



THE CITY OF WINNIPEG

TENDER

TENDER NO. 233-2022

REHABILITATION OF ROUTE 90 CULVERT OVER OMAND'S CREEK

TABLE OF CONTENTS

PART A - BID SUBMISSION

- Form A: Bid/Proposal
- Form B: Prices
- Form G1: Bid Bond and Agreement to Bond

PART B - BIDDING PROCEDURES

B1. Contract Title	1
B2. Submission Deadline	1
B3. Site Investigation	1
B4. Enquiries	1
B5. Confidentiality	1
B6. Addenda	2
B7. Substitutes	2
B8. Bid Components	3
B9. Bid	3
B10. Prices	4
B11. Disclosure	4
B12. Conflict of Interest and Good Faith	5
B13. Qualification	6
B14. Bid Security	7
B15. Opening of Bids and Release of Information	7
B16. Irrevocable Bid	8
B17. Withdrawal of Bids	8
B18. Evaluation of Bids	8
B19. Award of Contract	9

PART C - GENERAL CONDITIONS

C0. General Conditions	1
------------------------	---

PART D - SUPPLEMENTAL CONDITIONS

General

D1. General Conditions	1
D2. Form of Contract Documents	1
D3. Scope of Work	1
D4. Contract Administrator	1
D5. Contractor's Supervisor	1
D6. Notices	2
D7. Accessible Customer Service Requirements	2
D8. Furnishing of Documents	2

Submissions

D9. Authority to Carry on Business	2
D10. Safe Work Plan	3
D11. Insurance	3
D12. Contract Security	4
D13. Existing Utilities Protection Plan	4
D14. Subcontractor List	5
D15. Equipment List	5
D16. Detailed Work Schedule	5
D17. Requirements for Site Accessibility Plan	5

Schedule of Work

D18. Commencement	6
D19. Restricted Work Hours	7
D20. Work By Others	7
D21. Critical Stages	7

D22. Substantial Performance	8
D23. Total Performance	8
D24. Liquidated Damages	8
D25. COVID-19 Schedule Delays	8
Control of Work	
D26. Job Meetings	9
D27. Prime Contractor – The Workplace Safety and Health Act (Manitoba)	9
D28. The Workplace Safety and Health Act (Manitoba) – Qualifications	9
D29. Environmental Protection Plan	9
D30. Layout of Work	17
Measurement and Payment	
D31. Payment	17
Warranty	
D32. Warranty	17
Dispute Resolution	
D33. Dispute Resolution	18
Third Party Agreements	
D34. Funding and/or Contribution Agreement Obligations	18
Form H1: Performance Bond	21
Form H2: Labour and Material Payment Bond	23
Form J: Subcontractor List	25
Form K: Equipment	26

PART E - SPECIFICATIONS

General	
E1. Applicable Specifications and Drawings	1
E2. Mobilization and Demobilization	2
E3. Office Facilities	3
E4. Traffic Control	4
E5. Traffic Management	4
E6. Laydown Area	5
E7. Protection of Existing Trees	6
E8. Protection of Existing Utilities	6
E9. Water Obtained From the City	7
E10. Shop Drawings	7
E11. Creek Flow Maintenance	9
E12. Creek Bank Excavation	11
E13. Rockfill Shear Keys	14
E14. Silt Fence Barrier	17
E15. Erosion Control Blanket (ECB)	20
E16. Soft Excavation to Expose Underground Utilities	23
E17. Chain Link Fencing	24
E18. Cast-In-Place Concrete Pile Foundations	24
E19. Structural Removals	28
E20. Structural Concrete	31
E21. Concrete Repairs	45
E22. Discrete Galvanic Protection System	47
E23. Drilling and Placing Dowels	50
E24. Supplying and Placing Reinforcing Steel	51
E25. Structural Backfill	56
E26. Bridge Aluminum Barrier Rail	58
E27. Riprap	59
E28. Supply And Installation Of MMA Marking With Anti-Skid	59
E29. Roadway Concrete Materials	60
E30. Working Around Manitoba Hydro Poles	60
E31. Concrete Crack Injection	61

E32. Topsoil and Finish Grading	65
E33. Natural Seeding	68
E34. Sewer Cleaning and Inspections	73

Appendix 'A' – Concrete Constituent Materials, Mix Design Requirements, and Hot and Cold Weather Concreting

Appendix 'B'- Allowable Excavations Around Manitoba Hydro Poles

Appendix 'C' – Application Instructions – MMAX Area Markings and MMAX Area Markings Specification – Methyl Methacrylate Area Marking with Anti-Skid

Appendix 'D' – Reference Drawings

PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 REHABILITATION OF ROUTE 90 CULVERT OVER OMAND'S CREEK

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, May 26, 2022.

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. SITE INVESTIGATION

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

B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.

B4.2 If the Bidder finds errors, discrepancies or omissions in the 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.

B4.3 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.

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

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

B4.6 Any enquiries concerning submitting through MERX should be addressed to:
MERX Customer Support
Phone: 1-800-964-6379
Email: merx@merx.com

B5. CONFIDENTIALITY

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

- (a) was known to the Bidder before receipt hereof; or
- (b) becomes publicly known other than through the Bidder; or
- (c) is disclosed pursuant to the requirements of a governmental authority or judicial order.

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

B6. ADDENDA

- B6.1 The Contract Administrator may, at any time prior to the Submission deadline, issue addenda correcting errors, discrepancies or omissions in the Tender, or clarifying the meaning or intent of any provision therein.
- B6.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.
- B6.3 Addenda will be available on the MERX website at www.merx.com.
- B6.4 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.
- B6.5 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.
- B6.6 Notwithstanding B4, enquiries related to an Addendum may be directed to the Contract Administrator indicated in D4.

B7. SUBSTITUTES

- B7.1 The Work is based on the Plant, Materials and methods specified in the Tender.
- B7.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B7.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.
- B7.4 The Bidder shall ensure that any and all requests for approval of a substitute:
- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;
 - (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
 - (c) identify any anticipated cost or time savings that may be associated with the substitute;
 - (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;
 - (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.
- B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her sole discretion grant approval for the use of a substitute as an "approved equal" or as an "approved alternative", or may refuse to grant approval of the substitute.

- B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.
- B7.6.1 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.
- B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B18.
- B7.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B8. BID COMPONENTS

- B8.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices;
 - (c) Form G1: Bid Bond and Agreement to Bond.
- B8.2 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely.
- B8.3 The Bid shall be submitted electronically through MERX at www.merx.com.
- B8.3.1 Bids will **only** be accepted electronically through MERX.
- B8.4 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B18.1(a).

B9. BID

- B9.1 The Bidder shall complete Form A: Bid/Proposal, making all required entries.
- B9.2 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.
- B9.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.
- B9.3 In Paragraph 3 of Form A: Bid/Proposal, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

- B9.4 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.
- B9.4.1 The name and official capacity of all individuals signing Form A: Bid/Proposal should be entered below such signatures.
- B9.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.
- B10. PRICES**
- B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.
- B10.1.1 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.
- B10.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.
- B10.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.
- B10.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).
- B10.5 The Bidder shall enter the Total Bid Price from Form B: Prices into the Total Bid Price field in MERX.
- B10.5.1 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.
- B10.6 Form B: Prices is organized into Parts: Part 1 of the Work and Part 2 of the Work. Bidders shall provide a total price for each Part and, on the summary sheet, a Total Bid Price consisting of the sum of prices for Part 1 and Part 2.
- B11. DISCLOSURE**
- B11.1 Various Persons provided information or services with respect to this Work. In the City's opinion, this relationship or association does not create a conflict of interest because of this full disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.
- B11.2 The Persons are:
- (a) N/A

B12. CONFLICT OF INTEREST AND GOOD FAITH

- B12.1** 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.
- B12.2** 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.
- B12.3** In connection with its Bid, each entity identified in B12.2 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.
- B12.4** Without limiting B12.3, 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.
- B12.5** Without limiting B12.3, 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 B12.4 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.

B12.6 The final determination of whether a perceived, potential or actual Conflict of Interest exists shall be made by the City, in its sole discretion.

B13. QUALIFICATION

B13.1 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.

B13.2 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>

B13.3 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);
- (d) have completed the Accessible Customer Service online training required by the Accessibility for Manitobans Act (AMA) (see B13.5 and D7).

B13.4 Further to B13.3(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/>).

- B13.5 Further to B13.3(d), the Bidder acknowledges they and all Subcontractors have obtained training required by the Accessibility for Manitobans Act (AMA) available at <http://www.accessibilitymb.ca/training.html> for anyone that may have any interaction with the public on behalf of the City of Winnipeg.
- B13.6 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.
- B13.7 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.

B14. BID SECURITY

- B14.1 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>.
- B14.2 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 B14.2(a).
- B14.3 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 B18.1(a).
- B14.4 Bonds passing the verification process will be treated as original and authentic.
- B14.4.1 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.
- B14.5 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.
- B14.6 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.

B15. OPENING OF BIDS AND RELEASE OF INFORMATION

- B15.1 Bids will not be opened publicly.

- B15.2 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.
- B15.3 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.
- B15.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law or by City policy or procedures (which may include access by members of City Council).
- B15.4.1 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.

B16. IRREVOCABLE BID

- B16.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid/Proposal.
- B16.2 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.

B17. WITHDRAWAL OF BIDS

- B17.1 A Bidder may withdraw his/her Bid without penalty prior to the Submission Deadline.

B18. EVALUATION OF BIDS

- B18.1 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 B13 (pass/fail);
 - (c) Total Bid Price;
 - (d) economic analysis of any approved alternative pursuant to B7.
- B18.2 Further to B18.1(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.
- B18.2.1 Any bid with an apparent imbalance between the unit prices in Part 1 and Part 2 may be determined to be non-responsive and rejected by the Award Authority in its sole discretion, acting reasonably.
- B18.3 Further to B18.1(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.
- B18.4 Further to B18.1(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.

- B18.4.1 Further to B18.1(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.
- B18.4.2 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

B19. AWARD OF CONTRACT

- B19.1 The City will give notice of the award of the Contract or will give notice that no award will be made.
- B19.2 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.
- B19.2.1 Without limiting the generality of B19.2, 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.
- B19.3 The Work of this Contract is contingent upon Council approval of sufficient funding in the 2022 Capital Budget. 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.
- B19.4 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.
- B19.5 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 B18.
- B19.5.1 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) are no longer applicable.

D3. SCOPE OF WORK

D3.1 The Work to be done under the Contract shall consist of Rehabilitation of Route 90 Culvert Over Omand's Creek:

- (a) Traffic staging / control to facilitate culvert rehabilitation works.
- (b) Demolition of approach slabs and sidewalks.
- (c) Removal of top surface of culvert roof slab.
- (d) Supply and placement of reinforcing steel.
- (e) Install concrete cast-in-place concrete piles.
- (f) Construct concrete sidewalks, approach slabs, pile cap beams, and traffic barriers.
- (g) Construct concrete overlay on culvert roof slab.
- (h) Concrete crack and patch repairs to the culvert walls and roof underside.
- (i) Construct rockfill shear key and riprap.

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

At the pre-construction meeting the Contract Administrator 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. ACCESSIBLE CUSTOMER SERVICE REQUIREMENTS

- D7.1 The Accessibility for Manitobans Act (AMA) imposes obligations on The City of Winnipeg to provide accessible customer service to all persons in accordance with the Customer Service Standard Regulation ("CSSR") to ensure inclusive access and participation for all people who live, work or visit Winnipeg regardless of their abilities.
- D7.1.1 The Contractor agrees to comply with the accessible customer service obligations under the CSSR and further agrees that when providing the Goods or Services or otherwise acting on the City of Winnipeg's behalf, shall comply with all obligations under the AMA applicable to public sector bodies.
- D7.1.2 The accessible customer service obligations include, but are not limited to:
- (a) providing barrier-free access to goods and services;
 - (b) providing reasonable accommodations;
 - (c) reasonably accommodating assistive devices, support persons, and support animals;
 - (d) providing accessibility features e.g. ramps, wide aisles, accessible washrooms, power doors and elevators;
 - (e) inform the public when accessibility features are not available;
 - (f) providing a mechanism or process for receiving and responding to public feedback on the accessibility of all goods and services; and
 - (g) providing adequate training of staff and documentation of same.

D8. FURNISHING OF DOCUMENTS

- D8.1 Upon award of the Contract, the Contractor will be provided with 'issued for construction' Contract Documents electronically, including Drawings in PDF format only.

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

- D9.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on

business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D10. SAFE WORK PLAN

- D10.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.
- D10.2 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>
- D10.3 Notwithstanding B13.4 at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D11. INSURANCE

- D11.1 The Contractor shall provide and maintain the following insurance coverage:
- (a) commercial general liability insurance, in the amount of at least two million dollars (\$2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, broad form property damage cover and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;
 - (b) if applicable, 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) The Contractor shall provide and maintain contractor's pollution liability insurance (CPL) in the amount of at least one million dollars (\$1,000,000) per occurrence and two million dollars (\$2,000,000) aggregate insuring against claims for: third party injury and property damage, clean-up costs 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 and remain in place for a minimum of six (6) months following Total Performance.
- D11.2 Deductibles shall be borne by the Contractor.
- D11.3 All policies shall be taken out with insurers licensed in the Province of Manitoba.
- D11.4 The Contractor shall provide the City Solicitor with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work but in no event later than the date specified in the C4.1 for the return of the executed Contract Documents, as applicable.
- D11.5 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D12. CONTRACT SECURITY

D12.1 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.

D12.1.1 Where the contract security is a performance bond, it may be submitted in hard copy or digital format. If submitted in digital format the contract security must meet the following criteria:

- (a) the version submitted by the Contractor must have valid digital signatures and seals;
- (b) the version submitted by the Contractor 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 D12.1(b).

D12.1.2 Digital bonds failing the verification process will not be considered to be valid and may be determined to be an event of default in accordance with C18.1. If a digital bond fails the verification process, the Contractor may provide a replacement bond (in hard copy or digital format) within seven (7) Calendar Days of the City's request or within such greater period of time as the City in its discretion, exercised reasonably, allows.

D12.1.3 Digital bonds passing the verification process will be treated as original and authentic.

D12.2 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.

D12.3 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 D12.1(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.

D13. EXISTING UTILITIES PROTECTION PLAN

D13.1 The Contractor shall provide the Contractor Administrator a construction method statement, demonstrating adherence to the operating constraints for work in close proximity to all buried and overhead utilities, at least ten (10) Business Days prior to the commencement of any Work on the Site.

D14. SUBCONTRACTOR LIST

D14.1 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.

D15. EQUIPMENT LIST

D15.1 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.

D16. DETAILED WORK SCHEDULE

D16.1 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.

D16.2 The detailed work schedule shall consist of the following:

- (a) a critical path method (C.P.M.) schedule for the Work;
 - (b) a Gantt chart for the Work based on the C.P.M. schedule; and
 - (c) a daily manpower schedule for the Work.
- all acceptable to the Contract Administrator.

D16.3 Further to D16.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all activities/tasks making up the Work as well as showing those activities/tasks on the critical path.

D16.4 Further to D16.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

D16.5 Further to D16.2(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

D17. REQUIREMENTS FOR SITE ACCESSIBILITY PLAN

D17.1 The Contractor shall provide the Contract Administrator with an Accessibility 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.

