the Work provided under this Contract and payment received in this respect, prepared in accordance with generally accepted accounting principles in effect in Canada, including those principles and standards approved or recommended from time-to-time by the Chartered Professional Accountants of Canada or the Public Sector Accounting Board, as applicable, applied on a consistent basis.

FORM H1: PERFORMANCE BOND
(See D10.1)

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

TENDER NO. 24-2020

Sherwin Road Reconstruction and Culvert Replacement over Omand's Creek
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: LABOUR AND MATERIAL PAYMENT BOND
(See D10.1)

KNOW ALL MEN BY THESE PRESENTS THAT

_____
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Principal"), and

_____ ,
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Surety"), are held and firmly bound unto **THE CITY OF WINNIPEG** (hereinafter called the "Obligee"), for the use and benefit of claimants as herein below defined, in the amount of

_____

_____ dollars ($_____.____)

of lawful money of Canada, for the payment whereof we, the Principal and the Surety jointly and severally bind ourselves firmly by these presents.

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

TENDER NO. 24-2020

Sherwin Road Reconstruction and Culvert Replacement over Omand's Creek

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 promptly make payment to all claimants as hereinafter defined, for all labour, service and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void, otherwise it shall remain in full force and effect subject, however, to the following conditions:

(a) A claimant is defined as one having a direct contract with the Principal for labour, service and material, or any of them, used or reasonably required for use in the performance of the contract, labour, service and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment (but excluding rent of equipment where the rent pursuant to an agreement is to be applied towards the purchase price thereof) directly applicable to the Contract;

(b) The above-named Principal and Surety hereby jointly and severally agree with the Obligee that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work, labour or service was done or performed, or materials were furnished by such claimant, may sue on this bond, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon;

(c) No suit or action shall be commenced hereunder by any claimant

    (i) unless claimant shall have given written notice to the Principal and the Surety above-named, within one hundred and twenty (120) days after such claimant did or performed the last of the work, labour or service, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work, labour or service was done or performed. Such notice shall be served by mailing the same by registered mail to the Principal, and Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the Province of Manitoba;

(ii) after the expiration of one (1) year following the date on which Principal ceased work on said Contract; including work performed under the guarantees provided in the Contract;

(iii) other than in a court of competent jurisdiction in the Province of Manitoba.

(d) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

(e) The Surety shall not be liable for a greater sum than the specified penalty of this bond.

The Principal and Surety hereby agree that The Guarantors' Liability Act (Manitoba) shall apply to this Bond.

IN TESTIMONY WHEREOF, the Principal has hereunto set its hand affixed its seal, and the Surety has caused these presents to be sealed and with its corporate seal duly attested by the authorized signature of its signing authority this

_____ 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 J: SUBCONTRACTOR LIST
(See D12)

Sherwin Road Reconstruction and Culvert Replacement over Omand's Creek

Portion of the Work	Name	Address
SURFACE WORKS		
Supply of Materials:		
Concrete		
Asphalt		
Base Course & Sub-base		
Geotextile		
Subdrains		
Sod		
Installation/ Placement:		
Excavation		
Subdrains		
Concrete		
Asphalt		
Concrete Joint Sealing		
Reflective Crack Maintenance		
Sod		
UNDERGROUND WORKS		
Supply of Materials:		
Catchbasins, Catchpits & Manholes		
Frames & Covers		
Watermain Pipe		
Watermain Appurtenances		
Installation & Placement:		
Catchbasins, Catchpits & Manholes		
Sewer Televising		
Watermain Installation		

FORM J: SUBCONTRACTOR LIST
(See D12)

Sherwin Road Reconstruction and Culvert Replacement over Omand's Creek

Portion of the Work	Name	Address
STRUCTRUAL		
Supply of Materials:		
Structural Concrete		
Black Reinforcement		
Stainless Steel Reinforcement		
Chainlink Fence		
Backfill		
Waterproofing Membrane		
Cellular Concrete		
Native Seeding		
Installation and Placement:		
Structural Concrete		
Black Reinforcement		
Stainless Steel Reinforcement		
Chainlink Fence		
Backfill		
Waterproofing Membrane		
Cellular Concrete		
Native Seeding		
OTHERS		

FORM K: EQUIPMENT
(See D13)

Sherwin Road Reconstruction and Culvert Replacement over Omand's Creek

1. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D13)

Sherwin Road Reconstruction and Culvert Replacement over Omand's Creek

4. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

E1.1 These Specifications shall apply to the Work.

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

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

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

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

E1.3 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B6. In every instance where a brand name or design specification is used, the City will also consider approved equals and/or approved alternatives in accordance with B6.

E1.4 The following are applicable to the Work:

Drawing No.	Drawing Name/Title
C319-20-01	Cover Sheet And Location Plan
C319-20-02	Drawing List And General Notes
C319-20-03	Bore Hole Logs
C319-20-04	Existing Conditions And Site Plan
C319-20-05	Proposed Scope Of Work
C319-20-06	General Arrangement
C319-20-07	Concrete Details 1
C319-20-08	Concrete Details 2
C319-20-09	Slab Reinforcing Details
C319-20-10	Wall Reinforcing Details
C319-20-11	West Headwall Reinforcing Details
C319-20-12	East Headwall Reinforcing Details
C319-20-13	South Approach Slab Concrete And Reinforcing Details
C319-20-14	Infill Slab Concrete And Reinforcing Details
C319-20-15	North Approach Slab Concrete And Reinforcing Details
C319-20-16	Bill Of Reinforcing
P-3531-01	Geometry - Saskatchewan Ave To Sta 0+360
P-3531-02	Geometry - Sta 0+360 To Sta 0+610
P-3531-03	Geometry - Sta 0+610 To Sta 0+880
P-3531-04	Geometry - Sta 0+880 To Sta 1+130
P-3531-05	Geometry - Sta 1+130 To Notre Dame Ave
P-3531-06	Paving & Grading - Saskatchewan Ave To Sta 0+210
P-3531-07	Paving & Grading - Sta 0+210 To Sta 0+330
P-3531-08	Paving & Grading - Sta 0+330 To Sta 0+450
P-3531-09	Paving & Grading - Sta 0+450 To Sta 0+570
P-3531-10	Paving & Grading - Sta 0+570 To Sta 0+690
P-3531-11	Paving & Grading - Sta 0+690 To Sta 0+810
P-3531-12	Paving & Grading - Sta 0+810 To Sta 0+930
P-3531-13	Paving & Grading - Sta 0+930 To Sta 1+050
P-3531-14	Paving & Grading - Sta 1+050 To Sta 1+170

Drawing No.	Drawing Name/Title
P-3531-15	Paving & Grading - Sta 1+170 To Sta 1+280
P-3531-16	Paving & Grading - Sta 1+280 To Notre Dame Ave
P-3531-17	Sections - Sta 0+250 And Sta 0+800
P-3531-18	Sections - Sta 0+840 And Sta 0+940
P-3531-19	Sections - Sta 0+990 And Sta 1+230
P-3531-20	Stage 1
P-3531-21	Stage 2
P-3531-22	Stage 3
P-3531-23	Stage 4
P-3531-24	Stage 5 & 6
P-3531-25	Stage 7 & 8
P-3531-26	Stage 9
P-3531-27	Staging - Sections
D-15769	Watermain Renewal - Sherwin Road - 9m S Of Dublin Avenue To 47m N Of Dublin Avenue

E2. MOBILIZATION AND DEMOBILIZATION

DESCRIPTION

E2.1 This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the project location(s).

E2.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E2.3 The inclusion of a payment item for the Work under this Specification shall not release or reduce the responsibilities of the Contractor under any other specification in this Contract.

SCOPE OF WORK

E2.4 Further to C12 of the General Conditions, where Mobilization and Demobilization is included as a bid item, it shall consist of the following, as applicable:

(a) Mobilization shall include, but not be limited to:
   (i) All activities and associated costs for transportation of the Contractor's personnel, equipment, and operating supplies to the Site, and/or Sites, and/or between Sites;
   (ii) Establishment of offices, buildings, other necessary general facilities and equipment parking/staging areas for the Contractor's operations at the Site or Sites;
   (iii) Premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable;
   (iv) General cleanup and housekeeping needed maintain a neat and orderly project Site and/or Sites;
   (v) Installation of construction/ Site fencing and protection of public measures;
   (vi) Other job related items.

(b) Demobilization shall include, but not be limited to:
   (i) All activities and costs for transportation of personnel, equipment, and supplies not used in the project from the Site, and/or Sites, and/or between Sites;
   (ii) Disassembly, removal, and Site cleanup and restoration of offices, buildings, and other facilities assembled on the Site and/or Sites;
   (iii) Repair of access roads, temporary haul roads, and equipment parking areas leaving the project Site in the same or better condition than at the start of the project;

(iv) General cleanup and housekeeping needed to restore a neat and orderly project Site.

E2.5 Access to the Site, equipment parking, and staging areas are limited to that shown on the drawings or as approved by the Contract Administrator.

MEASUREMENT AND PAYMENT

E2.6 Watermain Renewal – Mobilization / Demobilization

E2.6.1 Payment for Mobilization:

(a) 60% of the lump-sum price will be paid to the Contractor for Mobilization on the first Progress Estimate for the Contract.

E2.6.2 Payment for Demobilization:

(a) The remaining 40% of the lump-sum price will be paid upon:
  (i) Restoration of the Site and/or Sites to the satisfaction of the Contract Administrator;
  (ii) Completion of critical stage D19.1(a).

E2.6.3 Mobilization and Demobilization will be paid only once (to a maximum of 100%), regardless of the number of times the Contractor mobilizes to the Site and/or Sites.

E2.7 Structural – Mobilization / Demobilization

E2.7.1 Payment for Mobilization:

(a) 60% of the lump-sum price will be paid to the Contractor for Mobilization on the first Progress Estimate for the Contract.

E2.7.2 Payment for Demobilization:

(a) The remaining 40% of the lump-sum price will be paid upon:
  (i) Restoration of the Site and/or Sites to the satisfaction of the Contract Administrator;
  (ii) Completion of scope of work items critical stageD19.1(c).

E2.7.3 Mobilization and Demobilization will be paid only once (to a maximum of 100%), regardless of the number of times the Contractor mobilizes to the Site and/or Sites.

E2.8 Roadworks Mobilization / Demobilization

E2.8.1 The lump-sum price for the Roadworks Mobilization and Demobilization bid item shall not exceed five percent (5.00%) of the Total Roadworks bid price for the Contract (Part C of Form B).

E2.8.2 Further to B9, B17, C12 and E2.8, should the lump sum price exceed 5% of the Total Roadworks bid price for the Contract (Part C of Form B), the lump sum price will be reduced to 5% of the Total Roadworks bid price for the Contract (Part C of Form B), the Total Roadworks bid price for the Contract (Part C of Form B), will be determined using the reduced lump sum price and payment will be based on the reduced lump sum price.

E2.8.3 Payment for Mobilization:

(ii) 60% of the lump-sum price will be paid to the Contractor for Mobilization on the first Progress Estimate for the Contract.

E2.8.4 Payment for Demobilization:

(a) The remaining 40% of the lump-sum price will be paid upon:
  (i) Restoration of the Site and/or Sites to the satisfaction of the Contract Administrator;
  (ii) Distribution of the Declaration of Total Performance.

E2.8.5 Mobilization and Demobilization will be paid only once (to a maximum of 100%), regardless of the number of times the Contractor mobilizes to the Site and/or Sites.

E3. REPORTS

E3.1 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 reports in Appendix A.

E3.2 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.

E3.3 Any test borings made by the Bidder shall be done in accordance with the requirements of the appropriate authorities of the City of Winnipeg. Bidders shall notify the Contract Administrator prior to starting any soil boring operation.

E3.4 Further to C3.1, the preliminary Hydraulic Report is available upon request.

E4. OFFICE FACILITIES

E4.1 The Contractor shall supply office facilities meeting the following requirements:

(a) The field office shall be for the exclusive use of the Contract Administrator.

(b) The building shall be conveniently located near the site of the Work.

(c) The building shall have a minimum floor area of 30 square metres, a height of 2.4m with two windows for cross ventilation and a door entrance with a suitable lock.

(d) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either 16-18^{o}C or 24-25^{o}C.

(e) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three wall outlets.

(f) The building shall be furnished with one desk, one drafting table, table 3m X 1.2m, one stool, one four drawer legal size filing cabinet, and a minimum of 15 chairs.

(g) A portable toilet shall be located near the field office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and other personnel from the City.

(h) The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when he/she deems it necessary.

E4.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E4.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance.

E5. PROTECTION OF EXISTING TREES

E5.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

(a) The Contractor shall not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.

(b) Trees identified to be at risk by the Contract Administrator are to be strapped with 25 x 100 x 2400mm wood planks, or suitably protected as approved by the Contract Administrator.

(c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the

excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation.

(d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the work required. Equipment shall not be parked, repaired, 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.

E5.2 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/her designate.

E5.3 No separate measurement or payment will be made for the protection of trees.

E5.4 Except as required in clause E5.1(c) and E5.1(e), Elm trees shall not be pruned at any time between April 1 and July 31.

E6. TRAFFIC CONTROL

E6.1 Further to clauses 3.6, 3.7 and 3.8 of CW 1130:

(a) Where directed by the Contract Administrator, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planing drop-offs to the satisfaction of the Contract Administrator. Payment shall be in accordance with CW3410.

(b) In accordance with the Manual of Temporary Traffic Control on City Streets (MTTC), the Contractor ("Construction Agency" in the manual) shall be responsible for placing, maintaining and removing the appropriate temporary traffic control devices as specified by the MTTC or by the Traffic Management Branch of the City of Winnipeg Public Works Department. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by their own forces or subcontractor.

E6.2 Notwithstanding E6.1, in accordance with the MTTC, the Contract Administrator shall make arrangements with the **Traffic Services Branch of the City of Winnipeg** to place, maintain, and remove all **regulatory signs** and traffic control devices authorized and/or required by the Traffic Management Branch in the following situations:

(a) Parking restrictions,

(b) Stopping restrictions,

(c) Turn restrictions,

(d) Diamond lane removal,

(e) Full or directional closures on a Regional Street,

(f) Traffic routed across a median,

(g) Full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure.

(h) Approved Designated Construction Zones with a temporary posted speed limit reduction. Traffic Services will be responsible for placing all of the advance signs and 'Construction Ends' (TC-4) signs. The Contractor is still responsible for all other temporary traffic control including but not limited to barricades, barrels and tall cones.

E6.2.1 An exception to E6.2 is the 'KEEP RIGHT/KEEP LEFT' sign (RB-25 / RB-25L) which shall be supplied, installed, and maintained by the Contractor at their own expense.

E6.2.2 Further to E6.2, where the Contract Administrator has determined that the services of the Traffic Services Branch are required, the City shall bear the costs associated with the placement of temporary traffic control devices by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

E7. TRAFFIC MANAGEMENT

E7.1 Further to clause 3.7 of CW 1130:

E7.1.1 The Contractor shall follow the traffic staging plan included in the Drawings.

E7.1.2 Intersecting local street and private approach access shall be maintained at all times.

E7.1.3 Flag persons may be necessary to maintain the flow of traffic during certain work operations.

E7.1.4 Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, he/she shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.

E7.1.5 Ambulance/emergency vehicle access must be maintained at all times.

E8. WATER OBTAINED FROM THE CITY

E8.1 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

E9. SURFACE RESTORATIONS

E9.1 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 complete all surface restorations required to restore the facility to its intended design and restore full capacity of the facility 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. The cost may include but is not limited to temporary paving work, temporary roads, sidewalk, active transportation and cycling facilities, Winnipeg Parking Authority charges related to loss of parking revenue and all traffic signing costs including those of Traffic Services Department.

E10. PROVISIONAL ITEMS FOR WATERMAIN WORKS

E10.1 The Provisional Items listed in the Schedule of Prices are part of the Contract.

E10.2 The Contractor shall not perform Work included in the Provisional Items without prior authorization from the Contract Administrator. All Work included in the Provisional Items will be carried out within the construction area shown on the drawings.

E11. OPERATING CONSTRAINTS FOR WORK IN CLOSE PROXIMITY TO THE 900 MM FEEDERMAIN

E11.1 Description

E11.1.1 This Specification details operating constraints for all Work to be carried out in close proximity to the 900 mm Feedermain. Close proximity shall be deemed to be any construction activity within a 3 m offset from the centreline of the feedermain.

E11.2 General Considerations for Work in Close Proximity to the 900 mm Feedermain.

E11.2.1 Work around the 900 mm Feedermain shall be planned and implemented to minimize the time period that Work is carried out in close proximity the Feedermain and to ensure that the pipeline is not subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement.

E11.2.2 Precaution must be undertaken to ensure that applied loading during all phases of construction is within accepted loading parameters.

E11.3 Protection of the 900 mm Feedermain During Construction

E11.3.1 The Drawings provide the location of the Feedermain through the construction Site. Pipe locations noted on the Drawings are based on the original record drawings.

E11.3.2 The Contractor shall determine pipeline location and obvert elevation at locations marked out by the Contract Administrator by soft excavation methods (hydrovac or hand digging) prior to the start of construction.

(a) Exposure of the Feedermain shall be completed in the presence of the Contract Administrator;

(b) Payment for soft excavation shall be included in the installation of the water main renewal.

E11.3.3 Contractors working in close proximity to the Feedermain shall meet the following conditions and technical requirements:

(a) Pre-Work, Planning and General Execution

(i) No Work shall commence in close proximity to the feedermain until after a meeting has taken place with a representative from each of the City of Winnipeg Water and Waste Department, Contract Administrator and Contractor. The meeting will review this Specification. Also, the meeting will verify that the feedermain location has been clearly delineated in the field.

(ii) Notify the Contract Administrator 7 days prior to commencement of any work near the feedermain.

(iii) For transverse crossings of the feedermain in support of pavement construction activities, designate crossing locations and confine equipment crossing the pipe to these locations. Reduce equipment speeds to levels that minimize the impacts of impact loading.

(iv) For construction Work activities either longitudinally or transverse to the alignment of the feedermain, Work only with equipment and in the manner that meet the requirements noted herein.

(v) Subgrade, subbase and base construction shall be kept in a rut free condition at all times. Construction equipment is prohibited from crossing pipelines if the grade is insufficient to support the equipment without rutting.

(vi) Granular material, construction material, soil or other material shall not be stockpiled on the pipelines or within 3.0 metres of the pipe centerline.

(vii) Where Work is in proximity to the feedermain, utilize construction practices and procedures that do not impart excessive vibration loads on the feedermain or that would cause settlement of the subgrade below the feedermain.

E11.3.4 Construction Methods:

(a) Excavation

(i) All excavation required within 3.0 metres of the pipe centerline either adjacent to or over the feedermain, utilize only smooth edged excavation bucket, soft excavation or hand excavation techniques.

(ii) Offset backhoe from feedermain a minimum of 2.5 meters from feedermain centerline, to carry out excavation.

(iii) All materials intended for backfill shall not be dumped directly on pipelines but shall be carefully bladed in place

(b) Subgrade Construction

(i) Subgrade compaction shall be limited to static compaction methods

(ii) Stage Work activities to minimize the time period that unprotected subgrade is exposed to the environment and protect the subgrade against the impacts of adverse weather if subbase/ base course construction activities are not sequential with excavation.

(c) Subbase and Base Course Construction

(i) Subbase or base course materials shall not be dumped directly on pipelines but shall be carefully bladed in-place.

(ii) Subbase compaction shall be either carried out by static methods without vibration or with smaller approved equipment such as hand held plate packers or smaller roller equipment

E12. WATER SERVICE INTERUPTIONS TO BUSINESSES

E12.1 Should the Contract Administrator require that Work be carried out at night, on weekends, on Public Holidays where required to minimize water service interruptions on this project, the Contractor shall comply without additional compensation being considered to meet the requirement.