D17.2 The Accessibility Plan shall demonstrate how the Contractor will accommodate the safe passage of pedestrians and cyclists in accordance with the Manual of Temporary Traffic Control, the Contract Drawings, Staging Plans, and Streets By-Law No. 1481/77 at all times for the duration of the Construction. Unless noted in the Contract, the Accessibility Plan must include a written plan for the following:

- (a) How the Contractor will maintain at least one crossing in each direction for each intersection (one north/south crosswalk and one east/west crosswalk).
- (b) How the Contractor will maintain access to bus stops within the site.
- (c) How the Contractor will maintain access to pedestrian corridors and half signals.
- (d) How the Contractor will maintain cycling facilities.

- (e) How the Contractor will maintain access to residents and businesses unless otherwise noted in the Contract.
 - (f) Any required detour signage at adjacent crossings to facilitate sidewalk or active transportation pathway closures.
- D17.3 The Accessibility Plan may also include figures, sketches, or drawings to demonstrate the proposed plan.
- D17.4 The Accessibility Plan shall include written details on how the Contractor intends to review, maintain, and document all items related to the Accessibility Plan on-site during Construction, including, but not limited to:
- (a) Signage
 - (b) Temporary Ramping
 - (c) Transit Stops
 - (d) Detour Signage
- D17.5 At minimum, the Contractor shall review the site conditions on a daily basis to ensure that all features related to the Accessibility Plan are in place. The site review is intended to correct deficiencies as a result of unforeseen events such as wind, traffic, or the general public. Deficiencies that are direct result of the Contractors actions must be corrected immediately.
- D17.6 Any changes to the Accessibility Plan must be approved by the Contract Administrator.
- D17.7 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.
- D17.8 Deficiencies as a direct result of actions by the Contractor that are not immediately corrected and/or failure to produce records that demonstrate that the site was maintained in compliance with the Accessibility Plan may result in a pay adjustment via the monthly Progress Payment. The rate of pay adjustment will be as per the following schedule:
- (a) First Offence – A warning will be issued and documented in the weekly or bi-weekly site meeting.
 - (b) Second Offence – A field instruction to immediately correct the site will be issued by the Contract Administrator.
 - (c) Third and subsequent Offences – A pay reduction will be issued in the amount of \$250.00 per instance and per day.

SCHEDULE OF WORK

D18. COMMENCEMENT

- D18.1 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.
- D18.2 The Contractor shall not commence any Work on the Site until:
- (a) the Contract Administrator has confirmed receipt and approval of:
 - (i) evidence of authority to carry on business specified in D9;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the twenty-four (24) hour emergency response phone number specified in D5.2.
 - (iv) the Safe Work Plan specified in D10;
 - (v) evidence of the insurance specified in D11;
 - (vi) the contract security specified in D12;
 - (vii) the existing utilities protection plan in D13;
 - (viii) the subcontractor list specified in D14;

- (ix) the equipment list specified in D15;
 - (x) the detailed work schedule specified in D16;
 - (xi) the Requirements for Site Accessibility Plan specified in D17; and
 - (xii) the direct deposit application form specified in D31
- (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.

D18.3 The City intends to award this Contract by June 15, 2022.

D18.3.1 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.

D19. RESTRICTED WORK HOURS

D19.1 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.

D20. WORK BY OTHERS

D20.1 Further to C6.25, the Contractor's attention is directed to the fact that other Contractors, the personnel of Utilities and the staff of the City may be working within the project limit, approach roadway, adjacent roadways or right-of-way. The activities of these agencies may coincide with the Contractors execution of work and it will be the Contractor's responsibility to cooperate to the fullest extent with other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of Contract.

D20.2 Work by others on or near the Site will include but not necessarily be limited to:

- (a) Manitoba Hydro – Relocation of street lighting.
- (b) Signals Underground Contractor – Relocation of signals plant.

D20.3 Further to D20.1 the Contractor shall cooperate and coordinate all activities with all parties performing required Work by Others. The Contractor must include and accommodate Work by Others identified in D20.2 or additional parties, in their construction schedule as per D16 and accommodate the necessary area on Site required for the Work by Others to complete the Work.

D21. CRITICAL STAGES

D21.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

- (a) Route 90 roadway and sidewalk Work shall be completed and fully re-opened to all traffic by October 14, 2022.

D21.2 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 the purposes of verifying Competition. 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 Critical Stages have been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of the Critical Stage has been achieved.

D22. SUBSTANTIAL PERFORMANCE

- D22.1 The Contractor shall achieve Substantial Performance by November 18, 2022.
- D22.2 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.
- D22.3 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.

D23. TOTAL PERFORMANCE

- D23.1 The Contractor shall achieve Total Performance by November 25, 2022.
- D23.2 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.
- D23.3 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.

D24. LIQUIDATED DAMAGES

- D24.1 If the Contractor fails to achieve Critical Stage or Substantial Performance in accordance with the Contract by the day fixed herein for Critical Stage or Substantial Performance, the Contractor shall pay the City Two Thousand dollars (\$2,000.00) per Calendar Day for each and every Calendar Day following the day fixed herein for Critical Stage or Substantial Performance during which such failure continues.
- D24.2 The amount specified for liquidated damages in D24.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Critical Stage or Substantial Performance by the day fixed herein for same.
- D24.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D25. COVID-19 SCHEDULE DELAYS

- D25.1 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, directives from health authorities and various levels of government and in close consultation with the Contract Administrator.
- D25.2 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.
- D25.3 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. 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.

- D25.4 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 D25.3. Failure to provide this notice will result in no additional time delays being considered by the City.
- D25.5 The Work schedule, including the durations identified in D19 to D23 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.
- D25.6 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.
- D25.7 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.

CONTROL OF WORK

D26. JOB MEETINGS

- D26.1 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 from 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.
- D26.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

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

- D27.1 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).

D28. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

- D28.1 Further to B13.4, 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 B13.4.

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 of construction materials shall be confined 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.
 - (iii) Construction materials and debris shall be tied down or secured if severe weather and high wind velocities are forecasted. Work shall be suspended during extreme high wind conditions.
 - (iv) Construction materials and debris shall be prevented from entering watercourses. In the event that materials and/or debris inadvertently enter the land drainage system, the Contractor will be required to remove the material to an appropriate landfill or storage facility and restore the watercourse to its original condition.
- (b) Fuel Handling and Storage
- (i) The Contractor shall obtain all necessary permits from Manitoba Conservation and Water Stewardship for the handling and storage of fuel products and shall provide copies to the Contract Administrator.
 - (ii) All fuel handling and storage facilities shall comply with The Dangerous Goods and Transportation Act Storage and Handling of Petroleum Products Regulation and any local land use permits.
 - (iii) Fuels, lubricants, and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act shall be stored and handled within the approved storage areas.
 - (iv) The Contractor shall ensure that any temporary fuel storage areas established for construction of the project are contained by an impermeable dyke. Dykes shall be designed, constructed, and maintained to retain not less than 100% of the capacity of the total number of containers or 110% of the largest container, whichever is greatest. The dykes shall be constructed of clay or similar impervious material. If this type of material is not available, the dyke shall be constructed of locally available material and lined with high-density polyethylene (HDPE). Furthermore, the fuel storage area(s) shall be secured by a battier such as a high fence and gate to prevent vandalism.
 - (v) The Contractor shall ensure that all fuel storage containers are inspected daily for leaks and spillage.
 - (vi) Products transferred from the fuel storage area(s) to specific Work Sites shall not exceed the daily usage requirement.
 - (vii) When servicing requires the drainage or pumping of fuels, lubricating oils or other fluids from equipment, a groundsheet of suitable material (such as HDPE) and size shall be spread on the ground to catch the fluid in the event of a leak or spill.
 - (viii) Washing, 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 29.1 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
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 8:00 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.
- (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 Omand's Creek to the greatest extent possible, to the satisfaction of the Contract Administrator.

- (ii) Areas that are heavily disturbed and vulnerable to erosion or gullyng 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 care 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 properties.

D29.5 The Contractor shall provide or maintain general and off-street access to any affected business during construction.

D30. LAYOUT OF WORK

D30.1 Further to C6, the Contract Administrator shall provide the basic centrelines and a benchmark for construction.

D30.2 The Contractor shall be responsible for the true and proper laying out of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work. The Contractor shall provide all required instruments and competent personnel for performing all layouts.

D30.3 The Contract Administrator shall be notified at least one (1) Business Day prior to any Work being commenced in order to have the option to check and review all elevations and layouts at their discretion.

D30.4 Should any error appear or arise in location, levels, dimensions, and/or alignments during the course of the Work, the Contractor shall promptly rectify such errors to the satisfaction of the Contract Administrator, at their own expense.

D30.5 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items of the basic data supplied by the Contract Administrator. Any such benchmarks or stakes removed or destroyed by the Contractor, without the consent of the Contract Administrator, shall be replaced by the Contract Administrator at the expense of the Contractor.

MEASUREMENT AND PAYMENT

D31. PAYMENT

D31.1 Further to C12, the City shall make payments to the Contractor by direct deposit to the Contractor's banking institution, and by no other means. Payments will not be made until the Contractor has made satisfactory direct deposit arrangements with the City. Direct deposit application forms are at https://winnipeg.ca/finance/files/Direct_Deposit_Form.pdf.

WARRANTY

D32. WARRANTY

D32.1 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.

D32.2 Notwithstanding C13.2 or D32.1, 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.

D32.2.1 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.

DISPUTE RESOLUTION

D33. DISPUTE RESOLUTION

- D33.1 The entire text of C21.4 is deleted, and amended to read: “Intentionally Deleted”
- D33.2 The entire text of C21.5 is deleted, and amended to read:
- (a) If Legal Services has determined that the Disputed Matter may proceed in the Appeal Process, the Contractor must, within ten (10) Business Days of the date of the Legal Services Response Letter, submit their written Appeal Form, in the manner and format set out on the City’s Materials Management Website, to the Chief Administrative Officer, and to the Contract Administrator. The Contractor may not raise any other disputes other than the Disputed Matter in their Appeal Form.
- D33.3 Further to C21, prior to the Contract Administrator’s issuance of a Final Determination, the following informal dispute resolution process shall be followed where the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator (“Dispute”):
- (a) In the event of a Dispute, attempts shall be made by the Contract Administrator and the Contractor’s equivalent representative to resolve Disputes within the normal course of project dealings between the Contract Administrator and the Contractor’s equivalent representative.
 - (b) Disputes which in the reasonable opinion of the Contract Administrator or the Contractor’s equivalent representative cannot be resolved within the normal course of project dealings as described above shall be referred to a without prejudice escalating negotiation process consisting of, at a minimum, the position levels as shown below and the equivalent Contractor representative levels:
 - (i) The Contract Administrator;
 - (ii) Supervisory level between the Contract Administrator and applicable Department Head;
 - (iii) Department Head.
- D33.3.1 Names and positions of Contractor representatives equivalent to the above City position levels shall be determined by the Contractor and communicated to the City at the pre-commencement or kick off meeting.
- D33.3.2 As these negotiations are not an adjudicative hearing, neither party may have legal counsel present during the negotiations.
- D33.3.3 Both the City and the Contractor agree to make all reasonable efforts to conduct the above escalating negotiation process within twenty (20) Business Days, unless both parties agree, in writing, to extend that period of time.
- D33.3.4 If the Dispute is not resolved to the City and Contractor’s mutual satisfaction after discussions have occurred at the final escalated level as described above, or the time period set out in D33.3.3, as extended if applicable, has elapsed, the Contract Administrator will issue a Final Determination as defined in C1.1(v), at which point the parties will be governed by the Dispute Resolution process set out in C21.

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 D11, 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 D11, 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 D11.4, 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.

D34.5.2 The Contractor agrees that in no event will Canada or Manitoba, their respective officers, servants, employees or agents be held liable for any damages in contract, tort (including negligence) or otherwise, for:

- (a) any injury to any person, including, but not limited to, death, economic loss or infringement of rights;
- (b) any damage to or loss or destruction of property of any person; or
- (c) any obligation of any person, including, but not limited to, any obligation arising from a loan, capital lease or other long term obligation;

in relation to this Contract or the Work.

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.

D34.7.5 The Contractor represents and warrants that no current or former public servant or public office holder, to whom the Value and Ethics Code for the Public Sector, the Policy on Conflict of Interest and Post Employment, or the Conflict of Interest Act applies, shall derive direct benefit from this Contract, including any employment, payments, or gifts, unless the provision or receipt of such benefits is in compliance with such codes and the legislation.

D34.7.6 The Contractor represents and warrants that no member of the House of Commons or of the Senate of Canada or of the Legislative Assembly of Manitoba is a shareholder, director or officer of the Contractor or of a Subcontractor, and that no such member is entitled to any benefits arising from this Contract or from a contract with the Contractor or a Subcontractor concerning the Work.

FORM H1: PERFORMANCE BOND
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

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

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

_____ dollars (\$_____)

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

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

TENDER NO. 233-2022

REHABILITATION OF ROUTE 90 CULVERT 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 D12)

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. 233-2022

REHABILITATION OF ROUTE 90 CULVERT 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 K: EQUIPMENT
(See D15)

REHABILITATION OF ROUTE 90 CULVERT 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 D15)

REHABILITATION OF ROUTE 90 CULVERT 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 B7. 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 B7.
- E1.4 The following are applicable to the Work:

<u>City Drawing No</u>	<u>Drawing Name/Title</u>
C315-21-01	Cover Sheet and Location Plan
C315-21-02	Drawing List and General Notes
C315-21-03	Bore Hole Logs
C315-21-04	Existing Conditions and Site Plan
C315-21-05	General Arrangements and Scope of Work
C315-21-06	Rebar Cover Survey
C315-21-07	Concrete Removal
C315-21-08	Caisson Layout and Details
C315-21-09	Shear Key Plan and Section
C315-21-10	Plan and Profile East Barrier Wall
C315-21-11	Plan and Profile West Barrier Wall
C315-21-12	Concrete Details 1 of 2
C315-21-13	Concrete Details 2 of 2
C315-21-14	Reinforcing Details 1 of 2
C315-21-15	Reinforcing Details 2 of 2
C315-21-16	Bill of Reinforcing Pile Cap Beam, Barrier, Sidewalk
C315-21-17	Approach Slab Details 1 of 2
C315-21-18	Approach Slab Details 2 of 2
C315-21-19	Bill of Reinforcing Approach Slabs
C315-21-20	Culvert Repairs 1 of 3
C315-21-21	Culvert Repairs 2 of 3
C315-21-22	Culvert Repairs 3 of 3
C315-21-23	Aluminum Barrier Details
C315-21-24	Paving and Grading – King Edward Street and Dublin Avenue
C315-21-25	Traffic Staging & Temporary Signage – Stage 1
C315-21-26	Traffic Staging & Temporary Signage – Stage 2
C315-21-27	Traffic Staging & Temporary Signage – Stage 3

- E1.5 The following Drawings are provided for the Contractor's reference in Appendix 'D':

<u>City Drawing No</u>	<u>Drawing Name/Title</u>
------------------------	---------------------------

C315-85-02	General Arrangement & Location of Proposed Works
C315-85-03	Traffic Routing & Construction Sequence
C315-85-04	Details of Top Slab Modification and Approach Slabs
C315-85-05	Asphalt Overlay – Layout & Grades
C315-85-06	Layout & Details of Aluminum Pedestrian Handrail
C315-85-07	Layout of Balanced Aluminum Shoulder Barrier, Headwall Chainlink Fence & Riprap
C315-85-08	Balanced Aluminum Shoulder Barrier Standard Details
C315-85-09	Details of Aluminum Bridge Rail Posts

E2. MOBILIZATION AND DEMOBILIZATION

E2.1 Description

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

E2.2 Scope of Work

- (a) The Work under this Specification shall include but not be limited to:
 - (i) the submission of a site layout plan;
 - (ii) mobilizing and demobilizing on site work facilities; and
 - (iii) installing, maintaining and removing any access roadway.

E2.3 References

- (a) CW 1120 – Existing Services, Utilities and Structures; and
- (b) CW 1130 – Site Requirements.

E2.4 Submittals

- (a) The Contractor shall submit the following to the Contract Administrator seven (7) Calendar Days prior to mobilization on Site:
 - (i) A plan highlighting the Site layout which includes: laydown area location(s), staging areas, office facility location, access road(s), temporary secure fencing limits and gate locations for review and approval.

E2.5 Materials and Equipment

- (a) All materials supplied under this Specification shall be of a type approved by the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.
- (b) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (c) All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E2.6 Construction Methods

- (a) Site Inspection
 - (i) Inspect the Site with the Contract Administrator to verify existing conditions prior to mobilizing on Site.

- (ii) Inspect the Site with the Contract Administrator soon after demobilizing off Site, confirming the Site has been restored to its original condition prior to initiation of Work.
- (b) Layout of On-Site Work Facilities
 - (i) The Contractor shall mobilize all on Site Work and other temporary facilities.
 - (ii) Upon completion of construction activities, the Contractor shall remove all on Site Work and other temporary facilities.
- (c) Access Roadway
 - (i) The Contractor shall maintain any access roadway they install.
 - (ii) The access road shall be maintained on a regular basis to provide continual unrestricted site access, to the satisfaction of the Contract Administrator.
 - (iii) Upon completion of the Work, the area shall be restored to its original condition.
- (d) Restoration of Existing Facilities
 - (i) Upon completion of the Work and demobilization, the Contractor shall restore existing facilities to their original condition, to the approval of the Contract Administrator.

E2.7 Measurement and Payment

- (a) Mobilization and Demobilization will not be measured and will be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization" 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) Mobilization and Demolition will be paid for at a percentage of the Contract Lump Sum Price, as specified herein:
 - (i) When Contract Administrator is satisfied that construction has commenced at the Site: 30%
 - (ii) During construction, percentage distributed equally on a monthly basis at the discretion of the Contract Administrator: 60%
 - (iii) Upon completion of the project: 10%

E3. OFFICE FACILITIES

E3.1 The Contractor shall supply office facilities for shared use with the Contract Administrator meeting the following requirements:

- (a) The building shall be conveniently located near the site of the Work.
- (b) The building shall have a minimum floor area of 25 m², a height of 2.4 m with a window and a door entrance with a suitable lock.
- (c) 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 to 18°C or 24 to 25°C.
- (d) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three (3) wall outlets.
- (e) The building shall be furnished with one (1) desk exclusively for use by the Contract Administrator, one (1) 3 m x 1.2 m drafting table, one (1) stool and a minimum of twelve (12) chairs.
- (f) 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.
- (g) 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.

- E3.2 The Contractor shall be responsible for all installation and removal costs, all operating costs and the general maintenance of the office facilities.
- E3.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance.
- E3.4 No separate measurement or payment will be made for the supply of office facilities as described in this Specification.

E4. TRAFFIC CONTROL

- E4.1 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 planning 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.
- E4.2 Notwithstanding E4.1, 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.
- E4.2.1 An exception to E4.2 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.
- E4.2.2 Further to E4.2, 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.
- E4.2.3 Further to E4.2, the Contractor shall supply all required barricades and poly-posts (traffic control devices) and the Traffic Services Branch of the City of Winnipeg will place and maintain them.

E5. TRAFFIC MANAGEMENT

- E5.1 Further to clause 3.7 of CW 1130:
- E5.1.1 Maintain a minimum of one lane in each direction at all times during construction including during paving and milling operations.
 - E5.1.2 Intersecting local streets, median openings and private approach access shall be maintained at all times.

- E5.1.3 Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, the Contractor shall review the planned disruption with the business or residence and the Contract Administrator and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of twenty-four (24) hours notification to the affected residence or business and the Contract Administrator prior to disruption of access.
- E5.1.4 Ambulance/emergency vehicle access must be maintained at all times.
- E5.2 Construction Methods
- E5.2.1 The Contractor shall advise the Contract Administrator five (5) days in advance of any new or change in lane closure;
- E5.2.2 Erect and maintain all applicable traffic control devices (including, but not limited to, warning signs, barrels, tall cones and chevrons) as specified by MTTC, the Traffic Management Branch, the Contract Administrator.
- E5.2.3 The Contractor shall take all other safety measures necessary to cope with any peculiar or unusual circumstances that have not been set out in the MTTC and shall, at all times, ensure that maximum protection is afforded to the road-user and that his/her operations in no way interfere with the safe operation of traffic, cyclists or pedestrians.
- E5.2.4 Improper signing will be sufficient reason for the Contract Administrator to order the Works to cease on Site.
- E5.2.5 During the hours when the Contractor is not working, equipment and stockpiled materials shall be left in such a location so as not to interfere with or present a hazard to motorists, cyclists or pedestrians.
- E5.3 Measurement and Payment
- E5.3.1 Traffic Control and Traffic management will not be measured and will be paid for at a percentage of the Contract Lump Sum Price for "Traffic and Pedestrian Control" 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.
- (i) When Contract Administrator is satisfied that construction has commenced at the Site: 30%
 - (ii) During construction, percentage distributed equally on a monthly basis at the discretion of the Contract Administrator: 60%
 - (iii) Upon completion of the project: 10%

E6. LAYDOWN AREA

- E6.1 Description
- E6.1.1 This Specification covers all items relating to the laydown area for use by the Contractor, as specified herein.
- E6.1.2 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 Works as hereinafter specified.
- E5.2 Scope of Work
- (a) The Work under this Specification shall include but not be limited to:
 - (i) The submission of a site layout plan as specified in E2.
- E6.2 References
- (a) E2 – Mobilization and Demobilization.

E6.3 Construction Methods

- (a) The Contractor shall be responsible for ensuring the laydown area(s) are kept clean and organized.
- (b) Equipment storage may be permitted in the closed lanes during Stage 1, Stage 2 and Stage 3.
- (c) The Contractor shall also be responsible to ensure the laydown area(s) do not interfere with road users or pedestrians and that road users and pedestrians are sufficiently protected from objects in the laydown area(s) that may pose a hazard. Placement of large, fixed objects adjacent to live lanes of traffic pose a hazard to users. Should the Contractor desire to use these areas for laydown the Contractor shall submit a plan for adequately protecting the roadside hazard. The plan is to be sealed by an Engineer registered to practice in the Province of Manitoba.

E6.4 Measurement and Payment

- (a) The laydown area(s) shall be considered incidental to the Work and no separate measurement or payment will be made.

E7. PROTECTION OF EXISTING TREES

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

- (a) the Contractor shall not stockpile materials and soil or park vehicles and equipment within 2 m of trees;
- (b) trees identified to be at risk by the Contract Administrator are to be strapped with
- (c) 25 mm X 100 mm X 2,400 mm wood planks, or suitably protected as approved by the Contract Administrator;
- (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; and
- (e) Work on Site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.

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

E7.3 Elm trees shall not be pruned at any time between April 1 and July 31.

E7.4 Measurement and Payment

E7.4.1 The protection of existing trees shall be considered incidental to the Work and no separate measurement or payment will be made.

E8. PROTECTION OF EXISTING UTILITIES

E8.1 In accordance with and further to CW 1120, the Contractor shall protect and maintain all existing utilities that may be affected by the Work. The Contractor shall identify and locate utilities, and select appropriate construction methods to complete the work while avoiding harm to any utilities.

E8.2 References

(a) CW 1120 – Existing Services, Utilities and Structures

E8.3 Measurement and Payment

(a) The protection of existing utilities shall be considered incidental to the Work and no separate measurement or payment will be made.

E9. WATER OBTAINED FROM THE CITY

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

E10. SHOP DRAWINGS

E10.1 Description

- (a) This Specification provides instructions for the preparation and submission of Shop Drawings.
- (b) 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.

E10.2 Shop Drawings

- (a) Original Shop Drawings shall be prepared by Contractor, Subcontractor, supplier, distributor or manufacturer to illustrate appropriate portion of Work including fabrication, layout, setting or erection details as specified in appropriate sections.
- (b) Shop Drawings are required for the following components:
 - (i) Aluminium Barrier Rail and Posts
 - (ii) Supply and fabrication of reinforcing steel

E10.3 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; and
 - (iii) Catalogue numbers and similar data.
- (c) Coordinate each submission with requirements of Work and Contract Documents. Individual Shop Drawings will not be reviewed until all related Drawings are available.
- (d) Submit specified Shop Drawings to the Contract Administrator for review. 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 Contract Administrator review.
- (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.

E10.4 Submission Requirements

- (a) Schedule submissions at least seven (7) Calendar Days before dates reviewed submissions will be needed, and allow for a seven (7) Calendar Day period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract Documents.
- (b) Submit one (1) electronic (PDF) copy of Shop Drawings.
- (c) Accompany submissions with transmittal letter containing:
 - (i) Date;
 - (ii) Project title and Tender document 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.
- (d) Submissions shall include:
 - (i) Date and revision dates;
 - (ii) Project title and Tender document number;
 - (iii) Name of:
 - 1. Contractor;
 - 2. Subcontractor;
 - 3. Supplier;
 - 4. Manufacturer; and
 - (iv) Detailer (if applicable).
 - (v) Identification of product or material;
 - (vi) Relation to adjacent structure or materials;
 - (vii) Field dimensions, clearly identified as such;
 - (viii) Specification section name, number and clause number or drawing number and detail /section number;
 - (ix) Applicable standards, such as CSA or CGSB numbers; and
 - (x) Contractor's stamp, initialed or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.

E10.5 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, re-submissions and review of Shop Drawings.

E10.6 Measurement and Payment

- (a) Shop Drawings shall be considered incidental to the Work and no separate measurement or payment will be made.

E11. CREEK FLOW MAINTENANCE

E11.1 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 construction of the rockfill shear key and culvert concrete repairs.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E11.2 Scope of Work

- (a) The Work under this Specification shall include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator:
 - (i) Designing creek flow maintenance methods;
 - (ii) Maintaining creek flows during construction;
 - (iii) Removing and disposing of material to maintain creek flows;
 - (iv) Confining suspended matter in Omand's Creek;
 - (v) Constructing cofferdams and dewatering in Omand's Creek; and
 - (vi) Complying with all requirements outlined in D29, "Environmental Protection Plan".

E11.3 Submittals

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, a detailed plan and schedule for the construction of cofferdams, clearly illustrating the method and sequence by which the Contractor 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.

E11.4 Materials

- (a) General
 - (i) All materials supplied under this Specification shall be of a type approved by

the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.

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

(b) Cofferdams

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

E11.5 Construction Methods

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

- (i) Design of creek flow maintenance methods including the preparation and submission for review and approval by the Contract Administrator of a Creek Flow Maintenance Plan.
- (ii) Maintenance of creek flows for the duration of construction.
- (iii) Removal of materials and/or equipment required to maintain creek flows, at the end of their use.
- (iv) Confinement of suspended matter in the creek water generated at the Site through excavation and structural removal activities, within the Project area. This will require the construction of cofferdams.

(b) Instream Activities

- (i) 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) Concrete repairs, and rockfill shear key construction are anticipated to take place 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 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 m³/s of Omand's Creek flow including pumps necessary to account for maintenance. Dewatering of the Site beyond the limits of the work area shall not be permitted.
- (iv) To fairly mitigate anticipated costs, if the flows encountered during the period of construction exceed the capacity of the required pumps, the Contractor shall be reimbursed for expenses as specified in C7 if authorized in advance. The use of any pumps in addition to the required pumps noted in E11.5 shall be recorded by the Contractor and signed off daily by the Contract Administrator.

(d) Cofferdam Construction

- (i) The construction of cofferdams is required in order to dewater Omand's Creek for the shear key construction, and concrete repairs to the culvert barrel.
- (ii) Efforts shall be made to minimize the period of time for which Omand's Creek is dewatered. As part of the submittals noted in E11.3, the Contractor shall provide an anticipated timeline for which the channel will be dewatered.

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

- (iii) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.
- (iv) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re- established.

E11.6 Measurement and Payment

(a) Creek Flow Maintenance

- (i) Creek flow maintenance shall not be measured. This item of Work shall be paid for at the Contract Lump Sum Price for “Creek Flow Maintenance”, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. Payment will be based upon the following breakdown:
 - (i) Installation: 50%
 - (ii) Removal: 50%

E12. CREEK BANK EXCAVATION

E12.1 Description

- (a) This Specification shall cover all operations related to the excavation of material for the structural concrete works and surface excavation near Omand’s Creek including removal of topsoil and vegetation, and shall amend and supplement CW 3170.
- (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.

E12.2 Referenced Specifications and Drawings

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

E12.3 Scope of Work

- (a) The Work under this Specification shall involve:
 - (i) Excavating all material required to construct the Works;
 - (ii) The design, fabrication and erection of all temporary shoring and such temporary protective measures as may be required to construct the Works;
 - (iii) Clearing and grubbing operations in areas where excavation is required;
 - (iv) Excavating topsoil where excavation is required;
 - (v) Off-site disposing of surplus and unsuitable material;
 - (vi) Dewatering of all excavations, as required; and
 - (vii) Complying with the requirements outlined in D29, “Environmental Protection Plan”.

E12.4 Submittals

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the

Site, a proposed schedule, including methods and sequence of operations.

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

E12.5 Materials

(a) General

- (i) All materials supplied under this Specification shall be of a type approved by the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.
- (ii) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

(b) Testing

- (i) All excavated materials shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

(c) Excavation

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

E12.6 Equipment

(a) General

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

E12.7 Construction Methods

(a) Excavation – 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 their 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 construction of structural concrete works.
 - (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 their work during and following construction. Sediment and erosion control measures shall comply with the requirements of D29, “Environmental Protection Plan”.
 - (ii) The Contractor shall monitor their work and implement appropriate sediment control measures as Site conditions warrant. Such measures may include installation of silt fences, straw bales, or other measures as required in the event that there is runoff from the Site.
 - (iii) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.

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

E12.8 Quality Control

- (a) Inspection
 - (i) After each excavation is completed, the Contractor shall notify the Contract Administrator to inspect the excavation.
- (b) Access
 - (i) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times. The Contractor shall supply samples to the Contract Administrator or their inspector for testing purposes as required. There will be no charge to the City for samples taken.

E12.9 Measurement and Payment

- (a) Creek Bank Excavation
 - (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.