E12.2 Water shutdowns to businesses will be arranged by the Contract Administrator in consultation with the business owner.

E12.3 The Contractor shall schedule shut downs in accordance with those arrangements made in E12.2.

E12.4 The Contractor shall be required to submit a work plan satisfactory to the Contract Administrator seven (7) days prior to any construction activities to illustrate how the work will be performed to minimize or eliminate water shut downs of this project. The plan will be reviewed by the Contract Administrator and revised by the Contractor as required.

E12.5 No additional payment will be made for measures taken to minimize water services disruptions

E13. SUPPLY AND INSTALL WATER MAIN AND WATER SERVICE INSULATION

DESCRIPTION

E13.1 Notwithstanding 3.12 of CW 2110, this specification covers the supply and installation of insulation in roadway excavations over watermains and water services.

E13.2 Referenced Standard Construction Specifications

(a) CW 2030 – Excavation Bedding and Backfill

(b) CW 3110 – Sub –grade, Sub-base and Base Course Construction

E13.3 Referenced Standard Details

(a) SD-018 - Watermain and Water Service Insulation

MATERIALS

E13.4 Acceptable insulation is:

(a) Extruded Polystyrene rigid foam insulation – Type 4, 4” in thickness.

DOW - Roofmate or Highload 40

Owen’s Corning - Foamular 350 or Foamular 400.

2" X 48" X 96", 2" X 24" X 96", 4" X 24" X 96"

E13.5 Sand Bedding :

(a) In accordance with CW 2030

CONSTRUCTION METHODS

E13.6 Prior to the installation of any sub-base material or geotextile material, locate all existing water services. Further to SD-018, where directed by the Contract Administrator, excavate the sub-grade to allow the top of the insulation to be installed flush with the surrounding sub-grade. Install the insulation on a level surface centered over the located watermain or water service for the full width of the roadway excavation. Install sand bedding if required to level the surface. Stockpile and dispose of excavated material in accordance with CW 3110.

E13.7 Thickness of insulation is 100 mm (4"). If using 50 mm (2") panels 2 layers are required. Total width of insulation to be as directed by the Contract Administrator. Place sufficient full width panels to meet or exceed the specified width.

E13.8 Place insulation panels adjacent to each other over the specified area with no gaps between panels and less than 15mm of elevation difference along the adjoined edges. Where 2" thick panels are being used, offset the top layer to prevent the panel joints from aligning with the joints in the lower layer.

E13.9 Use full panels of insulation where possible. Where necessary cut insulation panels to obtain coverage to specified lengths. Insulation pieces shall be a minimum of dimension of 300 mm in width or length.

E13.10 Take appropriate measures to ensure panels are not displaced when installing geotextiles and during backfilling operations.

MEASUREMENT AND PAYMENT

E13.11 Watermain and Water Service Insulation shall be measured on an area basis and paid for at the Contract Unit Price per square metre of "Watermain and Water Service Insulation". The area to be paid for shall be the total square meters of watermain and water service insulation supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

(a) Excavation of the roadway subgrade in accordance with E13.6 will not be measured for payment and will be included in the payment for "Watermain and Water Service Insulation".

E14. WATER MAIN ENCASEMENT PIPE

E14.1 Encasement Pipe

(a) Encasement pipe to be installed by Trenchless Technologies only. Face of excavation to be no closer to the creek then the start and end of the encasement pipe.

(b) Encasement pipe shall be 500 mm diameter IPEX Centurion AWWA C900 DR18 or approved equal.

E14.2 Water Main Encasement Pipe and the Water Main within the encasement pipe shall be measured on a length basis and paid for at the Contract Unit Price per metre of "Water Main Renewal within an Encasement pipe, Class B Sand Bedding, Class 3 Backfill". The length to be paid for shall be the length water main and water main encasement pipe supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

E14.3 Casing Spacers

(a) Casing Spacers shall be PSI Ranger II Midi 50

(b) Casing spacers shall be installed to support the PVC water main within the encasement pipe. Casing spacers shall be installed within 0.3 metres on each side of a bell and there shall be a total of 4 (four) spacers equally spaced per pipe length.

(c) No separate measurement or payment will be made for the supply and installation of the casing spacers. Supply and installation of the casing spacers will be considered included in the unit price bid for the water main installed within an encasement pipe.

E14.4 Link-Seal

(a) Link-Seal Model S61 Only to be used to seal both ends of the encasement pipe.

(b) No separate measurement or payment will be made for the supply and installation of the Link-Seal. Supply and installation of the Link-Seal will be considered included in the unit price bid for the water main installed within an encasement pipe.

E15. REMOVAL OF EXISTING BOLLARDS

DESCRIPTION

E15.1 This Specification shall cover the removal of existing bollards on the active transportation path where shown on the Drawings.

CONSTRUCTION METHODS

E15.2 Removal of Existing Bollards

E15.2.1 Before commencement of any work, the Contractor shall consult with the Contract Administrator as to which bollards shall be removed.

E15.2.2 The Contractor shall remove all bollards designated for removal including any concrete bases to 1 metre below proposed grade. The Contractor shall load and haul all materials from the Site and dispose of these materials in accordance with Section 3.4 of CW 1130.

MEASUREMENT AND PAYMENT

E15.3 Removal of Existing Bollards

E15.3.1 Removal and disposal of bollards will be measured on a unit basis and paid for at the Contract Unit Price for “Removal of Existing Bollards”. The number to be paid for will be the total number of bollards removed and disposed of in accordance with this Specification, accepted and measured by the Contract Administrator.

E15.3.2 No separate measurement or payment shall be made for the removal and disposal of any concrete bases.

E16. TREE REMOVAL

E16.1 Description

E16.1.1 This Specification shall supplement CW3010 – Clearing and Grubbing and cover the removal of individual trees outside of the designated “Clearing and Grubbing” areas designated for removal by the Contract Administrator. The Work shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work.

E16.2 Construction Methods

E16.2.1 Tree Removal

(a) Before commencement of any work, the Contractor shall consult with the Contract Administrator as to which trees and/ or shrubs shall be removed. All other trees and

shrubs shall be protected against damage from all construction activity in accordance with E5, Protection of Existing Trees.

(b) All trees designated for removal shall be removed no later than April 1, 2021.

(c) Trees to be removed are to be felled so as to land within the limits of the works. The Contractor shall take all precautions to prevent damage to traffic, structures, pole lines, adjacent property and to trees and shrubs designated to be saved, and he shall be liable for any damages occurring in the performance of this work.

(d) The Contractor shall cut down all trees and shrubs designated for removal and grub out all stumps and roots. The Contractor shall load and haul all trees, stumps, roots, logs, brush, rubbish and all other surface litter from the Site and dispose of these materials at dumps located by the Contractor and approved by the Contract Administrator.

E16.3 Measurement and Payment

E16.3.1 Measurement for payment shall be based on the Diameter at Breast Height (D.B.H.) measured at 145 cm above ground level on trees with single trunks. On trees with double or multiple trunks the following rules shall apply:

(a) Where a single diameter measurement is possible above ground, the measurement will be made at a point just below the junction of the trunks where the total tree diameter is not influenced by the junction or the basal flare;

(b) Where a single diameter measurement above ground is not possible, then the total tree diameter will be based on the D.B.H. (measured at 145 cm above ground level) of the largest trunk plus ½ the D.B.H. of each subsequent trunks;

(c) Situations regarding the measurement of any tree not falling into one of the above categories must be referred to the Contract Administrator immediately for a decision prior to removal

E16.3.2 Removal of Trees will be paid for at the Contract Unit Price for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for removing and disposing all tree materials and for completing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work:

Tree Removal

(a) 0 to 10 cm diameter

(b) 11 to 30 cm diameter

(c) Over 30 cm diameter

E17. REMOVE, SALVAGE AND REINSTALL EXISTING BRICK RETAINING WALL

DESCRIPTION

E17.1.1 This Specification shall cover the removal, salvage and reinstallation of an existing brick retaining wall at 2070 Notre Dame Avenue to accommodate the Work. The Work shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work.

CONSTRUCTION METHODS

E17.2 Remove and Reinstall Existing Brick Retaining Wall

E17.2.1 Before commencement of any Work, the Contractor shall consult with the Contract Administrator to confirm the limits of removal as shown on the Drawings.

E17.2.2 The Contractor shall store all brick material in a safe location until it is required for reinstallation.

E17.2.3 Any damage to the existing brick material that has not been identified prior to removal will be repaired or replaced by the Contractor at his own expense.

E17.2.4 The Contractor shall reinstall the brick retaining wall at the locations shown on the Drawings and as indicated by the Contract Administrator to match the existing installation to the satisfaction of the Contract Administrator.

E17.2.5 Surplus bricks shall be given to the property owner and if not wanted disposed of by the Contractor in accordance with CW 1130.

MEASUREMENT AND PAYMENT

E17.3 Remove and Reinstall Existing Brick Retaining Wall

E17.3.1 Removal, salvage, and reinstallation of existing brick retaining wall will not be measured and will be paid for on a lump sum basis at the Contract Lump Sum Price for "Remove, Salvage, and Reinstall Existing Brick Retaining Wall" which price shall include all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work described in this Specification.

E18. SHOP DRAWINGS

E18.1 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.

E18.2 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.

E18.3 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.

E18.4 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.

E18.5 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.

E18.6 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.

E19. VERIFICATION OF WEIGHTS

E19.1 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.

E19.2 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.

E20. CREEK FLOW MAINTENANCE

E20.1 Description

(a) This Specification shall cover all operations relating to maintaining flows in Omand's Creek 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.

(c) The Contractor shall refer to the “Hydraulic Report” for hydraulic information regarding Omand’s Creek. While the Critical Stage date for in water works, noted in D18 and D28 "Environmental Protection Plan” requires that all in-water work be completed as noted therein, the Contractor is reminded that spring runoff in the creek may be present prior to these dates.

(d) The Hydraulic Report is available for viewing upon request.

E20.2 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 Omand’s Creek;

(v) Constructing cofferdams and dewatering in Omand’s Creek; and

(vi) Complying with all requirements outlined in D29, “Environmental Protection Plan”.

E20.3 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 D29, “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.

E20.4 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.

E20.5 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 D19. 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 D28.4 (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 Omand's 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 Omand's 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 E20.5 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 Omand's 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 Omand's Creek is

dewatered. As part of the submittals noted in E20.3, 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 E22 “Rockfill Shear Keys”.

(v) Coordination will be required for scheduling of bank stabilization operations, culvert demolition and removals, creek bank excavation and structural backfill. Refer to E21 “Creek Bank Excavation”, E22 “Rockfill Shear key”, E26 “Culvert Demolition and Removals”, and E27 “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 Omand’s 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 D29 “Environmental Protection Plan”. Specific sediment and erosion control measures are outlined in E23, “Silt Fence Barrier” and E24, “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.

E20.6 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%

E21. CREEK BANK EXCAVATION

E21.1 Description

(a) This Specification shall cover all operations related to the excavation of material for the structural culvert works and surface excavation near Omand’s 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 E20 “Creek Flow Maintenance”, E26 “Culvert Demolition and Removals” and E22 “Rockfill Shear key”.

(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.

E21.2 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.

E21.3 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 D29, “Environmental Protection Plan”.

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.

E21.5 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.

E21.6 Equipment

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

E21.7 Construction Methods

(a) Excavation – 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) 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.

(i) 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 D29, “Environmental Protection Plan” and E20, “Creek Flow Maintenance”. Specific sediment and erosion control measures are outlined in E23, “Silt Fence Barrier” and E24, “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.

E21.8 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.

E21.9 Measurement and Payment

(a) Creek Bank Excavation

(ii) 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.

E22. ROCKFILL SHEAR KEYS

E22.1 Description

(a) This specification shall cover all operations related to the construction of Rockfill Shear Keys along Omand's Creek, 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. Coordinate activities in accordance with E20 "Creek Flow Maintenance", E21 "Creek Bank Excavation", and E26 "Culvert Demolition and Removals".

E22.2 Scope of Work

(a) The scope of this Work is not necessarily confined to the following, which is compiled as a general outline:

(i) Excavation and disposal of excavated material.

(ii) Supply and placement of all backfill materials.

(iii) Compaction of backfill materials.

E22.3 Materials

(a) General

(i) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator. There shall be no charge for any materials taken by the Contract Administrator for testing purposes.

(ii) The Contractor shall supply all materials incidental to these Works. All materials must be on hand prior to commencement of the Work.

(b) Rockfill for Shear Keys

(i) Backfill for Rockfill Shear Keys shall consist of sound, dense, durable crushed limestone with the following requirements:

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

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

(iii) maximum soundness loss of 13% (ASTM C88),

(iv) maximum absorption of 2.5% (ASTM C127)

(v) The material shall be free from organics, roots, silt, clay, snow, ice or any other deleterious material.

(vi) Gradation that conforms to the following:

Canadian Metric Sieve Size (mm)	Percent of Total Dry Weight Passing Sieve
100	97 – 100
25	30 – 50
0.08	0 - 8

(c) Clay Cap

(i) The clay cap at the top of the rockfill shear key may be salvaged from the on-site excavation, as approved by the Contract Administrator. Frozen material will not be accepted.

(d) Acceptance of Material

(i) The Contractor shall supply a representative sample of rockfill to TREK Geotechnical Inc. for approval at least ten (10) days prior to the commencement of construction. The Contract Administrator will advise the Contractor as to the

size of the samples required. Additional testing of samples shall be undertaken in the event the initial sample does not meet specification requirements.

(ii) The Contractor shall identify the supplier and location of the manufacturer of rockfill material and confirm that sufficient quantity of the specified material is available.

(iii) The Contractor shall provide, at no additional cost, whatever facilities are required to assist the Contract Administrator in checking rockfill gradation during construction.

(iv) Material deemed unacceptable by the Contract Administrator under these provisions shall be removed off-site at the Contractors expense.

E22.4 Construction Methods

(a) Compaction Testing Program

The Contractor shall carry out a Compaction Testing Program to facilitate quality control during construction. This program shall be carried out to demonstrate that the means, methods and techniques of compaction proposed by the Contractor are consistent with achieving the degree of compaction specified.

The Contractor shall provide all necessary labour, material and equipment necessary to carry out the compaction testing program. All testing shall be carried out in the presence of the Contract Administrator. Minimum requirements for the testing program will include:

(i) The first 3 m of shear key shall be used as a test trench. Additional test trenches (if required) shall be located immediately adjacent to completed test trenches. The test trench shall be excavated to the lines and grades shown on the drawings and backfilled as noted herein.

(ii) Placement of the backfill material shall be in maximum lift thicknesses (prior to compaction) of 400 mm, if compacted using a hoe-pack. If a direct-insertion vibratory probe will be used for compaction, the trench may be backfilled in full prior to compaction. The equipment to be used and methods to backfill and compact the ribs shall be subject to review and acceptance by the Contractor Administrator.

(iii) Compaction of the backfill in the manner proposed for construction to achieve a maximum apparent field density. The degree of compaction will be determined by measurement of the volume of backfill material before and after compaction.

(iv) Such other testing as necessary to demonstrate that the Contractor's proposed means, method(s), techniques and equipment are consistent with achieving the specified degree of compaction during construction.

As a result of the Compaction Testing Program, the Contractor must establish the following:

(i) the compaction equipment proposed for use

(ii) the protocol for operations

(iii) degree of compactive effort required

No construction of shear keys shall commence until the Contractor has demonstrated through the Compaction Testing Program that the proposed methods of compaction will meet the specified requirement for each portion of the works. Acceptance of the Compaction Testing Program shall in no way relieve the Contractor from his contractual obligation of achieving the maximum apparent field density during construction.

(b) Excavation

(i) The Contractor shall excavate the shear key to the lines and grades shown on the Drawings. If additional excavation or flattening of side slopes is necessary, the Contractor shall notify the Engineer and seek approval prior to proceeding.

(ii) The Contractor is advised that the excavations required for shear keys do not satisfy Workplace Health and Safety guidelines for safe excavation slopes to permit personnel working upslope of shear key slopes or in the excavation. The

Contractor shall incorporate this consideration in their Safe Work Plan.

(iii) The Contractor shall maintain a dry excavation and will be required to take the necessary corrective actions to prevent surface water from entering the excavation. Dewatering of shear key excavations will not be required.

(c) Backfilling and Compaction

(i) Excavation and backfilling of shear keys shall be a continuous operation whereby any opened excavations shall be backfilled immediately. Excavations shall not be left open overnight.

(ii) Care shall be taken to prevent contamination of the crushed limestone backfill. Should contamination of the backfill occur, the affected backfill shall be removed and disposed as directed by the Contract Administrator.

(iii) The Contractor shall monitor his compaction operations during construction to ensure the compaction methods selected based on the Compaction Testing Program are consistently achieving the specified results.

(iv) The Contractor shall advise the Contract Administrator of any modifications to his proposed methods that are required if the required degree of compaction is not being achieved.

(d) Clay Cap

(i) The rockfill shear key shall be sealed with a clay cap as shown on the Drawings.

(ii) The clay cap material shall be placed within the rockfill shear key and compacted by mechanical means to eliminate any voids in the clay cap

E22.5 Measurement and Payment

(a) Compaction testing program

(i) The Compaction Testing Program shall be incidental to Rockfill Shear Key construction.

(b) Rockfill Shear Key Construction

(i) Rockfill Shear Key construction shall be measured on a weight basis and paid for at the Contract Unit Price per tonne for “Rockfill Shear Key” for the total number of tonnes of backfill measured by truck weight scale tickets, constructed in accordance with this specification as accepted by the Contract Administrator.

(ii) The Contractor is to supply all truck weight scale tickets to the Contract Administrator by the end of each work day.

(iii) Excavation, disposal of excavated soil, and supplying, loading, hauling, placing and compacting rockfill shall be considered incidental to the Work.

(iv) The backfill used in the Compaction Testing Program shall be included in the quantity for payment.

(c) Clay Cap

(i) Clay cap construction shall be considered incidental to Rockfill Shear Key, and no separate measurement or payment will be made for this Work.

E23. SILT FENCE BARRIER

E23.1 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 D29, “Environmental Protection Plan”.

(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.

E23.2 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;

E23.3 Scope of Work

(a) The Work under this Specification shall include the following items as 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 D29, “Environmental Protection Plan”.

E23.4 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.

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.

(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 24.1
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.

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

E23.7 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 Omand's 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 D29, "Environmental Protection Plan" to prevent deleterious substances from entering into Omand's 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 Omand's 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 D29, "Environmental Protection Plan" and E20, "Creek Flow Maintenance".

E23.8 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.

E23.9 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.

E24. EROSION CONTROL BLANKET (ECB)

E24.1 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 E23, "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.

E24.2 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.

E24.3 Scope of Work

(a) The Work under this Specification shall include the following items as 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 D29, "Environmental Protection Plan".

E24.4 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.

E24.5 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.

E24.6 Equipment

(a) General

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

E24.7 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 Omand's 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 D29, "Environmental Protection Plan" and E20, "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.

E24.8 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.

E24.9 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.

E25. SOFT EXCAVATION TO EXPOSE UNDERGROUND UTILITIES

E25.1 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.

E25.2 Materials

(a) Backfill Material

(i) Backfill material for backfill of shafts after soft-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”.

E25.3 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 or as shown on the Drawings.

E25.4 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.

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

E26. CULVERT DEMOLITION AND REMOVALS

E26.1 Description

(a) Description

(i) This Specification shall cover all operations related to the demolition and removal of the entire existing culverts 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 CSP culverts and previous structural elements;
- 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 to facilitate the removals and demolition of the existing culverts and previous structural elements.

E26.2 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.

E26.3 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.

E26.4 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.