E13. ROCKFILL SHEAR KEYS

E13.1 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.

E13.2 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.

E13.3 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.

E13.4 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 their 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 their 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 their proposed methods that are required if the required degree of compaction is not being achieved.

E13.5 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.

E14. SILT FENCE BARRIER

E14.1 Description

- (a) This Specification shall cover all operations relating to the work necessary for the supply, installation, and maintenance of silt fence barrier, as herein specified.
- (b) The Contractor shall coordinate silt fencing activities with the referenced specifications noted in 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.

E14.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
 - (i) ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³);
 - (ii) ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics— Diaphragm Bursting Strength Tester Method;
 - (iii) ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus;
 - (iv) ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity;
 - (v) ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles;
 - (vi) ASTM D4632 – Grab Breaking Load and Elongation of Geotextiles;
 - (vii) ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile; and
 - (viii) ASTM D4833 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - (ix) CW 3550 – Chain Link and Drift Control Fence
- (b) The latest version of the City of Winnipeg Standard Construction Specifications
 - (i) CW 3550 – Chain Link and Drift Control Fence;

E14.3 Scope of Work

- (a) The Work under this Specification shall include the following items 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".

E14.4 Submittals

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

E14.5 Materials

(a) General

- (i) All materials supplied under this Specification shall be of a type approved by the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.
- (ii) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

(b) Handling and Storage of Materials

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

(c) Fence Posts

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

(d) Filter Fabric

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

TABLE 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.

E14.6 Equipment

(a) General

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

E14.7 Construction Methods

(a) General

- (i) Silt fencing which should be installed at the start of the work, shall be installed

along areas where there is stripped or exposed soil where run-off would enter the 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 their work during and following construction. Sediment and erosion control measures shall comply with the requirements of D29, "Environmental Protection Plan" and E11, "Creek Flow Maintenance".

E14.8 Quality Control

- (a) Inspection
 - (i) All workmanship and all materials furnished and supplied under this Specification

are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work.

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

E14.9 Measurement and Payment

(a) Silt Fence Barrier

- (i) Supplying, installing, maintaining, and removing silt fence barrier shall be measured on a length basis and shall be paid for at the Contract Unit Price for "Supply and Install Silt Fence Barrier", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work. The length to be paid for shall be the total lineal metres of silt fence barrier supplied, installed, maintained, and removed in accordance with this Specification, and as accepted by the Contract Administrator.
- (ii) Payment for silt fence barrier shall be based on the following breakdown:
 - (i) Following supply and installation: 60%
 - (ii) Following final removal: 40%
- (iii) Removal of accumulated sediment from the silt fence shall be considered incidental to the Work and no separate measurement or payment shall be made.
- (iv) Temporary removal and reinstallation of the silt fence to facilitate other project activities such as revegetation shall be considered incidental to the Work and no separate measurement or payment shall be made.

E15. **EROSION CONTROL BLANKET (ECB)**

E15.1 Description

- (a) This Specification shall cover the supply, installation, and maintenance of erosion control blanket (ECB), as herein specified.
- (b) The Contractor shall coordinate silt fencing activities with the referenced specifications noted in E14, "Silt Fence Barrier".
- (c) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E15.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
 - (i) ASTM D1117 – Standard Guide for Evaluating Nonwoven Fabrics;
 - (ii) ASTM D1388 – Standard Test Method for Stiffness of Fabrics;
 - (iii) ASTM D6525 – Standard Test Method for Measuring Nominal Thickness of Rolled Erosion Control Products;
 - (iv) ASTM 6818 – Standard Test Method for Ultimate Tensile Properties of Rolled Erosion Control Products; and
 - (v) Erosion Control Technology Council (ECTC) Guidelines.

E15.3 Scope of Work

- (a) The Work under this Specification shall include the following items 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".

E15.4 Submittals

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

E15.5 Materials

- (a) General
 - (i) All materials supplied under this Specification shall be of a type approved by the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.
 - (ii) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (b) Handling and Storage of Materials
 - (i) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (c) ECB
 - (i) ECB shall be a machine-produced mat of 70% agricultural straw and 30% coconut blanket with a functional longevity of up to 24 months. Suitable products include SC 150 Extended Term manufactured by North American Green (<http://www.jmdcompany.com/products/N-11%20SC150.pdf>), or approved equivalent in accordance with B7 "Substitutes".
 - (ii) The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat.
 - (iii) The blanket shall be covered on the topside with heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and a maximum 159 mm x 159 mm mesh and on the bottom side with a lightweight photodegradable polypropylene netting with a maximum 127 mm x 127 mm mesh. The blanket shall be sewn together on 381 mm centres (maximum) with degradable thread.
 - (iv) ECB shall have the following properties:
 - (i) Matrix 70% Straw Fibre (0.19 kg/m²) and 30% Coconut Fibre (0.08 kg/m²);
 - (ii) Netting top side heavyweight photodegradable with UV additives (1.47 kg/100 m²);
 - (iii) Bottom side lightweight photodegradable minimum netting weight (0.73kg/100 m²); and
 - (iv) Degradable thread.
 - (v) Staples used to secure ECB shall be as recommended by the Manufacturer.

E15.6 Equipment

- (a) General
 - (i) All equipment shall be of a type acceptable to the Contract Administrator and

shall be kept in good working order.

E15.7 Construction Methods

(a) General

- (i) ECB shall be placed on all disturbed and exposed slopes for which revegetation is required.
- (ii) Locations of ECB will be confirmed on site with the Contract Administrator.

(b) ECB Installation

- (i) The blanket shall be rolled out in the direction of the water flow.
- (ii) The upper edges of the blanket on the side slopes and the edges at the terminal ends of the installation shall be placed in a 150 mm x 150 mm trench.
- (iii) The upper edges shall be stapled at 1 000 mm intervals and the terminal edges shall be stapled at 300 mm intervals within the trench. The trench shall be then be backfilled and compacted. The side and end seams shall be overlapped edge over edge (shingle style) with an overlap of 150 mm. The side seams shall be stapled at 1000 mm intervals and the end seams shall be stapled at 300 mm intervals.
- (iv) At 10 m intervals, the Contractor shall place a double row of staggered staples to secure the blankets. The staples shall be spaced 100 mm apart. The remainder of the blanket shall be stapled at a rate of four staples per m². 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 their 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 their 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 their work during and following construction. Sediment and erosion control measures shall comply with the requirements of D29, "Environmental Protection Plan" and E11, "Creek Flow Maintenance".
- (ii) The Contractor shall monitor their work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales, or other measures as required in the event that there is runoff from the Site.
- (iii) The Contractor shall monitor, maintain, repair all sediment control measures until vegetation has re-established in restored areas and there no longer is a potential for sediment releases due to construction.
- (iv) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control potential erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established.

E15.8 Quality Control

(a) Inspection

- (i) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work.
- (ii) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

E15.9 Measurement and Payment

(a) Erosion Control Blanket

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

E16. **SOFT EXCAVATION TO EXPOSE UNDERGROUND UTILITIES**

E16.1 Description

- (a) This Specification covers the soft excavation to expose underground utilities to determine the depth of the underground utility and whether it will interfere with the installation of proposed Works on Site.
- (b) These underground utilities include, but are not limited to, Manitoba Hydro cables and gas line, telecommunications cables, existing sewers, and existing water mains. Some abandoned utilities are also anticipated to be present within the depth of the excavation required for the culvert works.
- (c) The Contractor is responsible for confirming all utility locations prior to commencing work.

E16.2 Materials

(a) Backfill Material

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

E16.3 Construction Methods

- (a) Prior to commencement of any construction works adjacent to underground utilities, the Contractor shall use soft digging or hand excavation to expose the underground utilities.
- (b) Once the elevation of the top of the pipe or duct has been determined the resulting excavation shall be backfilled with bedding sand to the elevation of the existing ground.
- (c) The installation of void form shall be undertaken in accordance with the manufacturer's recommendations or as shown on the Drawings.

E16.4 Measurement and Payment

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

E17. CHAIN LINK FENCING

E17.1 Description

- (a) Further to CW 3550, this Specification shall cover the supply and installation of new chain link fencing, as herein specified.
- (b) All existing chain link fencing on the culvert wingwalls shall be removed and salvaged, in accordance with direction from the Contract Administrator, and new chain fencing shall be installed in all areas of existing fencing removal.
- (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.

E17.2 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-R3. Further to CW 3550-R3, 43 O.D. top and bottom rails shall be used.

E17.3 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.

E17.4 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.

E18. CAST-IN-PLACE CONCRETE PILE FOUNDATIONS

E18.1 Description

E18.1.1 General

- (a) This Specification covers all operations relating to the supply and installation of cast-in-place concrete piles including but not limited to overburden drilling, water control, inspection, supply and placement of concrete and reinforcing steel, and disposal of excavated material.
- (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.

E18.1.2 Elevations on Drawings

- (a) The pile elevations are shown on the Drawings. Refer to the test hole logs and all other available information to gain more knowledge about the surface and subsurface conditions.

E18.2 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 tremie concrete operations the proposed tremie concrete procedures.

E18.3 Materials

E18.3.1 General

- (a) 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 acceptance by the Contract Administrator.

E18.3.2 Handling and Storage

- (a) Storage of materials shall be in accordance with CSA Standard CAN/CSA A23.1. Materials damaged by careless or negligent handling or storage by the Contractor shall be replaced at the Contractors expense.

E18.3.3 Testing

- (a) All materials supplied under this Specification shall be subject to inspection by the Contract Administrator and testing by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall be approved by the Contract Administrator at least seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the 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 their own expense.

E18.3.4 Concrete

- (a) The concrete shall conform to Specification E20.
- (b) The concrete shall meet the requirements for hardened concrete specified as follows:
 - (i) Nominal compressive strength = 35MPa at 28 days.
 - (ii) Class of exposure = F-1& S-1.
 - (iii) Air Content Category = 1.
 - (iv) Maximum Aggregate size = 20mm.

E18.3.5 Reinforcing Steel

- (a) The reinforcing steel shall conform to Specification E24.

E18.3.6 Miscellaneous Materials

- (a) Miscellaneous materials shall be of the type specified on the Drawings or approved by the Contract Administrator.

E18.4 Equipment

E18.4.1 All equipment shall be of a type accepted by the Contract Administrator and shall be kept in good working order.

E18.4.2 Tremie Equipment

- (a) The tremie pipe shall consist of a tube, having a diameter of not less than 250 mm, constructed with sections having flange couplings fitted with gaskets. The discharge end shall have a proper seal so that water will not enter the tube at any time.

E18.5 Construction Methods

E18.5.1 Location and Alignment of Piles

- (a) Pile construction shall not commence until the Contractor has obtained clearance from the appropriate Utility Authorities including but not limited to Manitoba Hydro, MTS and City of Winnipeg Water and Waste.
- (b) Piles shall be placed in the positions shown on the Drawings and as directed by the Contract Administrator in the field.
- (c) The deviation of the axis of any finished pile shall not differ by more than one percent (1%) from the vertical.

E18.5.2 Buried Utilities

- (a) The Contractor shall exercise extreme caution when constructing the pile foundations in the vicinity of existing buried utilities and buildings. The Drawings show the approximate locations of existing buried utilities. The Contractor shall be responsible for obtaining the exact location of the buried utilities from the appropriate Utility Authorities prior to installing the piles.
- (b) The Contractor shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing buried utilities as a result of the Contractor's operations in constructing cast-in-place concrete piles, as determined by the Contract Administrator.

E18.5.3 Excavation

- (a) Pile excavation shall be achieved by auguring (i.e. drilling) for the full depth of all piles.
- (b) It may be necessary to hydro-jet excavate utilities adjacent to a pile location to adequately ascertain the location or provide enough "slack" in conduits to move them slightly to avoid interference with the pile locations.
- (c) Upon reaching the required elevation, the bottom of the excavation shall be cleaned as directed by the Contract Administrator in the field.
- (d) All excavated material from the piles shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor.
- (e) Upon completion of the cleaning out of the bottom to the satisfaction of the Contract Administrator, the reinforcement shall be set in place and the concrete placed immediately. Under no circumstances shall a hole be left to stand open after excavation has been completed.

E18.5.4 Inspection of Excavations

- (a) Concrete shall not be placed in an excavation until the excavation has been inspected and approved by the Contract Administrator.
- (b) The Contractor shall have available suitable light for the inspection of each excavation throughout its entire length.
- (c) Any improperly set casing or improperly prepared excavation shall be corrected to the satisfaction of the Contract Administrator.

E18.5.5 Placing Reinforcing Steel

- (a) Reinforcement shall be:
 - (i) placed in accordance with the details shown on the Drawings;
 - (ii) rigidly fastened together; and
 - (iii) lowered into the excavation intact before concrete is placed.

- (b) Spacers shall be utilized to properly locate the reinforcing steel cage in the excavation.

E18.5.6 Placing Concrete

- (a) Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 mm. The concrete shall be vibrated throughout the entire length of the pile.
- (b) Concrete shall be placed to the elevations as shown on the Drawings. The top surface of the pile shall be finished smooth with a hand float.
- (c) The shaft shall be free of water prior to placing of concrete. Concrete shall not be placed in or through water unless authorized by the Contract Administrator. Tremie concrete shall be placed as specified herein.
- (d) All concrete, during and immediately after deposition, shall be consolidated by mechanical vibrations so that the concrete is thoroughly worked around the reinforcement and around embedded items; eliminating all air or stone pockets that may cause honeycombing, pitting, or planes of weakness.

E18.5.7 Tremie Concrete

- (a) The shaft of the pile shall be pumped clear of water so that the bottom can be cleaned. Pumping shall then be stopped and water shall be allowed to come into the excavation until a state of equilibrium is reached. Concrete shall then be placed by means of a tremie pipe. The tremie pipe shall have a suitable gate in the bottom to prevent water from entering the pipe. The bottom of the pipe shall be maintained below the surface of the freshly placed concrete. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.
- (b) Tremie concrete shall be poured up to a depth of 600 mm or as the Contract Administrator directs. Pumps shall then be lowered into the excavation and the excess water pumped out. The laitance that forms on top of the tremie shall then be removed and the remainder of the concrete shall be placed in the dry excavation.

E18.5.8 Protection of Newly Placed Concrete

- (a) Newly laid concrete threatened with damage by rain, snow, fog, or mist shall be protected with a tarpaulin or other approved means.

E18.5.9 Curing Concrete

- (a) The top of the freshly finished concrete piles shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above 10°C for at least three (3) consecutive days thereafter.
- (b) After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.
- (c) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.
- (d) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3° in one hour or 20° in twenty-four hours.

E18.5.10 Cold Weather Concreting

- (a) Protection of concrete shall be considered incidental to its placement. The temperature of the concrete shall be maintained at or above 10°C for a minimum of three (3) days or till the concrete has reached a minimum compressive strength of 20 MPa, by whatever means are necessary. Concrete damaged as a result of inadequate protection against weather conditions shall be removed and replaced by the Contractor at their own expense. Also, concrete allowed to freeze prior to the three (3) days will not be accepted for payment

E18.6 Quality Control

- E18.6.1 All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, including all operations from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works that are not in accordance with the requirements of this Specification.
- E18.6.2 The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Contract. All material shall be free of surface imperfections and other defects.