E26.5 Equipment

(a) General

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

E26.6 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 E6 “Traffic Control” and E7 “Traffic 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 anynew 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 D29 “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 east side of Sherwin Road, and an abandoned Hydro gas line on the west side of Sherwin Road;

(iii) Manitoba Hydro Telecom Fibre on the west side of Sherwin Road;

(iv) BellMTS on east side of Sherwin Road;

(v) City of Winnipeg Watermain on Sherwin Road; and

(vi) City of Winnipeg Conc sewer on Sherwin Road.

(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 D29 “Environmental Protection Plan” and E20 “Creek Flow Maintenance”. Specific sediment and erosion control measures are outlined in E23 “Silt Fence Barrier” and E24 “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.

E26.7 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.

E27. STRUCTURAL BACKFILL

E27.1 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.

E27.2 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.

E27.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Supply and placing sub-base material under the culvert and footings;

(ii) Supply and placing graded material behind the headwalls, retaining wall, and wingwalls.

(iii) Supply and placing sub-base material around the culvert.

(iv) Supply and placing compacted base course under the approach slabs and asphalt pathway.

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

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

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 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.

E27.5 Equipment

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

E27.6 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, shall be clean and free from organic material, meeting the gradation requirements of Table CW 3110.1 Granular A in Specification CW 3110.

(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) Graded Granular Fill

(i) Graded granular fill shall consist of pit-run sand and gravel consisting of round particles and satisfying the following gradation:

Sieve Size (mm)	Min Passing	Max Passing
1.25	85%	100%
0.425	30%	70%
0.075	0%	10%

E27.7 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 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) The Contractor shall be required to provide necessary water or equipment during compaction of backfill material to achieve the required densities.

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

(v) 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.

(vi) 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.

E27.8 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.

E27.9 Measurement and Payment

(a) The backfilling required around the culvert, 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) Items of Work:
Structural Backfill

(i) Base Course Material – Granular A;

(ii) Graded Granular Fill; and

(iii) Granular Sub-Base Course Material.

E28. SUPPLYING AND PLACING REINFORCING STEEL

E28.1 Description

(a) This Specification shall cover all operations relating to the supply, fabrication, delivery, and placement of black steel reinforcing and stainless 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.

E28.2 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 Barsfor Concrete Reinforcement;

(ii) ASTM A955M – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcing;

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

(iv) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of

Concrete Construction/Methods of Test for Concrete;

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

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

E28.3 Scope of Work

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

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 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) 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 Certificate of Compliance from the Manufacturer stating that the stainless steel materials supplied comply with the provisions of ASTM A955M and these Specifications, including corrosion resistance.

(d) 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).

E28.5 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) Handling and Storage of Stainless Steel Reinforcing

(i) Stainless steel reinforcing shall be stored separately from other reinforcing steel with the bar tags maintained and clearly visible until placing operations commence. Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.

(ii) Chains for steel bands used for shipping shall not be in direct contact with stainless steel reinforcing. Wood or approved alternate should be used to protect the bars

(iii) Nylon or polypropylene hslings shall be used for moving stainless steel reinforcing.

(iv) Keep carbon steel tools, chains, slings, etc. off stainless steel reinforcing.

(d) Reinforcing Steel

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

(ii) All black reinforcing steel shall conform to the requirements of CSA Standard CAN/CSA G30.18-M92, Grade 400W, Billet-Steel Bars for Concrete Reinforcement.

(iii) Stainless steel reinforcing as shown on the Drawings shall meet or exceed the minimum requirements of ASTM A955M, 300 Series, minimum Grade 420, of the Types listed below in Table E29.1, “Type of Stainless Steel Reinforcing”. Reinforcing deformations shall conform to the requirements of ASTM A615M. All hooks and bends shall be bent using pin diameters and dimension recommended by Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

(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 and ASTM A955M.

TABLE 29.1
TYPE OF STAINLESS STEEL REINFORCING

Common or Trade Name	AISI Type	UNS Designation
Type 316 LN	316 LN	S31653
Type 2205	Duplex 2205	S31803
Type 2304	Duplex 2304	S32304

(e) 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 for black reinforcing or stainless steel, fully annealed 1.6 mm diameter wire, Type 316 or 316L for stainless steel reinforcing.

(vi) 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.

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.

(ii) All tools used for stainless steel reinforcing shall be stainless steel and shall not be contaminated with iron or non-stainless steel.

E28.7 Construction Methods

(a) Fabrication of Reinforcing Steel

(a) General

(i) Reinforcing steel shall be fabricated in accordance with CSA Standard CAN/CSA G30.18-M92 to the lengths and shapes as shown on the Drawings.

(b) Black Steel Reinforcing

(i) Heating shall not be used as an aid in bending black steel reinforcing.

(ii) Hooks and bends should be smooth and not sharp.

(iii) Fabrication of the black steel reinforcing shall be straight and free of paint, oil, mill scale, and injurious defects.

(c) Stainless Steel Reinforcing

(i) Heating shall not be used as an aid in bending stainless steel reinforcing.

(ii) Hooks and bends should be smooth and not sharp.

(iii) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and/or non-stainless steel or damage to the surface of the bars.

(iv) The stainless steel reinforcing shall be mechanically or chemically de-scaled prior to fabrication, leaving a totally passive stainless steel finish free of millscale, slag, or oxidation. Iron contamination shall be removed with picking paste or by wire brushing. Wire brush cleaning shall be done with stainless steel wire brushes only.

(v) All hand tools shall be stainless tools that have not been used on carbon steel.

(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 maybe 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 E28.5(e) “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) Placing Stainless Steel Reinforcing

(i) Stainless steel reinforcing will be rejected if:

(i) Any area of contamination of the stainless steel by iron exceeds 100 mm in length;

(ii) Two or more areas of iron contamination greater than 25 mm in length occur along the length of the bar; or

(iii) There are frequent small occurrences of rust contamination along the full length of the bar.

(ii) If stainless steel reinforcing bars have been rejected due to excessive iron contamination, the Contractor may attempt to treat the bar to remove the contamination. This treatment can be accomplished by mechanical cleaning with a stainless steel wire brush, or by a polishing machine, or by chemical treatment, pickling. If the treatment(s) are not successful, the contaminated bar(s) shall be replaced at no cost to the City.

(iii) If the stainless steel reinforcing is mechanically damaged, the bars will be rejected and the Contractor shall replace the rejected bars at no cost to the City. Any cuts into a bar, sharp tears, or flattening of the deformations on the bars will be cause for rejection.

(iv) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections may be tied.

(v) All tools used for placing shall be stainless steel and shall not be contaminated with iron or non-stainless steel.

(vi) For lapping steel reinforcing bars at the joints and intersection, an ample supply of stainless steel wire shall be provided. The wire shall not be contaminated with non stainless steel.

(vii) Proper stainless steel cutting pliers shall be used and the bending and tying of the wires done as neatly as possible.

(viii) Twisted ends of the tie wire shall be bent away from forms and surfaces so that they do not project into the concrete cover over the reinforcing steel.

(d) 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.

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.

(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.

E28.9 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.

E28.10 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 the “Items of Work ”listed here below 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.

(b) Items of Work:

Supply and Placing Reinforcing Steel

i) Black

ii) Stainless Steel

E29. STRUCTURAL CONCRETE

E29.1 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.

E29.2 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.

E29.3 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 Bottom Slabs, Walls, and Top Slabs;
(iii) Head Walls;
(iv) Wing Walls;
(v) Retaining Walls;
(vi) Approach Slabs;
(vii) Infill Slabs;
(viii) Footings;
(ix) Safety Curbs;
(x) Working Base Concrete.

E29.4 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;
(viii) Quantity of other admixtures; and
(ix) Dosage and type of synthetic fibres.

(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) The Contractor shall submit at a minimum, the test data to prove that the minimum compressive strength, flexural performance and post-cracking residual strength index (Ri) for Fibre Reinforced Concrete (FRC) only, air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. Testing of Ri of concrete shall be completed in accordance with E29.8(e).

(iii) Testing for air void system shall be completed in accordance with E29.8(e)(iii).

(iv) Testing for rapid chloride permeability shall be completed in accordance with E29.8(e)(iv).

(v) 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.

E29.5 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.

(ii) Concrete shall have nominal comhpressive strengths (f'c) and meet the requirements for hardened concrete as specified in the following Table 29.1.

TABLE 29.1
REQUIREMENTS FOR HARDENED CONCRETE

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Minimum Post Residual Cracking Index
Type 1	Approach Slabs, Infill Slab and Safety Curbs	35 @ 28 days	C-1	1	20 mm	Synthetic Fibres	0.15
Type 2	All other structural elements	35 @ 28 days	F-1 & S-1	1	20 mm	-	-

(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) Synthetic Fibres

(i) The synthetic fibres shall consist of one hundred percent (100%) virgin polypropylene or one hundred percent (100%) virgin polylefin as accepted by the Contract Administrator. The dosage shall be designed by the Contractor to meet the requirements for post-cracking residual strength index (Ri).

(i) 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.

(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) 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".

(bb) 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".

E29.6 Equipment

(b) General

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

(c) 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.

E29.7 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, E29.7(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) 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.

(f) 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 Structural Concrete works.

(g) 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 29.1, “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.

(h) 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.

(i) 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.

(j) 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 E29.5(r) “Patching Mortar”, E29.5(n) “Bonding Agents”, and E29.7(n) “Patching of Formed Surfaces” of this Specification.

(v) Working Base Concrete Finish

(i) During placing, concrete working base shall be vibrated, screeded and floated. 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.

(k) General Curing Requirements

(i) Refer to E29.7(o) “Cold Weather Concreting” for cold weather curing requirements and E29.7(p) “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) 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.

(ix) 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.

(x) 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.

(l) 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.

(m) 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.

(n) 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.

(ii) Heating and hording is to remain in place a minimum of 7 days after the moist curing is removed.h

(o) 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 maybe 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 E29.2, “Acceptable Concrete Temperatures”, for the indicated size of the concrete section.

TABLE 29.2
ACCEPTABLE CONCRETE TEMPERATURES

THICKNESS OF SECTION, m	TEMPERATURES °C	
	MINIMUM	MAXIMUM

Less than: 1 1.2	 10 5	 27 25

(p) Cleanup

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

(q) Structure Identification Date

(i) The Contractor shall indent into the exposed concrete a structure identification date at such location at the east end of the structure as shown on the Drawings, in accordance with the detail shown on the Drawings, or as otherwise directed by the contract Administrator.