E18.7 Measurement and Payment

- E18.7.1 Construction of Cast-in-Place Concrete Pile Foundations
- (a) Construction of cast-in-place concrete pile foundations shall be measured on a per metre length and paid for at the Contract Unit Price per metre for "Cast-In-Place Concrete Piles", 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, accepted and measured by the Contract Administrator.

E19. STRUCTURAL REMOVALS

E19.1 Description

- (a) This Specification shall cover all operations relating to the removal and disposal of miscellaneous culvert components and existing concrete, as specified herein and as shown on the Drawings. This Specification shall cover structural removal Works, including all necessary staging, demolition, removal, salvaging, transporting, unloading, stockpiling and disposal of applicable materials.
- (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.

E19.2 Scope of Work

- (a) The Work under this Specification shall generally include the following items, to the limits as shown on the Drawings or as otherwise directed by the Contract Administrator.
- (i) Complete removal of concrete approach slabs;
 - (ii) Partial depth removal of culvert sidewalks with curb;
 - (iii) Complete removal of approach sidewalk and curb;
 - (iv) Partial removal of caissons;
 - (v) Removal and salvage of aluminum pedestrian handrail, guardrail posts;
 - (vi) Removal and salvage of chain link fencing mesh and posts;
 - (vii) Concrete removal shall include removal of reinforcing steel as shown on the Drawings.
- (b) Removing concrete with appropriate equipment satisfactory to the Contract Administrator. No demolition products shall find their way into the watercourse. No demolition products shall find their way onto the sidewalk or roadway lanes which are open to traffic. Limits of demolition shall be saw-cut to provide a clean edge at the extent of demolition. Repair any over demolition and damaged reinforcing steel to the satisfaction of the Contract Administrator, at no additional cost.
- (c) All structural removal materials not identified for salvage by the Contract Administrator shall revert to the Contractor for off-site disposal.

E19.3 References

- (a) ICRI No. 310.2 – Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers and Polymer Overlays.

E19.4 Submittals

- (a) 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 detailed plan and schedule, clearly illustrating the method and sequence by which the Contractor proposes to perform the concrete removals, including a description of the measures that will be implemented to meet any applicable environmental requirements. The demolition procedure shall include a description of the following:
 - (i) Type and capacity of equipment;
 - (ii) Sequence of operations; and
 - (iii) Design of demolition products protection of traffic lanes.

E19.5 Materials

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

E19.6 Equipment

- (a) All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.
- (b) The use of explosives is prohibited.

E19.7 Sequence of Structural Removals

- (a) Sequencing of all structural removals shall take place as shown on the Drawings unless otherwise approved to in writing by the Contract Administrator.

E19.8 Demolition Barriers

- (a) The Contractor shall provide all necessary temporary barriers to protect the general public from the products of the demolition process. The barriers shall not impede the concrete removals process or associated inspection of all Works by the Contract Administrator.

E19.9 Construction Methods

- (a) General
 - (i) Structural removals shall be deemed to include all the items of work as listed under Clause E19.2 of this Specification and to the limits as shown on the Contract Drawings or otherwise directed by the Contract Administrator.
 - (ii) The Contractor shall prevent damage and destructive vibrations to: existing structures to remain, services, expansion joints, and adjacent roadways. If safety measures are not followed, or if existing structures to remain and/or services appear to be endangered, the Contractor shall cease operations and notify the Contract Administrator immediately.
 - (iii) All removed material shall become the responsibility of the Contractor except as otherwise indicated herein.
 - (iv) 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 of the Contract Administrator. It shall be the Contractor's responsibility to find suitable disposal areas away from the Site.

- (v) The Contractor shall take all necessary precautions to ensure that materials do not fall onto any neighbouring roadways or sidewalks during removal operations.
- (vi) The Contractor shall visit the Site to become familiar with the existing conditions and scope of work prior to bid submission. No allowance for extras will be made for any structural removals, not foreseen by the Contractor, required to complete the scope of Work.
- (vii) The details and dimensions of the existing structures shown on the Drawings are for assisting the Contractor in establishing methods and limits of removal and for determining the cost of the Work. All available Drawings for the existing culvert structure and modifications are available for viewing with the Contract Administrator. No guarantee for the accuracy of the information is given. No allowance for extras will be given for information on the Drawings that does not represent existing conditions.
- (viii) In no case will the Contractor be permitted to use removal equipment, or other equipment or methods which may cause damage to any remaining structural elements or to any new construction. In the event that any element is damaged, the Contractor shall repair such element at their own expense to the satisfaction of the Contract Administrator.
- (ix) The Contractor shall provide all necessary access to facilitate concrete removals and subsequent inspection of all the Works by the Contract Administrator.
- (x) 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 their employees.
- (xi) The Contractor shall only use methods of concrete removal that will not damage the existing structure to remain or new structures. Limits of demolition shall be straight and saw-cut to provide a clean edge at the extent of demolition.

E19.10 Salvaged Structural Removals

- (a) The Contractor shall salvage structural removal materials as directed by the Contract Administrator and arrange to load, deliver and unload the salvaged handrail, guardrail, posts, and chain link fencing mesh and posts from the Site to the City of Winnipeg Bridge Yard at 960 Thomas Avenue by contacting Mike Terleski at 794-8510, providing a minimum five (5) business days notice prior to deliver(ies). The Contractor shall place salvaged structural removal materials on timber dunnage or palettes and tie down material with strapping to the satisfaction of the Contract Administrator prior to delivery to the City of Winnipeg Bridge Yard.

E19.11 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 their inspector for testing purposes as required. There will be no charge to the City for samples taken.

E19.12 Measurement and Payment

- (a) Removal of the existing concrete will not be measured. This item of Work will be paid for at the Contract Lump Sum Price for "Concrete Removals." The payment will be considered full compensation for performing all operations herein described or shown on the drawings and all other items incidental to the Work.

E20. STRUCTURAL CONCRETE

E20.1 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.

E20.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
 - (i) American Concrete Publication SP4 – Formwork for Concrete;
 - (ii) ASTM A1035 – Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement;
 - (iii) ASTM B418 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes;
 - (iv) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;
 - (v) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;
 - (vi) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;
 - (vii) ASTM C881- Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete;
 - (viii) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;
 - (ix) ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete;
 - (x) ASTM C1609 – Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam with Third Point Loading);
 - (xi) ASTM C1876 – Standard Test Method for Bulk Electrical Resistivity or Bulk Conductivity of Concrete;
 - (xii) CSA A23.1 – Concrete Materials and Methods of Concrete Construction;
 - (xiii) CSA-A3001 – Cementitious Materials for Use in Concrete; and
 - (xiv) CSA O121 – Douglas Fir Plywood.

E20.3 Scope of Work

- (a) Supplying and placing concrete for:
 - (i) Pile Cap Beam
 - (ii) Reinforced Sidewalk
 - (iii) Traffic Barriers
 - (iv) Barrier curbs
 - (v) Median
 - (vi) Approach Slabs
 - (vii) Culvert overlay

E20.4 Submittals

- (a) General

- (i) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.
 - (ii) The contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site, the proposed materials to be used.
- (b) Concrete Mix Design Requirements
 - (i) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump) methods are to be used, the method of placement must include a clear description of the pumping methods (line, vertical drop, length of hose, etc.).
 - (ii) The Supplier shall submit directly, in confidence, to the City of Winnipeg, the concrete mix designs for each of the concrete types specified herein. The purpose of this confidential submission will be for record keeping purposes only. The concrete mix design shall contain a description of the constituents and proportions, and at the minimum the following:
 - (i) Cementitious content in kilograms per cubic metre or equivalent units, and type of cementitious materials;
 - (ii) Designated size, or sizes, of aggregates, and the gradation;
 - (iii) Aggregate source location(s);
 - (iv) Weights of aggregates in kilograms per cubic metre or equivalent units. Mass of aggregates is saturated surface dry basis;
 - (v) Maximum allowable water content in kilograms per cubic metre or equivalent units and the water/cementitious ratio;
 - (vi) The limits for slump;
 - (vii) The limits for air content; and
 - (viii) Quantity of other admixtures.
 - (iii) The concrete mix design statements must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each of 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 to CSA A23.1-19 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 ten (10) 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 strength for Fibre Reinforced Concrete (FRC) only, air content and slump of the concrete to be supplied meets or exceeds the performance criteria. In addition, test data shall be submitted to support requirements for fibre dispersion in accordance with the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-19, Section 16, Fibre Reinforced Structures, Clause 16.6.
 - (iii) Testing for post-cracking residual strength index (Ri) of FRC shall be conducted at the Contractor's expense as follows: one set of five (5) concrete beam specimens, 100 mm X 100 mm X 350 mm long, shall be tested at seven (7) Calendar Days in accordance with the latest addition of ASTM C1609. The initial cracking load of the concrete (Pp) and the post-cracking residual strength (Pcr), which shall be taken as the average of loads corresponding to deflection values of 0.5 mm, 0.75mm, 1.0mm, and 1.25 mm, shall be tabulated for each of the specimens. The Ri for each specimen, which shall be taken as the ratio of Pcr over Pp, shall be tabulated. Tests conducted in accordance with ASTM C1609 will be considered invalid if the initial crack in the specimen has occurred after 0.2 mm deflection. The Ri shall be taken as the average of the Ri values from a minimum of five (5) valid specimens. The Contractor shall submit a report as specified in ASTM C1609, including a summary of the results of all post-cracking residual strength index tests and all load deflection curves.
 - (iv) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.
 - (v) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-19, "Sampling Plastic Concrete".
- (ii) Aggregates
- (i) The Contractor shall furnish, in writing to the Contract Administrator for review and approval, at least ten (10) 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 A23.2-7A.
 - (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 one hundred (100) to one hundred and twenty (120). 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.

- (vi) 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 the Contractor is proposing to use, at least ten (10) 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.

E20.5 Materials

- (a) General
 - (i) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification.
- (b) Testing and Approval
 - (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 seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such materials shall be rejected by the Contract Administrator and replaced by the Contractor at their own expense.
- (c) Adhesive Agent
 - (i) Adhesive agent for bonding steel reinforcing or dowels to concrete shall conform to the requirements of ASTM C881, Type V, Grade 3, Class A, B and C, except linear shrinkage. An acceptable product would be Hilti Hit-RE 500 V3, or equivalent.
- (d) Concrete Strength and Workability
 - (i) Structural Concrete
 1. Proportioning of fine aggregate, coarse aggregate, cement, water, and air-entraining agent shall be such as to yield concrete having the required strength and workability, as follows:

Concrete Type	Exposure Class	Nominal Compressive Strength	Maximum Aggregate Size	Air Content Category	Special Requirements
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All	C-XL	50 MPa @ 56 days	20 mm	1	Synthetic Fibres Ri = 0.15
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(e) Concrete Aggregate

(i) Fine Aggregate

1. Fine aggregate shall consist of sand having clean, hard, strong, durable, uncoated grains; free from injurious amounts of dust, soft or flaking particles, shale, alkali, organic matter, loam or other deleterious substance.
2. Fine aggregate shall be well-graded throughout and shall conform to the following gradation requirements:

Sieve Size	Percent of Total Dry Weight Passing Each Sieve
10 mm	100%
5 mm	95 - 100%
2.5 mm	80 - 100%
1.25 mm	50 - 90%
630 µm	25 - 65%
315 µm	10 - 35%
160 µm	2 - 10%
80 µm	0 - 3%

- (ii) Coarse Aggregate (20 mm Nominal) Coarse aggregate shall be clean and free from alkali, organic, or other deleterious matter, shall have an absorption not exceeding three percent (3%), and shall conform to the following gradation requirements:

Sieve Size	Percent of Total Dry Weight Passing Each Sieve
28 mm	100%
20 mm	85 - 100%
14 mm	50 - 90%
10 mm	25 - 60%
5 mm	0 - 10%
2.5 mm	0 - 5%

(f) Cementitious Materials

- (i) Cementitious materials shall conform to the requirements of 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 eight percent (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 C1 or F and the substitution shall not exceed thirty percent (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.

(g) 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 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.

- (h) 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.
- (i) Synthetic Fibres
 - (i) The synthetic fibres shall consist of one hundred percent (100%) virgin polypropylene 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) and fibre dispersion in accordance to the CHBDC CSA-S6-19, Fibre-Reinforced Structures, Clause 16.6. Notwithstanding CHBDC Section 16, Clause 16.6, testing for post-cracking residual strength index (Ri) of concrete shall be completed in accordance with E13.4(c)(i).
- (j) Bonding Agents
 - (i) Latex Bonding Agent
 - 1. Latex bonding agents to bond new concrete to existing concrete shall conform to the requirements of ASTM C1059, Type II. Polyvinyl acetate-based latexes will not be permitted. An acceptable product would be SikaCem 810, or equivalent. An acceptable product for concrete greater than twenty-eight (28) days in age would be Planicrete AC by MAPEI, or equivalent.
 - (ii) Epoxy Bonding Agent
 - 1. Epoxy bonding agents to bond new concrete to existing concrete shall be SikaTop Armatec-110 EpoCem, or equivalent as approved by the Contract Administrator, in accordance with B7.
- (k) Bonding Grout
 - (i) For latex bonding grouts, the grout for bonding the new concrete to the existing concrete shall be mixed in accordance with manufacturer's specifications.
 - (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.
- (l) Curing Compound
 - (i) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM C309. Curing compounds shall be resin-based and white-pigmented. An acceptable product would be WR Meadows 1215 WHITE Pigmented Curing Compound, or other equivalent product as approved by the Contract Administrator, in accordance with B7. Curing compounds shall only be permitted for use on the pile cap beam concrete and application shall be restricted to beam faces that do not bond to subsequent concrete pours.
- (m) Curing Blankets
 - (i) Curing blankets for wet curing shall be one hundred percent (100%) polyester, 3 mm thick and white in colour. Alternately, a ten (10) ounces burlap, five (5) mil polyethylene, curing blanket white in colour shall be used. An acceptable product would be Curelap together with a second layer of burlap, or other equivalent product as approved by the Contract Administrator, in accordance with B7.
- (n) 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 one (1) part cement to two (2) parts sand by damp loose volume. White Portland Cement shall be substituted for a part of the grey Portland Cement on exposed concrete in order to produce a colour matching the colour of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling or placing.
- (o) Formwork
 - (i) Formwork materials shall conform to CSA Standard 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 O121, a minimum of twenty (20) millimetres thick.
 - (iii) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA O121.
 - (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 beyond 50 mm must be made from a non-rusting material and 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) Whalers 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 falsework is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.
- (p) Form Coating
 - (i) Form coating shall not stain the surface of the concrete.
- (q) Permeable Formwork Liner
 - (i) Permeable formwork liner shall be a draining synthetic lining finished with two (2) different surfaces. The side in contact with the concrete shall be smooth and perform as a filter to prevent the leaching of fine cement particles when the formwork is in place. The other side shall be fibrous and act as a draining element to help evacuate the water and the excess air at the surface. An acceptable product would be Texel Drainform. This formwork liner shall be used on all barrier repair types and transition barrier repairs.
- (r) 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".
- (s) 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 revision 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.

- (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 Mameco, Sonolastic NP1 by Sonneborn, Sikaflex-1a by Sika, Bostik 915 by Bostik, 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 performed, nonextruding, resilient type made with a bituminous fiber such as Flexcell 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", satisfying the requirements of ASTM C711 and G155, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".
 - (ii) The sealant system shall be comprised 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.
 - (iii) 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.
 - (iv) BEJS foam seal to be installed into manufacturer's standard field-applied epoxy adhesive. The BEJS SYSTEM is to be installed recessed from the surface such that when the field-applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellows, the system will be ½" (12 mm) down from the substrate surface.
 - (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.
 - (vi) All substitute candidates shall be free in composition of any waxes or asphalts, wax compounds or asphalt compounds. All substitute candidates shall be:
 - (i) 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
 - (ii) Capable of self-expanding to the maximum movement capability (+50% nominal material size) within twenty-four (24) hours at 20°C.

E20.5.1 Ethafoam Joint Filler

- (i) Ethafoam joint filler shall be non-staining, polyethylene, closed-cell product for expansion and contraction and/or isolation joint application.

E20.5.2 Low Density Styrofoam

- (i) Low density Styrofoam shall be the type accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E20.5.3 Backup Rod

- (i) Backup rod shall be preformed compressible polyethylene, urethane, neoprene, or vinyl foam backer rod, extruded into a closed cell form and oversized 30 to 50%.

E20.5.4 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".

E20.6 Equipment

(a) General

- (i) All equipment shall be of a type accepted by the Contract Administrator. The equipment shall be kept in good working order, kept free from hardened concrete or foreign materials, and shall be cleaned at frequent intervals.

(b) Vibrators

- (i) The Contractor shall have sufficient numbers of internal concrete vibrators and experienced operators on site to properly consolidate all concrete in accordance with ACI 309. The type and size of vibrators shall be appropriate for the particular application, the size of the pour, and the amount of reinforcing and shall conform to standard construction procedures.
- (ii) The Contractor shall use rubber coated vibrators for consolidating concrete containing epoxy-coated reinforcing steel.
- (iii) The Contractor shall have standby vibrators available at all times during the pour.

(c) 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 CSA A23.1-19, 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 one hundred and twenty (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 ninety (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 one hundred and twenty (120) and/or ninety (90) minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement twenty-four (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, 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.
- (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 Owner upon request.

(iv) Delivery of Concrete

- (i) The Contractor shall confirm 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.
 - (ii) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.
- (d) 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 by water jet 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. Surface preparation type shall be to ICRI Guideline No. 310.2 CSP 6 (Medium Scarification). Sand-blasting or shot-blasting 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) Immediately after the blasting is complete and before signs of flash rusting appears on the steel surface, all exposed bars are to be recoated with an approved epoxy coating.
- (e) 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, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.
 - (ii) Placing Structural Concrete
 - (i) Placement of deck concrete shall not be permitted when the surface moisture evaporation exceeds $0.75 \text{ kg/m}^2/\text{h}$. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator.
 - (ii) The nomograph, Figure D1, Annex D of CSA Standard A23.1-19 shall be used to estimate surface moisture evaporation rates.
 - (iii) 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.
 - (iv) 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.
 - (v) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.

- (vi) 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.
 - (vii) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.
 - (viii) 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.
 - (ix) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.
 - (x) 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.
 - (xi) 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 seven thousand (7,000) revolutions per minute immersed.
 - (xii) 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 (five (5) to fifteen (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.
 - (xiii) 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.
- (f) 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 one hundred and twenty (120) minute discharge time limit during the delay, while the finishing operations catch up, shall be rejected.
 - (ii) Type 1 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.

- (v) For riding surfaces, after final floating, the slab surface shall receive coarse transverse scored texture by drawing a steel tined broom uniformly across the slab surface, to the satisfaction of the Contract Administrator.
- (iii) Type 2 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, Type 4 finishes.
 - (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.

E20.7 Construction Methods

(a) Debris Containment

- (i) The Contractor shall ensure that all debris including, but not limited to: concrete debris, concrete cutting fluids, formwork debris, and repair materials do not enter the waterway in any way including by the bridge or adjacent roadway drainage system.

(b) Construction Joints

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

(c) General Curing

- (i) Hot weather curing shall be in accordance with CSA A23.1, refer to (f) for hot weather curing requirements.
- (ii) Unformed concrete surfaces shall be covered and kept moist by means of wet polyester blankets for three (3) consecutive days immediately following finishing operations or otherwise approved by the Contract Administrator and shall be maintained at above 10°C for at least seven (7) consecutive days. Construction joints shall only be covered and kept saturated by means of wet polyester curing blankets for the curing period.
- (iii) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, a waterproofing membrane, or an asphalt overlay.
- (iv) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, or running water, vibration, and mechanical shock. Concrete

shall be protected from freezing until at least twenty-four (24) hours after the end of the curing period.

- (v) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3°C in any one hour period or 20°C in any twenty-four (24) hour period.
 - (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.
- (d) Form Removal
- (i) All forms for concrete repairs shall remain in place for a minimum of three (3) days. The Contract Administrator must be notified at least twenty-four (24) hours prior to any form removal. The Contractor must receive approval from the Contract Administrator prior to beginning Work.
 - (ii) The minimum strength of concrete and mortar in place for safe removal of soffit forms for horizontal or inclined members, as well as vertical forms shall be 20 MPa, with the added provisions that the member shall be of sufficient strength to carry safely its own weight, together with superimposed construction loads.
 - (iii) Field-cured test specimens, representative of the in-place concrete being stripped, may be tested to verify the concrete strength.
- (e) Patching of Formed Surfaces
- (i) Immediately after forms have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the Contract Administrator. Any repair or surface finishing started before this inspection may be rejected and required to be removed.
 - (ii) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.
 - (iii) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement shall be thoroughly brushed onto the area to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the adjacent surface and left for one (1) hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.
 - (iv) All objectionable fins, projections, offsets, streaks, or other surface imperfections shall be removed by approved means to the Contract Administrator's satisfaction. Cement washes of any kind shall not be used.
 - (v) Concrete shall be cast against forms that will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects that will impair the texture of concrete surfaces shall not be used. All fins on the concrete surfaces shall be removed.
- (f) Hot Weather Concreting
- (i) General
 1. The requirements of this section shall be applied during hot weather; i.e., air temperatures above 25°C during placing.
 2. Concrete shall be placed at as low a temperature as possible, preferably below 15°C, but not above 22°C. Aggregate stockpiles

may be cooled by water sprays and sunshades.

3. Ice may be substituted for a portion of the mixing water; providing it has melted by the time mixing is completed.
4. 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.
5. Sunshades and wind breaks shall be used as required during placing and finishing.
6. Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints."
7. The Contract Administrator's approval is necessary before the Contractor may use admixtures, such as retardants, to delay setting or water-reducing agents to maintain workability and strength, and these must then appear in the Mix Design Statement submitted to the Contract Administrator.
8. Curing shall follow immediately after the finishing operations.
 - (ii) Hot-Weather Curing
 1. When the air temperature is at or above 25°C, curing shall be accomplished by water spray or by using saturated absorptive fabric, in order to achieve cooling by evaporation.
 - (iii) Job Preparation
 1. When the air temperature is at or above 25°C, or when there is a probability of it rising to 25°C during the placing period, facilities shall be provided for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, as defined in CSA A23.1 the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by fogging and evaporation.
 - (iv) Concrete Temperature
 1. The temperature of the concrete as placed shall be as low as practicable and in no case greater than that shown below for the indicated size of the concrete section.

Thickness of Section (m)	Temperatures, °C	
	Minimum	Maximum
Less than 0.3	10	27
0.3 to 1.0	10	27
1.0 to 2.0	5	25

- (g) Void Form
 - (i) The installation of void form shall be undertaken in accordance with the manufacturer's recommendations or as shown on the Drawings.
- (h) Cleanup
 - (i) The Contractor shall cleanup equipment and construction debris on at least a daily basis to the satisfaction of the Contract Administrator.

E20.8 Measurement and Payment

Structural Concrete

- (a) Supplying and placing structural concrete shall not be measured. This Work shall be paid for at the Contract Lump Sum Price for the "Item of Work" listed here below, 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.
- (b) Items of Work:

Supply and Place Structural Concrete:

- (i) Pile Cap Beam
 - (ii) Reinforced Sidewalk
 - (iii) Traffic Barriers
 - (iv) Approach Slabs
 - (v) Culvert Overlay
- (c) Supply 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 or this Work unless indicated otherwise.

E21. CONCRETE REPAIRS

E21.1 Description

- (a) This Specification shall cover all concrete repairs to the culvert barrel and wingwall surfaces, as shown on the Drawings and as directed by the Contract Administrator.
- (b) The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E21.2 Materials

E21.2.1 General

- (a) Unless otherwise listed herein, materials shall be in accordance with E20.

E21.2.2 Concrete

- (a) The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this specification. Either ready mix concrete or proprietary repair mortars, where applicable, may be used having the following minimum properties in accordance with CSA A23.1:
 - (i) Class of Exposure : C-1;
 - (ii) Compressive Strength @ 28 days = 35 MPa;
 - (iii) Maximum Aggregate Size = 10mm;
 - (iv) Air Content: Category 1 per Table 4 of latest CSA A23.1; and,
 - (v) Slump Flow = 550-600mm
- (b) The concrete mix shall meet the latest edition CSA A23.1 Cl. 8.9.2 Low Shrinkage requirements.
- (c) The concrete mix shall have an electrical conductivity less than 50,000 ohm-cm.
- (d) Mix design for ready mix concrete shall be submitted to Contract Administrator at least two (2) weeks prior to concrete placing operations.
- (e) The workability of the concrete mix shall be consistent with the Contractor's placement operations.
- (f) Any proposed proprietary repair mortar shall be subject to the approval of the Contract Administrator and must meet or exceed the properties of the ready mix concrete.
- (g) The temperature of all types of concrete shall be between fifteen degrees Celsius (15°C) and twenty-five (25°C) at discharge. Temperature requirements for concrete containing silica fume shall be between ten degrees Celsius (10°C) and eighteen degrees Celsius (18°C) at discharge unless otherwise approved by the Contract Administrator.
- (h) Concrete materials susceptible to frost damage shall be protected from freezing.

- (i) Concrete repair material shall be compatible with the concrete substrate and the Contractor's method of placement. The Contractor may choose to use a proprietary repair mortar subject to the approval of the Contract Administrator.

E21.3 Equipment

E21.3.1 General

- (a) Equipment shall be in accordance with E20".

E21.4 Construction Methods

E21.4.1 General

- (a) The Contractor may consider form and pour, pressure grouting or low velocity spraying as application methods for concrete repairs. Other methods shall be subject to the approval of the Contract Administrator.

E21.4.2 Removal of Existing Concrete and Concrete Surface Preparation

- (a) All areas requiring repair shall have their perimeters sawcut to a depth of 25 mm. The only exception to saw cutting will be in areas where there is no room for a concrete saw.
- (b) Remove all concrete in the repair area to a minimum depth
 - (i) 25 mm beyond the exposed rebar;
 - (ii) 6 mm larger than the largest size aggregate in the repair material beyond the exposed rebar;
 - (iii) to the depth of delamination;
 - (iv) whichever is greater.
- (c) In locations where anodes or post-installed rebar will be present, remove concrete to provide a minimum of 50 mm cover.
- (d) Concrete removal may be undertaken by mechanical means with chipping hammers of appropriate size so as not to damage the substrate concrete as accepted by the Contract Administrator. Alternatively, hydro demolition may be used.
- (e) Clean all resulting concrete and steel surfaces by grit-blasting. All unsound and stained concrete shall be fully removed. Exposed rebar shall be cleaned to a near-white condition.
- (f) If recommended by the mortar/grout manufacturer's directions, pre-wet the patch surfaces for the duration recommended.

E21.4.3 Form Work and Shoring

- (a) Formwork and shoring shall be in accordance with E40 Structural Concrete.

E21.4.4 Formliner

- (a) Formliner shall be used on all exposed formed surfaces.

E21.4.5 Bonding New Concrete to Existing Concrete

- (a) The Contractor is responsible to create a bond between the new mortar/concrete and the existing substrates. This may be done by either the application of a suitable bonding agent or grout or by using a self-bonding mortar or concrete. The Contract Administrator will check all repaired areas for bond using a hammer "sounding" method after form removal. Place mortar or concrete by trowelling, pumping, spraying, or into forms ensuring that all entrapped air is removed.
- (b) Should a bonding grout be used, it shall be applied immediately before concrete placement. It shall be thoroughly brushed onto the existing hardened concrete surface in a thin and even coating that will not puddle.

E21.4.6 Mixing and Placing Concrete

- (a) Mixing and placing concrete shall be in accordance with E20". Where proprietary repair mortars are used, they shall be prepared in accordance with the manufacturer's instructions.

E21.4.7 General Curing

- (a) Concrete Curing shall be in accordance with E20". Where proprietary repair mortars are used, they shall be cured in accordance with the manufacturer's instructions.

E21.4.8 Form Removal

- (a) Form Removal shall be in accordance with E20".

E21.4.9 Patching of Formed Surfaces

- (a) Patching of Formed Surfaces shall be in accordance with E20".

E21.5 Measurement and Payment

(a) Concrete Repair

- (i) The concrete repairs will be measured on an area basis and paid for at the Contract Unit Price per square meter 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, accepted and measured by the Contract Administrator.

Items of Work:

(b) Concrete Repair:

- (i) Type 1
- (ii) Type 2

E22. DISCRETE GALVANIC PROTECTION SYSTEM

E22.1 Description

- (a) The Work under this section consists of designing, supplying, installing and energizing a zinc-based galvanic corrosion control system consisting primarily of embedded zinc anodes, including required electrical connections, materials, testing and ensuring continuity of the reinforcing steel to all elements as outlined in 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 Works as hereinafter specified.

E22.1.2 References

- (a) ACI/ICRI 1999 Concrete Repair Manual
- (b) ACI Guideline No. 222 – Corrosion of Metals in Concrete
- (c) ACI 562-13 Code Requirements for Evaluation, Repair and Rehabilitation of Concrete Buildings
- (d) ACI Repair Application Procedure (RAP) Bulletin 8 – Installation of Embedded Galvanic Anodes (2010)
- (e) ICRI Guideline 310.1R-2008 Guide for Surface Preparation for the Repair of Deteriorated Concrete resulting from Reinforcing Steel Corrosion
- (f) ASTM B418-12 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes

E22.2 Materials

E22.2.1 Embedded Galvanic Anodes

- (a) Discrete galvanic units shall be alkali-activated zinc meant to be embedded into concrete repairs and for corrosion prevention only. Nominal dimensions shall be 125

mm x 25 mm x 25 mm or as approved. The anodes shall be pre-manufactured with a nominal 60 grams of zinc in compliance with ASTM B418 Type II cast around a pair of uncoated, non-galvanized steel tie wires and encased in a highly alkaline cementitious shell with a pH of 14 or greater.