E29.8 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 E29.4(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, E29.4(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 29.1 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.

E29.9 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 the “Items of Work”, listed here below 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) Items of Work:

Supply and Place Structural Concrete

i) Type 1

ii) Type 2

(b) 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.

E30. BOARD INSULATION

E30.1 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.

E30.2 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.

E30.3 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.

E30.4 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

E30.5 Equipment

(a) General

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

E30.6 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.

E30.7 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.

E30.8 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 “Board Insulation” 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.

E31. CELLULAR CONCRETE BACKFILL

E31.1 Description

(a) This Specification shall cover the supply and installation of cellular concrete backfill, 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 or incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E31.2 References

(a) CAN/CSA A3001, Cementitious Materials for Use in Concrete

(b) CSA A23.1, Concrete Materials and Methods of Concrete Construction

(c) ASTM C869, Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete

(d) ASTM C796, Standard Test Method for Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam

(e) ASTM C495-99a, Standard Test Method for Compressive Strength of Lightweight Insulating Concrete

E31.3 Qualification

(a) The Contractor is to submit the qualifications of the Subcontractor that is to produce and place the cellular concrete for review and approval by the Contract Administrator.

(b) The approved Subcontractor producing and placing cellular concrete shall have a record of experience and quality of work that is satisfactory to the Contract Administrator, and shall be capable of developing a mix design, batching, mixing, handling, and placing cellular concrete. The Subcontractor shall be certified by the manufacturer of the foaming agent and regularly engaged in the production and placement of cellular concrete. The Subcontractor shall have an adequate number of fully qualified workers who are thoroughly trained and experienced in the production and placement of cellular concrete.

E31.4 Equipment

(a) The specialized batching, mixing, and placing equipment shall be automated and certified for the purpose by the manufacturer of the cellular concrete material. Dry-mix equipment must be able to receive bulk cement and produce over 100 cubic metres per hour on Site, continuously, from one piece of equipment, and pump through hoses or pipes up to a flat lineal distance of 1000 metres. Bulk cement shall be weighed on a scale that operates within a tolerance of one and one-half percent (1.5%) per batch. Wet-mix equipment must be able to receive slurry on Site into the equipment and process it continuously during ready-mix supply, and pump through hoses or pipes up to a flat lineal distance of 200 metres.

(b) Cellular concrete must be pumped by a positive displacement pump (Peristaltic or similar). A foam generator shall be used to continuously produce pre-formed foam, which shall be injected and mixed with the cementitious slurry downstream of the positive displacement slurry pump. The equipment shall be calibrated to produce a precise and predictable volumetric rate of foam with stable uniform microbubbles.

E31.5 Materials and Testing

(a) Cellular concrete shall be CEMATRIX CMEF-400 lightweight engineered fill, or equal as accepted by the Contract Administrator, in accordance with B6 “Substitutes”, with the following properties:

(i) Minimum unconfined compressive strength at 28 days of 0.3 MPa.

(ii) Wet cast density of 400 kg/m3 (+/-10%)

(b) Portland cement shall conform to the requirements of CSA Standard CAN/CSA A3001, Type GU or HE. Supplementary cementing materials shall conform to the requirements of CSA Standard CAN/CSA A3001.

(c) Mixing water shall conform to the requirements of CSA Standard A23.1. Water of questionable quality shall not be used unless proven to produce specimens whose 28-day compressive strength is at least 90% of those made with known acceptable water and an identical material mix.

(d) Foaming agents shall conform to the requirements of ASTM C869 when tested in accordance with the provisions of ASTM C796. CEMATRIX CF-1 or PROVOTON foaming agents shall be used, or equal as accepted by the Contract Administrator, in accordance with B6 “Substitutes”. The Subcontractor shall be pre-qualified and approved in writing by the foaming agent manufacturer, referencing this Project. A copy of the written approval is to be submitted to the Contract Administrator prior to the commencement of the work.

(e) The fresh cellular concrete density shall be measured and recorded once per production run, or once for every 50 cubic metres, or once per 30 minutes, whichever is more frequent. The density shall be maintained within +/- 10% of the design density.

(f) Cellular concrete samples must be captured, cured, and tested to verify the compressive strength requirement is satisfied. One sample is comprised of one set of six cellular

concrete cylinders. One sample should be taken for each placement, or every 100 m3, whichever is more frequent. Cylinders are cast in 75mm by 150mm cylindrical plastic molds. The sample mold must be lined with “freezer paper” with the plastic side against the cellular concrete. Cellular concrete cylinders shall be cured and tested as per ASTM C495-99a, modified to represent the field curing conditions for geotechnical applications.

E31.6 Subgrade Conditions and Site Preparation

(a) The subgrade shall be cleared of vegetation, soft, wet, muddy, loose soil and other deleterious material, and graded and compacted to the lines and grades shown on the relevant drawings. The prepared subgrade shall be good competent level ground with nominal compaction to provide a firm base. The placement area shall be free of standing water during placement of cellular concrete and until backfill is placed on top of the cellular concrete. Snow and ice must be removed from the area prior to placement.

E31.7 Installation

(a) The Quality Control and Quality Assurance Manual Cematrix Cellular Concrete, Document Number: QCS-007, Last Updated: September 29, 2011 shall apply to the work.

(b) Any items to be fully or partially encased in the cellular concrete shall be properly set and stable prior to the installation of the cellular concrete.

(c) Where required, formwork should be designed and installed to withhold cellular concrete, and may require lining with poly sheeting or similar impermeable membrane to prevent leakage. The sheet drain system on the side of the steel sheet piles shall also be lined with poly sheeting.

(d) Cellular concrete may be placed during freezing conditions, provided measures are taken to prevent damage to the cellular concrete until sufficient strength has been attained. Care should be taken to avoid freezing before initial set. Cellular concrete must not be placed during heavy or prolonged precipitation.

(e) Once mixed, the cellular concrete shall be conveyed promptly to the location of placement without excessive handling.

(f) The Contractor shall determine the maximum lift thickness based on density and any other considerations that may impact placement. Cellular concrete shall be cast in a formed area within 1 to 2 hours, to permit an undisturbed setting.

(g) Finished surface elevation shall be with +/- 25mm of the design grades shown on the Drawings. Cellular Concrete can be placed with a maximum slope of 1%. Slopes greater than 1% will require profiling by creating steps for the Cellular Concrete with formwork.

(h) Loading of, or traffic on, the cellular concrete shall be prevented until the material has attained sufficient strength to withstand the loads with no damage. Backfill can commence with cellular concrete supports foot traffic without leaving an indentation.

E31.8 Measurement and Payment

(a) Cellular concrete shall be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for “Cellular Concrete” 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, accepted and measured by the Contract Administrator.

E32. HOT-POURED RUBBERIZED ASPHALT WATERPROOFING

E32.1 Description

(b) 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 top slab, as specified herein and as shown on 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 other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E32.2 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.

E32.3 Scope of Work

(a) The Work under this Specification shall involve:

(i) Preparing the concrete culvert top slab surface to receive the waterproofing membrane;

(ii) Applying primer to the concrete culvert top slab surface;

(iii) Placing the asphalt waterproofing membrane on the concrete culvert top slab surface; and

(iv) Placing polyester fabric protection layers and protection board.

E32.4 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.

E32.5 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 or "790-11" by Henry/BAKOR 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, "Polyester Fabric Reinforcing Sheet" by Henry/BAKOR, "Fabric Reinforcement BP-16" by McAsphalt, 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 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.

E32.6 Equipment

(a) General

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

E32.7 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 Omands 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.

E32.8 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.

E32.9 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.

E33. STRAW WATTLES

E33.1 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.

E33.2 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.

E33.3 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 Omands 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.

E33.4 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.

E34. SUBDRAIN SYSTEM

E34.1 Description

(a) This Specification covers all operations relating to the supply and installation of the subdrain pipe and wall drain systems, including associated accessories, as shown on the Drawings.

(b) The Work to be done by the Contractor under this Specification shall include the furnishing of the 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.

E34.2 Material

(a) General

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

(b) Drain Pipes, Fittings, and Accessories

(i) Drain pipes, fittings and other accessories and appurtenances for substructure drain pipe systems shall be 150 mm diameter, Schedule 40 PVC, with holes 12 mm in diameter, spaced at a maximum of 150 mm o/c; subdrain pipe shall have two rows of holes: pipe holes shall be positioned at 4 o'clock and 8 o'clock; holes may be aligned or alternating; and

(ii) All other drain pipes, fittings, and other accessories and appurtenances shall conform to the requirement of CW 2130.

(c) Drainage Fabric

(i) Drainage fabric shall be in accordance with CS 3120-R4 or as accepted by the Contract Administrator in accordance with B6 “Substitutes”.

(d) Sheet Drain

(i) Sheet drain materials shall be Nudrain DN50-1 or equal as accepted by the Contract Administrator in accordance with B6 “Substitutes”.

(e) Drainage Material

(i) Drainage material shall be in accordance with Specification CW 3120-R4.

(f) Equipment

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

E34.3 Construction Methods

(a) Subdrain Systems

(i) Install a perforated drain pipe system as shown on the Drawings. The supply and installation of this drain pipe system shall include the drain pipe, all required fittings, drain pipe drainage materials, and the filter fabric; and

(ii) The drain pipe shall be laid to the line and grade shown on the Drawings, with the separate sections securely jointed together by means of watertight solvent welded joints or watertight rubber bell-and-spigot joints, with the bell on the downstream side of the connection. All bent joints shall be solvent welded. Tee connections are not permitted.

(iii) Sheet drain materials shall be applied to all buried surfaces as shown on the Drawings.

E34.4 Measurement and Payment

(a) Subdrain Systems

(a) The Subdrain Systems will not be measured. This Item of Work will be paid for at the Contract Lump Sum Price for the “Subdrain Systems”, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification and accepted by the Contract Administrator.

E35. CHAIN LINK FENCING

E35.1 Description

(a) Further to CW 3550, this Specification shall cover the supply and installation of new chain link fencing, as herein specified.

(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.

E35.2 Materials

(a) Base Plate and Anchors

(i) The base plate shall be fabricated and installed in accordance with the details provided on the Drawings. The base plate shall be hot-dip galvanized.

(ii) Anchors to be Hilti HVU adhesive anchors c/w stainless steel threaded HAS rods, nuts and washers.

(b) Chain Link Fence

(i) Chain link fencing to be supplied in accordance with CW 3550. Further to CW 3550, 43 O.D. top and bottom rails shall be used.

E35.3 Construction Methods

(a) Fence Post Anchors

(i) Core holes for post anchors in the box culvert headwalls and wingwalls where shown on the Drawings. Install anchors using adhesive in accordance with the Manufacturer's instructions.

(ii) Supply and installation of fence post base plate and anchors shall be considered incidental to the Works of the Specification and no additional payment will be made.

E35.4 Measurement and Payment

(a) Chain Link Fencing

(i) Chain link fencing shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for "Chain Link Fencing", performed in accordance with this Specification and accepted by the Contract Administrator, 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.

E36. TOPSOIL AND FINISH GRADING

E36.1 Description

(a) The Work to be done by the Contractor under this Specification shall supplement CW3450 and shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work as shown on the Drawings and as specified hereinafter.

(b) Related Specifications

(i) Tree Planting

(ii) Natural Seeding

E36.2 Provide submittals in accordance with Specifications.

E36.3 Quality control submittals:

(a) Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in General Instructions.

(b) Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

E36.4 Further to CW 3540 this specification is for the preparation of in situ soil, supply and placement of topsoil and finish grading for naturalization, seeded, and sodded areas.

E36.5 Following approval of removals and rough grading work the Contractor is to fracture the existing soil with approved tilling machinery, add top soil and till into existing soil. Fracturing plan and procedures are to follow method as approved by the City of Winnipeg.

E36.6 Topsoil

(a) All topsoil required shall consist of a clay-textured or loam-textured dark topsoil, a fertile, friable material neither of heavy clay nor of very light sandy nature containing by volume, a minimum of four (4%) percent for clay loams and two (2%) percent for sandy loams to a maximum twenty-five (25%) percent organic matter (peat, rotted manure or composted

material) and capable of sustaining vigorous plant growth. Soil shall be free of roots and stones over 30 mm in diameter or subsoil clay lumps over 30 mm in diameter.

(i) Upon delivery or thirty (30) days following delivery, salinity ratings shall be less than 4.0 mm hos/cm. The pH range shall be between 6.5 and 7.5.

(ii) Topsoil shall be free of residual chemical properties originating from past herbicide applications or other forms of contamination which can potentially negatively affect the growth and successful establishment of planted material as specified.

(iii) Topsoil shall not contain the roots or rhizomes of quack grass (*Elymus repens*), smooth brome (*Bromus inermus*), Canada thistle (*Circium arvense*), sweet clover spp. (*Melilotus officinale* or *M. alba*), dandelion (*Taraxacum officinale*) or other undesirable weed species.

E36.7 Organic Soil Amendments

(a) Topsoil:

(i) In accordance with CW3540 and E36.6.

(b) Peatmoss:

(i) Derived from partially decomposed species of Sphagnum mosses.

(ii) Elastic and homogeneous, brown to black in colour.

(iii) Free from Wood and deleterious material which could inhibit growth; Debris and stones over 12.5 mm diameter.

(iv) Shredded particle minimum size: 5 mm.

(c) Organic matter: compost Category A in accordance with CCME PN1340; unprocessed organic matter such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

(d) Inorganic Soil Amendments

(i) Fertilizer: In accordance with the Canada Fertilizers Act and Fertilizers Regulations; compatible with the seed mix and soil conditions.

(ii) Fertility: major soil nutrients present in following amounts:

(i) Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.

(ii) Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.

(iii) Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.

(iv) Calcium, magnesium, sulfur and micro nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

(iii) pH value: 6.5 to 8.0.

(e) Sand: washed coarse silica sand, medium to course textured.

(f) Limestone:

(i) Ground agricultural limestone.

(ii) Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

E36.8 Temporary Erosion And Sedimentation Control

(a) Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, whichever is more stringent.

(b) Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

(c) Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E36.9 Stripping and stockpiling of soils to be used for natural grass seeding

(a) Soils shall not be stripped if they are too wet or too dry as determined by the Contract Administrator.

(b) Begin topsoil stripping of areas after brush, weeds and grasses have been cleared and removed from Site.

(c) If existing topsoil contains established perennial noxious weed species or the perennial grassy weeds quackgrass (*E. repens*) or smooth brome (*B. enermis*), treat area with non-selective herbicide during the active growing season, a minimum of 10 days prior to stripping. Alternatively, provide minimum of 1 year of pre-plant weed control designed to eliminate persistent perennial weed species. Do not seed permanent cover until the Site is free of primary and secondary noxious weeds and persistent perennial grassy weeds.

(d) Strip topsoil to depths as indicated by core test samples to avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.

(e) Stockpile in locations that are protected from traffic or where they will be protected from erosion, compaction, and contamination from wind-blown weed seed. Stockpile height not to exceed 1.5 m

(f) If topsoil is expected to remain stockpiled for more than three (3) weeks during the growing season (May – October), seed the stockpile with an annual cover crop such as oats or barley by broadcast-harrow seeding method.

E36.10 Preparation of Existing Grade

(a) Verify that grades are correct.

(b) If discrepancies occur, notify the Contract Administrator and do not commence work until instructed.

(c) Ensure positive drainage by grading soil to eliminate uneven areas and low spots.

(d) Remove debris, roots, branches, stones and other deleterious materials in excess of 12.5 mm diameter.

(i) Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

(ii) Remove debris in excess of 12.5 mm which protrudes from soil surface.

(iii) Dispose of removed material off site.

(e) Cultivate entire area which will receive topsoil to minimum depth of 150 mm.

(i) Cross cultivate (minimum of two perpendicular passes) those areas where equipment used for hauling and spreading has compacted soil.

E36.11 Placing and Spreading of Topsoil

(a) Place stockpiled topsoil after subgrade meets conditions of E36.10 and has been accepted by Contract Administrator

(b) Spread stockpiled topsoil in a uniform layer at a minimum depth of 150 mm.

(c) If necessary, supplement stockpiled topsoil with suitable imported soil to CW3540 in order to achieve minimum 150 mm depth.

(d) Integrate topsoil/organic soil amendments to a depth of 200-250 mm, taking care not to bury topsoil when blending with decompacted subgrade.

E36.12 Soil Amendments

(a) Stockpiled soils that do not meet the requirements of this specification must be amended in order to achieve the minimum conditions.

E36.13 Finish Grading

(a) Grade to eliminate rough spots and low areas and ensure positive drainage.
  (i) Prepare loose friable bed by means of cultivation and subsequent raking.

(b) Consolidate topsoil to required bulk density using approved equipment.

(c) Leave surfaces smooth, uniform and firm against deep (> ½") foot-printing.

E36.14 Acceptance

(a) Contractor to provide soil tests confirming soil quality adheres to specified criteria. If amendments are required, Contractor is to provide follow up soil tests to ensure soil has been amended sufficiently.

(b) Contract Administrator will inspect topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

E36.15 Cleaning

(a) Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers

E36.16 Measurement and Payment

(a) Topsoil and Finish Grading is considered incidental to Natural Seeding work. No payment will be made for Topsoil and Finish Grading.

E37. NATURAL SEEDING

E37.1 GENERAL

E37.1.1 The work to be done by the Contractor under this Specification shall include the supply, installation, labour, equipment, tools and all other things necessary for and incidental to the satisfactory performance and completion of all work shown in the drawings and as hereinafter specified, including, but not necessarily confined to the following:

(a) Site preparation (Growth Media Preparation)

(b) Supply and install topsoil

(c) Weed control

(d) Erosion control

(e) Supply and install grass seed

  (i) Cover crop of Common Oats to be seeded in immediately following placement of topsoil

  (ii) Cover crop of Winter wheat (*Triticum aestivum*) or fall rye (*Secale cereale*) to be seeded in if late in the year.

(iii) Natural Areas Seed Mix to be seeded in spring, consisting of the following pre-mixed grass species: (if after July 1st, only cover cropping will be acceptable until following year)

OMAND'S CREEK BANK GRASS MIX - SPECIES	
Western Wheatgrass	Tufted Hairgrass
Slender Wheatgrass	Rough Hair Grass
Fowl Bluegrass	Switch Grass
Canada Wildrye	Cordgrass
Virginia Wildrye	

(iv) Planting rate information will be supplied by the Contract Administrator prior to seeding.

E37.1.2 The Contractor shall ensure coordination with other Site works including but not limited to asphalt and concrete surfacing as well as grading and other planting works.

E37.1.3 The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials shall be subject to inspection and testing by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for inspection and testing purposes.

E37.1.4 Submittals

(a) Detailed work schedule

(b) Weed control plan

(c) Erosion control plan (including cover crop management approach)

(d) Salt Tolerant and Natural Areas grass establishment plan

(e) Herbicide applicator's license

(f) Soil analysis report from accredited soil testing lab.

(g) Seed bag tags

E37.2 Materials

E37.2.1 Topsoil

(a) In accordance with E36.6.

E37.2.2 Topsoil Testing

(a) The Contractor shall inform the Contract Administrator of the proposed Topsoil source. The Contract Administrator reserves the right to reject topsoil not conforming to the requirements of this Specification.

(b) The Contractor will submit Topsoil samples for review and approval by the Contract Administrator. Topsoil will be subject to tests for nitrate, phosphate, potassium, sulphate, pH, electrical conductivity, and organic matter content by an accredited soil testing laboratory.

E37.2.3 Erosion Control

(a) Annual and perennial vegetation once established (>80% ground cover); residual dead biomass left after termination of annual cover crop vegetation.

(b) In accordance with E24.