- (b) The galvanic anodes shall be alkali-activated and shall contain no intentionally added chloride, bromide or other constituents that are corrosive to reinforcing steel as per ACT 562-13. Anode units shall be supplied with integral unspliced wires for directly tying to the reinforcing steel. Embedded galvanic anodes shall be Galvashield® XPT available from Vector Corrosion Technologies (www.vector-corrosion.com) USA (813) 830-7566, Canada (204) 489-9611 or approved equal.
- (c) Application for approved equals shall be requested in writing two weeks before submission of project bids. Application for galvanic anode approved equals shall include verification of the following information:
 - (i) The zinc anode is alkali-activated with an alkaline cementitious shell with a pH of 14 or greater.
 - (ii) The galvanic anode shall contain no intentionally added constituents corrosive to reinforcing steel, e.g. chloride, bromide, etc.
 - (iii) The anode manufacturer shall provide documented test results from field installations showing that the anodes have achieved a minimum of 10 years in service.
 - (iv) The galvanic anode shall have been used in a minimum of ten projects of similar size and application.
 - (v) The galvanic anode units shall be supplied with solid zinc core (ASTM B418) cast around uncoated, non-galvanized, non-spliced steel tie wires for wrapping around the reinforcing steel and twisting to provide a durable steel to steel connection between the tie wire and the reinforcing steel.
 - (vi) The anode manufacturer shall provide third party product evaluation, such as from Concrete Innovations Appraisal Service, BBA, etc.

E22.2.2 Repair Materials

- (a) Repair mortars, concrete, and bonding agents shall be Portland cement-based materials with suitable electrical resistivity less than 50,000 ohm-cm. Non-conductive repair materials such as epoxy, urethane, or magnesium phosphate shall not be permitted. Repair materials with significant polymer modification and/or silica fume content may have high resistivity. Insulating materials such as epoxy bonding agents shall not be used unless otherwise called for in the design.

E22.2.3 Storage

- (a) Deliver, store, and handle all materials in accordance with manufacturer's instructions. Anode units shall be stored in dry conditions in the original unopened containers in a manner to avoid exposure to extremes of temperature and humidity.

E22.3 Construction Methods

E22.3.1 General

- (a) The galvanic corrosion protection shall consist of the anodes as indicated on the Drawings. The anode units are connected to the reinforcing steel and encased in a concrete with a minimum of 50 mm of clear concrete cover over the anode units. For deck area the concrete clear cover under the membrane and asphalt topping can be 25 mm.

E22.3.2 Manufacturer Corrosion Technician

- (a) The Contractor will enlist and pay for a technical representative employed by the galvanic anode manufacturer to provide training and on-site technical assistance during the initial installation of the galvanic anodes. The technical representative shall be a NACE-qualified corrosion technician (Cathodic Protection Technician-CP2 or higher).

- (b) The qualified corrosion technician shall have verifiable experience in the installation and testing of embedded galvanic protection systems for reinforced concrete structures.
- (c) The contractor shall coordinate its work with the designated corrosion technician to allow for site support during project start up and initial anode installation. The corrosion technician shall provide contractor training and support for development of application procedures, verification of electrical continuity, and project documentation.

E22.3.3 Concrete Removal

- (a) Remove loose or delaminated concrete.
- (b) Undercut all exposed reinforcing steel by removing concrete from the full circumference of the steel as per ICRI R310.1R to the limits indicated on the Drawings or as per the Contract Administrator.
- (c) Concrete removal shall continue along the reinforcing steel until no further delamination, cracking, or significant rebar corrosion exists and the reinforcing steel is well bonded to the surrounding concrete as per ICRI R310.1R.

E22.3.4 Cleaning and Repair of Reinforcing Steel

- (a) Clean exposed reinforcing steel of rust, mortar, epoxy coating, etc. to provide sufficient electrical connection and mechanical bond.
- (b) If significant reduction in the cross section of the reinforcing steel has occurred, replace or install supplemental reinforcement as directed by the Contract Administrator.
- (c) Secure loose reinforcing steel by tying tightly to other bars with steel tie wire.
- (d) Verify electrical continuity of all reinforcing steel, including supplemental steel, as per Section E22.3.6(f).

E22.3.5 Edge and Surface Conditioning of Concrete

- (a) Concrete patches shall be square or rectangular in shape with squared corners per ICRI Guideline 310.1R-2008.
- (b) Saw cut the patch boundary as per the Drawings or as directed by the Contract Administrator.
- (c) Create a clean, sound substrate by removing bond-inhibiting materials from the concrete substrate by high pressure water blasting or abrasive blasting.

E22.3.6 Galvanic Anode Installation

- (a) Install anode units and repair material immediately following preparation and cleaning of the steel reinforcement.
- (b) Anode spacing shall be such to provide full protection for the entire patch perimeter. Anode spacing is dependent on the reinforcing steel density. Maximum anode spacing shall be as per the manufacturer's guidelines to provide a 20 year service life.
- (c) Place the galvanic anodes as close as possible to the patch edge while still providing sufficient clearance between anodes and substrate to allow the repair material to fully encase the anode with a minimum concrete or mortar cover over the anode of 25mm. If necessary, increase the size of the repair cavity to accommodate the anodes.
 - (i) Place the anode such that the preformed BarFit™ groove fits along a single bar or at the intersection between two bars and secure to each clean bar.
 - (ii) If less than 25 mm of concrete cover is expected, place anode beneath the bar and secure to clean reinforcing steel.
- (d) The tie wires shall be wrapped around the cleaned reinforcing steel at least one full turn in opposite directions and then twisted tight to create a secure electrical connection and allow no anode movement during concrete placement.

- (e) Repair materials with resistivity greater than 15,000 ohm-cm are not to be used.
- (f) Electrical Continuity
 - (i) Confirm electrical connection between anode tie wire and reinforcing steel by measuring DC resistance (ohm Ω) or DC potential (mV) with a multi-meter.
 - (ii) Electrical connection is acceptable if the DC resistance measured with the multi-meter is 1 Ω or less or the DC potential is 1 mV or less.
 - (iii) Confirm electrical continuity of the exposed reinforcing steel within the repair area. If necessary, electrical continuity shall be established by tying discontinuous steel to continuous steel using steel tie wire.
 - (iv) Electrical continuity between test areas is acceptable if the DC resistance measured with multi-meter is 1 Ω or less or the potential is 1 mV or less.

E22.3.7 Concrete or Mortar Replacement

- (a) If the repair procedures require the concrete surface to be saturated with water, do not damage the anode nor allow the anode units to be soaked for greater than 20 minutes.
- (b) Complete the repair with the repair material, taking care not to damage, loosen or leave voids around the anode

E22.4 Measurement and Payment

E22.4.1 Discrete Galvanic Anode System

- (a) The supply and installation of Discrete Galvanic Protection System as shown on the Drawings will be measured on a Unit Basis. This work shall be paid for at the Contract Unit Price Per Unit for "Discrete Galvanic Anode System" 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

E23. DRILLING AND PLACING DOWELS

E23.1 Description

- (a) This Specification shall cover all operations related to drilling and preparation of dowel holes, supply and placing epoxy grout and installation of the applicable anchorages.
- (b) Dowels shall include the following post-installed anchorages and reinforcing bars:
 - (i) Dowels for anchoring the approach slabs

E23.2 Materials

- (a) Epoxy grout shall be Hilti HIT-RE 100 or equivalent as approved by the Contract Administrator. The epoxy grout shall be suitable for horizontal, vertical or overhead dowel grouting application as required.

E23.3 Construction Methods

- (a) The Contractor shall core or drill holes and place dowels at the locations and in accordance with the details as shown on the Drawings. Holes for dowels shall be drilled or cored.
- (b) The Contractor shall predetermine the locations of existing steel bars prior to drilling or coring, using an effective reinforcing steel bar locator. Dowel hole locations as shown on the Drawings, shall be relocated as required to avoid conflicts with existing reinforcing steel bars as approved by the Contract Administrator.
- (c) Dowel hole diameters shall be in accordance with the recommendations of the epoxy adhesive grout manufacturer.
- (d) All holes shall be thoroughly cleaned prior to the installation of grout and dowels.

- (e) The epoxy adhesive grout shall be prepared, placed and cured in accordance with the recommendations of the epoxy adhesive grout manufacturer.

E23.4 Measurement and Payment

E23.5 Drilling and Placing Dowels

- (a) Drilling and placing dowels will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for "Drilling and Placing Dowels", 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.
- (b) The supply of reinforcing steel for the dowels will be measured and paid for in accordance with E24.

E24. SUPPLYING AND PLACING REINFORCING STEEL

E24.1 Description

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

E24.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
 - (i) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;
 - (ii) ASTM A955M – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcing;
 - (iii) AISI 304 - Stainless Steel Welded Wire Mesh
 - (iv) ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete;
 - (v) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
 - (vi) CAN/CSA G30.18 – Billet-Steel Bars for Concrete Reinforcement;
and
 - (vii) Reinforcing Steel Institute of Canada (RSIC) – Reinforcement Steel Manual of Standard Practice.

E24.3 Scope of Work

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

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 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, AISI 304, 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).

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. 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 h-slings shall be used for moving stainless steel reinforcing.
- (iv) Keep carbon steel tools, chains, slings, etc. off stainless steel reinforcing.
- (v) Welded wire stainless steel mesh must be supported sufficiently during moving, lifting and installation operations to avoid excessive deformation of the mesh, completed to the satisfaction of the Contract Administrator.

(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) All stainless steel welded wire mesh shall conform to the requirements of AISI 304.

- (v) 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.
- (vi) All reinforcing steel shall be straight and free from paint, oil, mill scale, 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 24.1 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.

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

E24.7 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 Including Welded Wire Mesh Reinforcement
 - (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 pickling 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 may be placed. Intersecting bars shall be tied positively at each intersection.
 - (iii) Splices in reinforcing steel shall be made only where indicated on the Drawings. Prior acceptance by the Contract Administrator shall be obtained where other splices must be made. Welded splices will not be permitted.
 - (iv) Place reinforcing bars to provide a clear space between the reinforcing bars as shown on the Drawings to accurately place preformed holes where necessary.
 - (v) Reinforcing steel shall not be straightened or re-bent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used.
 - (vi) Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator.
 - (vii) The Contractor shall supply and place all necessary support accessories to ensure proper placement of reinforcing steel. All reinforcement shall be accurately placed in the positions shown on the Drawings, and firmly tied and chaired before placing the concrete.
 - (viii) Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Spacers and supports for holding reinforcing steel at the required location and ensuring the specified concrete cover over the reinforcing steel shall be as specified in 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 Including Welded Wire Mesh Reinforcement
 - (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 and or either direction of welded wire mesh reinforcement.
 - (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.

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.

- (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.

E24.9 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.

E24.10 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

E25. STRUCTURAL BACKFILL

E25.1 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 Specification CW 3110, 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, tolls, supplies, and all things necessary for and incidental to the satisfactory performance, and completion of all works as hereinafter specified.

E25.2 Referenced Specifications and Drawings

- (a) The latest version of the City of Winnipeg Standard Construction Specifications
 - (i) CW 3110 – Subgrade, Sub-Base, and Base Course Construction; and
 - (ii) CW 3170 – Earthwork and Grading.

E25.3 Scope of Work

- (a) The Work under this Specification shall involve:
 - (i) Supplying and placing granular backfill for the approach slabs;
 - (ii) Supplying and placing granular backfill the structural sidewalks;
 - (iii) Supplying and placing granular backfill for the construction of corbels;

- (iv) Supplying and placing structural backfill for all other elements required to construct the Works.

E25.4 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.

E25.5 Materials

E25.5.1 General

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

E25.5.2 Suitable Site Backfill

- (d) Suitable site backfill material shall be of a type approved by the Contract Administrator and shall conform to the requirements of the latest version of the City of Winnipeg Standard Construction Specification CW 3170.
- (e) Excavated material may be used for backfilling provided it meets the above requirements.

E25.5.3 Granular Backfill

- (f) Granular backfill shall conform to the requirements of the latest version of the City of Winnipeg Standard Construction Specification CW 3110 for Sub-base material of maximum 50 mm size.

E25.5.4 Equipment

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

E25.6 Construction Methods

E25.6.1 Backfilling

- (a) All materials shall be accepted by the Contract Administrator at least seven (7) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials in whole or in part, do not conform to the 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 their own expense.
- (b) 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 their own expense, to the satisfaction of the Contract Administrator.
- (c) 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.

E25.7 Quality Control

E25.7.1 Inspection

- (a) All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work.
- (b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously

given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.

- (c) 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 Owner for any materials taken by the Contract Administrator for testing purposes.
- (d) 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.
- (e) All backfilling work shall take place under the supervision of the Contract Administrator. The Contractor shall notify the Contract Administrator when backfilling work is to take place.
- (f) The frequency and number of tests to be made shall be as determined by the Contract Administrator.

E25.8 Access

- (a) 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 their inspector for testing purposes as required. There will be no charge to the City for samples taken.

E25.9 Measurement and Payment

E25.9.1 Structural Backfill

E25.9.2 Supplying and placing structural backfill shall be considered incidental to the applicable portions of structural concrete work requiring backfill, and no measurement or payment shall be made for this Work.

E26. BRIDGE ALUMINUM BARRIER RAIL

E26.1 Description

- (a) The specification shall amend and supplement City of Winnipeg specification CW 3650.

E26.2 Scope of Work

- (a) The Work under this Specification shall involve:
 - (i) Supply and installation of the bridge aluminum barrier rails and posts on the concrete traffic barriers.
 - (ii) Supply and installation of the anchors for the bridge aluminum barrier rails on the concrete traffic barriers.

E26.3 Submissions

- (a) At least fourteen (14) days prior to the scheduled commencement of any fabrication, the qualifications of Contractor, the qualifications of operator, the shop drawings, mill certificates, welding procedures, and welding consumable certificates shall be submitted to the Contract Administrator for their acceptance.
- (b) The shop drawings shall clearly show shapes, dimensions, detail, connection (including proper CSA welding identification), bolt holes, and accessories. Shop Drawings shall be prepared in accordance with E10.

E26.4 Materials

- (a) Zinc for hot dipped, galvanized coating of anchor bolts shall conform to the requirements of ASTM A123.
- (b) Stainless steel bolts, nuts, washers, inserts, and the like as shown on the Drawings shall conform to the requirements of ASTM A320, Grade B8, Class 2.

E26.5 Measurement and Payment

- (a) Supplying and installing the bridge aluminum barrier rail, posts and anchors will not be measured and will be paid for at the Contract Lump Sum Price for "Supply and Install Bridge Aluminum Barrier Rail", 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. RIPRAP

E27.1 General

- (a) Riprap shall be random stone riprap and supplied and installed on the south creek banks in accordance with Specification CW 3615, except as specified herein.

E27.2 Materials

E27.2.1 Riprap

- (a) The Contractor shall supply quarried rock, or quarried limestone which is dense, durable, sound, resistant to the action of water and frost, and suitable in all respects or the purpose intended. Stone riprap shall be free from sod, roots, organic material and debris prior to placement. Individual pieces of stone shall be free of defects such as seams or cracks that would cause rapid or excessive deterioration or degradation. The Contract Administrator shall approve the rock for riprap prior to placing.
- (b) Quarried limestone shall have a maximum Los Angeles Abrasion Loss of 32% (ASTM C535) and a maximum Magnesium Sulphate Soundness Loss of 13% (ASTM C88).
- (c) The stone riprap shall be well graded having a full range and even distribution of sizes and shall conform to the following gradation:
 - (i) 100% passing 350 mm
 - (ii) 50% passing 200 mm
 - (iii) 20% passing 100 mm
- (d) 30% by volume of granular will be blended with the stone riprap prior to placement in order to fill the interstitial voids within the rock.
- (e) The granular blended with the riprap shall be clean gravel or clean crushed rock with the following gradation:
 - (i) 100% passing 19 mm
 - (ii) 50% passing 9 mm
 - (iii) 20% passing 3 mm

E27.2.2 Geotextile

- (a) The geotextile shall be non-woven type, and supplied and placed in accordance with CW 3130-R4 for "Geotextile Fabric".