E37.2.4 Seed

(a) "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.

(b) Annual cover crop seed will be regionally appropriate and will be accompanied by an up-to-date seed analysis report. The Contract Administrator will review and approve the Contractor selected cover crop seed prior to seeding.

(c) Natural Areas Seed Mix consists of a pre-blended, grass-based seed mix developed by the Contract Administrator on a pure live seed per square metre basis.

(i) The Contractor will order seed mixes supplied by The Contract Administrator, pick up and deliver them to the work Site.

(ii) The seed will be packaged in 25 kilogram labelled bags. The Contractor must supply all equipment and labour required to transport seed.

(d) Storage for seed shall be in cool dry location. The Contractor shall provide secure, weather and rodent proof storage for the seed prior to planting.

(e) Any seed lost or damaged while stored shall be replaced by The Contractor and will be considered incidental to the contract.

E37.3 Method of Construction

E37.3.1 Growth Media Preparation

E37.3.2 Subsoil

(a) The subsoil shall be graded in accordance with Specifications and Drawings.

(b) In areas where doing so will not interfere with existing below ground infrastructure, the subsoil grade shall be decompacted to a depth of 200mm. A minimum depth of 150mm will be permitted only in areas where obstructions exist at greater depths.

E37.3.3 Topsoil

(a) A minimum of 150mm of Topsoil shall be placed above decompacted subsoil in all areas to be seeded.

(b) Topsoil shall be placed in a manner as to avoid compaction of decompacted subsoil.

(c) Topsoil shall be lightly incorporated evenly into prepared subsoil to a depth of 200-250 mm.

(i) The Contractor shall take care not to bury Topsoil when incorporating into decompacted subsoils.

(d) The Contractor to submit for review and approval all growth media preparation activities, prior to seeding.

E37.3.4 Fine Grading

(a) Topsoil and Fine Grading shall be as shown on the drawings.

(b) The Contractor shall fine grade Topsoil, to eliminate rough spots, ruts or other similar low areas to ensure positive drainage and to facilitate consistent seed placement and seed rate during planting.

(c) The incorporated Topsoil shall be lightly consolidated and the surface shall be left smooth, firm and level prior to seeding.

(d) All seeded areas are to be free of woody debris and rocks. The Contract Administrator will advise the Contractor of any debris clean-up requirements.

E37.3.5 Erosion Control

(a) Annual cereal cover crops will be seeded and managed throughout the growing season to help protect against soil erosion.

(b) Cover crops may require management to prevent excessive built-up of plant stock and to limit seed production on-site.

(i) Cover crop management may involve any of the following activities: mowing, herbicide application, and/or thatch removal.

(c) The Contract Administrator shall evaluate all seeded areas for potential soil erosion during the life of The Project and the Contractor shall take appropriate mitigation measures as directed by the Contract Administrator.

(d) Rutting or damage caused during seeding operation shall be repaired at the Contractor’s cost to the satisfaction of the Contract Administrator.

E37.3.6 Weed Control

(a) Properly timed weed control shall be undertaken in the seeded areas to facilitate grass seedling establishment. Two to three weed control treatments per year will be undertaken during the establishment period; treatment approach to be determined based on weed species presence and abundance observed during weed surveys.

(b) Weed control prescriptions shall be reviewed by The Contract Administrator prior to undertaking any weed control activities. No herbicide application shall be undertaken without consent of the Contract Administrator.

(c) For herbicide treatments, products, timing, and rates will be supplied by a certified herbicide applicator with experience in weed control in native revegetation projects.

(d) Herbicide application shall be undertaken by a licensed pesticide applicator in accordance with all local, provincial and federal regulations, whichever is more stringent. Owner and adjacent land owner environmental policies shall be considered in developing and implementing weed control approach.

(e) Herbicide is to be applied in accordance with the manufacturer's instructions and the Manitoba Agriculture Guide to Crop Protection and Herbicide Recommendations for Landscape Applicators, latest editions.

(f) Glyphosate cannot be used at any time following seeding of the Salt Tolerant Natural Areas Seed mix.

(g) The Contractor shall not apply broad-leaf herbicides in areas seeded to perennial grass cover prior to seedlings reaching the 2-3 leaf stage. Determination of 2-3 leaf stage shall be made by the Contract Administrator.

(h) Herbicide application technique must control spray drift and protect adjacent non-target vegetation, habitat and property.

(i) The Contractor shall undertake all reasonable and permissible means of restricting seed-rain of invasive or otherwise problematic weed species from areas immediately adjacent The Project for the duration of The Project.

E37.3.7 Seeding

(a) Prior to seeding permanent grass cover, the seeding area shall be free of noxious perennial grassy and broadleaf weeds listed in the Manitoba Noxious Weed Act C.C.S.M. c. N110.

(b) Prior to seeding permanent grass cover seeding areas shall be free of weedy perennial species that may not be listed as noxious weeds but which will become invasive within the planting over time, including but not limited to, quackgrass, smooth brome, sweet clover and dandelion.

(c) Annual weeds including green and yellow foxtail (*Setaria* spp.), barnyard grass (*Echinochloa crus galli*), if present, are to be controlled so as to not compromise short term or long term grass stand establishment. Post seeding control of these species, and species with similar tendencies in permanent plantings, shall be at the direction of the Contract Administrator.

(d) Cover Crop Seeding to be undertaken as soon as possible following topsoil placement and preparation, during suitable seeding windows. Cover crop seeding can be done using any of the three seeding methods described below (E37.3.8-E37.3.10).

(e) Grass will be mechanically seeded using a Truax seed drill to allow for accurate distribution and proper seed coverage. In areas where the Truax cannot reach, a Brillion seed drill will be used. To a much smaller degree, broadcasting methods will be utilized only in areas where equipment cannot reach. All seeding methods require the same seedbed conditions and post-plant maintenance outlined in the specifications.

(f) Contour seeding must be employed to discourage down slope erosion on sloped areas.

(g) While on-site, seed requiring short-term storage shall be stored by the Contractor in a secure, dry and rodent-free environment either at or below ambient outdoor temperatures.

(h) Following seeding, The Contractor shall return to the Contract Administrator the shipment tags from each bag of seed planted on Site.

E37.3.8 Drill Seeding

(a) Drill seeding shall be undertaken using a Truax, two or three box native seed drill with seed box agitators, on-row packers and depth bands, capable of uniformly applying the specified mixes to a depth of 5.0-12.0mm (0.25” – 0.5”).

(b) A 1.8 – 2.4m (6.0 – 8.0’) three point hitch-mounted Truax native seed drill is preferred. Alternatively a low ground pressure configuration capable of delivering native seed consistently at the proper rate and depth as per seeding specifications may be acceptable, pending Contract Administrator approval.

(c) The Truax seed drill must be capable of being equipped with trash plows to prevent light debris from interfering with seed placement during native drill seeding.

(d) The Contract Administrator shall supply drill seeding rates for the Salt Tolerant and Natural Areas Seed Mix and the rate shall be provided on a bulk seeds per 1/10 m^2 (approximately / ft^2) basis.

E37.3.9 Brillion Seeding

(a) Permitted only in areas that are inaccessible to Truax drill seeding equipment.

(b) Brillion seeding must be accomplished using a Brillion Ag Seeder or Brillion Landscape Seeder with a Double Roller set-up capable of placing seed uniformly at a depth of 5.0-12.0mm (0.25" – 0.5").

(c) Brillion seeding equipment must be fitted with Seed Box agitators capable of keeping the seed mix evenly blended throughout seeding operations to ensure seed of variable weights and dimensions are dispersed evenly.

(d) The Contract Administrator shall supply Brillion seeding rates for the Salt Tolerant and Natural Areas Seed Mix and the rate shall be provided on a bulk seeds per 1/10 m^2 (approximately / ft^2) basis.

E37.3.10 Harrow-Broadcast-Harrow Seeding

(a) Permitted only in areas that are inaccessible to all mechanical seeding equipment.

(b) Broadcast seeding is preceded by one or more harrow passes and is then followed by a second harrow pass once seed has been broadcasted at the specified rate.

(c) An industrial fertilizer applicator may be used for broadcast seeding to facilitate consistency of seed flow. A manual broadcast seeder may be used for small areas requiring manual seeding. Seed mix must be suitably agitated within the seeder/spreader to ensure seed of variable weights and dimensions are dispersed evenly.

(d) The Contract Administrator shall supply Harrow-Broadcast-Harrow seeding rates for the Salt Tolerant and Natural Areas Seed Mix and the rate shall be provided on a bulk seeds per 1/10 m^2 (approximately / ft^2) basis.

E37.4 Acceptance

(a) A minimum of 6-8 grass seedlings with permanent roots (4-leaf stage) have been documented per 1/10 square meter, by the end of the first growing season.

(b) Seeded areas are free of rutted, eroded, bare or dead spots.

E37.5 Method of Measurement

E37.5.1 Supply and installation of Natural Seeding shall be measured on an area basis. The area to be paid for shall be the total number of square meters material installed and maintained in accordance with this Specification and the Drawings, and as acceptable to the Contract Administrator.

E37.5.2 Weed Control is considered a lump sum item. No measurement shall be made.

E37.6 Basis of Payment

E37.6.1 Payment for Installation of Natural Seeding shall be paid for at the Contract Unit Prices for "Native Grass Planting". This price shall be payment in full for supplying all labour, equipment and materials, including erosion control, maintenance, grow-in, and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator. Payment for Native Grass Planting shall be in accordance with the following:

(b) Sixty five (65%) percent of quantity following supply and placement.

(c) Remaining thirty five (35%) percent of quantity following termination of the Acceptance criteria.

E37.6.2 Payment for Installation of Weed Control shall be paid for at the Contract Lump Sum Price for the “Weed Control”. This price shall be payment in full for supplying all labour, equipment and materials, including licenses, regulatory approvals and performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator. Payment for Weed Control shall be in accordance with the following:

(d) Fifty (50%) percent of payment following year 1 of warranty period.

(e) Remaining fifty (50%) percent of payment following year 2 of warranty period.