E28. SUPPLY AND INSTALLATION OF MMA MARKING WITH ANTI-SKID

DESCRIPTION

- E28.1 This specification covers the supply and installation of Methyl Methacrylate Area (MMA) Marking with Anti-Skid in concrete sidewalk for the project sidewalks as shown on the Drawings.

GENERAL

E28.2 Drawings and Manuals

- (a) Contract Drawings; C315-21-01 to C315-21-27 – Rehabilitation of Route 90 Culvert over Omand's Creek

- (b) Attached Manual; Appendix 'C' – Application Instructions – MMAX Area Markings and MMAX Area Markings Specification – Methyl Methacrylate Area Marking with Anti-Skid

E28.3 Material

- E28.3.1 CycleGrip® MMAX kit – includes CycleGrip® MMAX Resin (black), CycleGrip® MMAX Aggregate and Catalyst.

SUBMITTALS

- E28.4 Prior to construction, submit the following to the Contract Administrator. Material data sheets for the product proposed to be supplied and installed.

E28.5 Source

- E28.5.1 ENNIS-FLINT

Available from:

ENNIS-FLINT

Attention: Deryk Upton

Ph: 604-315-8765

Email: dupton@ennisflint.com

Web: www.ennisflint.com

E28.6 Preparation and Installation

- E28.6.1 Where the MMA Markings is to be placed, the surface of the concrete sidewalk must be texture grooved to a width of 0.21m and a depth of 1.25mm(min) to 2.5mm(max). **Note:** The use of grooving equipment with gang stacked diamond cutting blades is required for texturing concrete sidewalk surfaces.
- E28.6.2 Prepare the concrete sidewalk surface in accordance with Manufacturer's application instructions and MMAX Area Markings specification (attached).

MEASUREMENT AND PAYMENT

- E28.7 Supply and installation of MMA marking with anti-skid will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Supply and Installation of MMA Marking with Anti-Skid". The area to be paid for will be the total number of square metres of MMA marking with anti-skid supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
- E28.8 Grooving and preparation of concrete sidewalk for MMA marking with anti-skid shall be included in the cost for "Supply and Installation of MMA Marking with Anti-Skid" and no separate measurement and payment will be made

E29. ROADWAY CONCRETE MATERIALS

- E29.1 The Specification contained in Appendix 'A' shall apply to the Work.

E30. WORKING AROUND MANITOBA HYDRO POLES

GENERAL REQUIREMENTS

- E30.1 When excavating for the road within 3.0 metres of a Manitoba Hydro wood pole, a Safety Watch will be required. The Contractor shall provide a digger truck capable of holding the pole in place while excavation and granular subbase backfill is completed back to original grade.
- (a) The digger truck to be provided by the Contractor shall be to the satisfaction of the Contract Administrator and Manitoba Hydro Safety Watch personnel.

- (b) See Appendix 'B' for allowable excavations around existing poles.

E30.2 Measurement and Payment

- E30.3 The Work described in this Specification will be considered incidental to "Excavation" and no measurement or payment will be made.

E31. CONCRETE CRACK INJECTION

E31.1 Description

- (a) This Specification shall cover all operations related to concrete crack injection located within the concrete barrel and wingwall surfaces as shown on the Drawings and as directed by the Contract Administrator.
- (b) The Work to be done by the contractor under this specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tolls, supplies, and all things necessary for and incidental to the satisfactory performance, and completion of all works as hereinafter specified.

E31.2 Submittals

- (a) Four copies of the crack repair work plan shall be submitted to the Contract Administrator at least 3 weeks prior to the commencement of the work.
- (b) The crack repair work plan shall bear the seal and signature of an Engineer and include at least the following information.
- (c) A description of the method of repair, including the following minimum information:
 - (i) Basis of selection.
 - (ii) Proposed effective pressure.
 - (iii) Surface finishing.
 - (iv) Location and size of injection ports.
 - (v) Surface treatment of the concrete prior to surface sealing.
 - (vi) Method of storing and handling grouts, cleaning solvents, and waste materials.
- (d) A list of the materials to be used for crack preparation and repair, including the following minimum information:
 - (i) Material specifications.
 - (ii) Product data sheets with test data.
 - (iii) Material safety data sheets.
 - (iv) Pot life of the components to be used based on a sample size of 200 ml at 5 °C and 20 °C.
- (e) A certificate from the material supplier shall be submitted stating the material is suitable for the intended use in this Contract.
- (f) A list of the equipment and accessories to be used including the following minimum information:
 - (i) The operating pressure of each component.
 - (ii) The type of injection port and means of closure.

E31.3 Materials

E31.3.1 Epoxy Resin

- (a) Material used for crack injection shall be epoxy resins for passive cracks.
- (b) Epoxy grout shall prevent the penetration of water and shall have sufficient flowability to fill the crack at least 80% of the depth of the crack using the proposed equipment and method of repair at the ambient and substrate temperatures existing at the time of grouting.

(c) Epoxy resin shall be moisture insensitive and 100% solids.

E31.3.2 Equipment

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

E31.3.3 Gauges

(a) In addition to the calibrated gauges required for use with the pumps and with the injection hose, additional gauges shall be available on site to replace those that malfunction.

(b) Certificates of calibration, from an organization accredited by the Standards Council of Canada shall be supplied for each gauge certifying that the gauges are capable of measuring the pressure within a tolerance of ± 5 kPa.

E31.3.4 Pumps

(a) Equipment used for pressure injection shall be suitable for the intended use and compatible with the grout.

(b) Pumps shall be positive displacement type and shall be capable of delivering a minimum of two litres of grout per minute.

(c) Pumps shall be capable of developing a maximum regulated operating pressure at least equal to twice the effective pressure.

(d) Pumps shall be equipped with a calibrated gauge and shall be capable of accurately maintaining an effective operating pressure of 50 kPa or less.

(e) Plural component pumps shall be used when multicomponent solution grouts are used.

(f) Hand cartridge pumps shall not be used unless the volume of crack repair is less than one litre of resin for 100 m² of gross repair area.

E31.3.5 Static In-Line Mixers

(a) Static in-line mixers shall produce a homogeneous grout and shall be sized to accommodate the minimum and maximum anticipated flow rates.

(b) Static mixers shall have the manufacturer's plate attached showing the following mixer information:

(i) Size.

(ii) Type.

(iii) Maximum operating pressure.

E31.3.6 Agitating Mixer

(a) Agitating mixers shall have a power driven paddle mixing head and produce a homogeneous component. The speed of the mixers shall be variable to a maximum of 500 rpm.

E31.3.7 Injection Hoses

(a) Injection hoses shall have a rated working pressure equal to or greater than the maximum pump operating pressure and shall be equipped with a calibrated gauge at the injection port end.

E31.3.8 Injection Ports

(a) Injection ports shall be removable or non-metallic insert type units. The pressure capacity of the injection ports shall be at least equal to the maximum operating pressure of the pump. All injection ports shall be equipped with a shut-off valve or other mechanical means of closure under pressure.

(b) Surface mounted injection ports shall not be used.

E31.3.9 Air Compressor

- (a) Compressed air shall be free from oil and water when tested according to ASTM D 4285.

E31.3.10 Drills

- (a) Drilling of the injection holes shall be performed using a rotary percussion or rotary diamond type drill.
- (b) Percussion drilling equipment shall not be used for drilling holes greater than 26 mm diameter and holes within 150 mm of any edge of concrete.
- (c) Only holes 26 mm or less in diameter shall be drilled within 50 mm of any free edge of concrete.

E31.3.11 Routing Equipment

- (a) Routing equipment shall be any of the following:

E31.3.12 Concrete router.

- (a) Hand-held grinding wheel or a multi-bladed cut-off saw equipped with abrasive or diamond blades.
- (b) Multi-bladed floor saw cutting equipment equipped with diamond blades.

E31.4 Construction Methods

E31.4.1 General

- (a) Installation of all accessories and material shall be according to the manufacturer's recommendations and as specified in the submitted work plan.
- (b) Work shall only proceed when the temperature of the concrete is 5 °C or greater.
- (c) Prior to commencement of the work, the cracks requiring repair, as identified by the Contract Administrator, shall be numbered, physically marked as to their extent, and measured in the presence of the Contract Administrator.
- (d) This information shall be recorded and a copy submitted to the Contract Administrator.

E31.4.2 Crack Injection

(a) Drilling for Injection Ports

- (i) Injection holes shall be drilled, on each side of the crack, at a 45° angle to the surface of the concrete. The holes shall be located such that they intersect the crack section at approximately the midpoint and they shall extend through the crack section. The holes shall be sized to accommodate the injection ports. The spacing of the holes shall not exceed the depth of the crack or 200 mm, and the holes shall be alternated from one side of the crack to the other.
- (ii) Prior to installation of the injection ports each hole shall be individually cleaned of all deleterious material by an air-water blast to completely remove all drill cuttings from the hole.
- (iii) Injection ports shall be inserted into the holes and sealed. The inserted end of the injection port shall not extend beyond the point at which the drilled hole intersects the crack.

(b) Cleaning and Flushing

- (i) After the injection ports have been inserted, cracks shall be flushed with an air-water mixture or an alternating water and air flush to remove all deleterious material prior to the injection of grout. The flushing material shall be injected through the injection port and continued until it exudes from the adjacent injection port and the crack is thoroughly cleaned. This flushing shall proceed from one end of the crack to the other.
- (ii) A final flush shall be made with air only to remove all of the free water.

(c) Surface Preparation and Sealing

- (i) Surface opening of the cracks shall be sealed prior to injection.

- (ii) The surface of the concrete shall be mechanically cleaned for a distance of 25 mm each side of the crack sections to prepare a clean substrate for bonding of the surface sealing compound. The surface preparation and sealing shall be as recommended by the manufacturer of the surface sealing material.
- (iii) The surface sealing material shall completely confine the injection grout to the crack section with only the injection ports providing access. The surface sealing material shall withstand the maximum injection pressure without developing leakage along the crack section.
- (iv) Surface sealing of passive cracks shall not commence until at least one hour after the final air flush.

E31.4.3 Injection of Epoxy

- (a) Injection of epoxy shall proceed from the injection port at the lowest elevation of the crack and continue upwards along the crack on an injection port to injection port basis without interruption to the other end of the crack. The injection nozzle shall not be moved to the adjacent injection port until epoxy is showing at the next higher adjacent injection port or refusal criteria is developed.
- (b) While under pressure, each injection port shall be sealed immediately after completion of injection at that injection port.
- (c) When a maximum operating pressure greater than 3 MPa is required to inject the epoxy, the injection operation shall cease until the Contractor determines why this operating pressure is required.

E31.4.4 Monitoring

- (a) The volume of grout used within each five metres of crack length shall be recorded. The pump gauge pressure shall be recorded every 10 minutes. The volume of grout and pump pressure shall be related to the crack location.
- (b) The records shall indicate crack location and number, injection port spacing and confirmation of grout showing or refusal. A copy of the recorded information shall be submitted to the Contract Administrator at the end of each Day.

E31.4.5 Effective Pressure

- (a) When calculating the effective pressure, the head losses shall be determined prior to commencement of injection.
- (b) Head losses shall be determined in the presence of the Contract Administrator by performing a pressure flow test, through the equipment, for each equipment configuration used.

E31.4.6 Ratio Test

- (a) Plural component injection equipment proportioning shall be verified in the presence of the Contract Administrator by measuring the volume output of material in the pressure lines at least once for each two hours of operation.
- (b) When deviation from the manufacturer's specified proportioning ratio exceeds 5%, immediate adjustment or replacement of the equipment is required.

E31.4.7 Pot Life Determination

- (a) Prior to commencing the grouting operation, a sample shall be taken from the material containers on site and manually proportioned to the specified component ratio in the presence of the Contract Administrator. The total sample size shall be 200 ml, and the same size container shall be used for each sample taken.
- (b) The temperature of the material at the time of mixing and the pot life of the mixed material shall be recorded.
- (c) The proportions of materials and pot life shall conform to those specified in the original submissions.

- (d) An additional sample shall be taken from the end of the injection hose and a further pot life determination performed.
- (e) During grouting material samples shall be taken on a frequency of at least one per hour of operation and the pot life recorded.
- (f) Deviation from the proportions and pot life specified shall result in immediate discontinuance of use of the material.
- (g) All records shall be submitted to the Contract Administrator at the end of each working day.

E31.4.8 Surface Finishing

- (a) Surface finishing shall not proceed until the curing period, as specified by the material supplier, has elapsed. Surface finishing shall consist of removal of the injection ports and the surface sealant flush with the original concrete surface. Core holes and holes left after the removal of injection ports shall be filled with a cement-based non-shrink grout after the surface sealant has been removed.
- (b) Where the crack is not completely filled to the injection surface, the crack shall be filled with a compatible material acceptable to the Contract Administrator. The material shall be applied according to the manufacturer's recommendations.

E31.4.9 Measurement and Payment

- (a) Concrete crack injection shall be paid for at the Contract Unit Price per lineal metre for "Concrete Crack Injection", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

E32. TOPSOIL AND FINISH GRADING

E32.1 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) Natural Seeding

E32.2 Provide submittals in accordance with Specifications.

E32.3 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.

E32.4 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.

E32.5 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.

E32.6 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 mmhos/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 inermis*), Canada thistle (*Cirsium arvense*), sweet clover spp. (*Melilotus officinale* or *M. alba*), dandelion (*Taraxacum officinale*) or other undesirable weed species.

E32.7 Organic Soil Amendments

- (a) Topsoil:
 - (i) In accordance with CW3540 and E32.6.
- (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 coarse 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.

E32.8 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.

E32.9 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.

E32.10 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.

E32.11 Placing and Spreading of Topsoil

- (a) Place stockpiled topsoil after subgrade meets conditions of E32.10 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.

E32.12 Soil Amendments

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

E32.13 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.

E32.14 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.

E32.15 Cleaning

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

E32.16 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.

E33. NATURAL SEEDING

E33.1 GENERAL

E33.1.1 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.

- E33.1.2 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.
- E33.1.3 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.
- E33.1.4 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
- E33.2 Materials
- E33.2.1 Topsoil
- (a) In accordance with E32.6.
- E33.2.2 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.
- E33.2.3 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 E15.
- E33.2.4 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.

E33.3 Method of Construction

E33.3.1 Growth Media Preparation

E33.3.2 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.

E33.3.3 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.

E33.3.4 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.

E33.3.5 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.

E33.3.6 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.

E33.3.7 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 (E33.3.8-E33.3.10).
- (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 Billion 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.

E33.3.8 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 m² (approximately / ft²) basis.

E33.3.9 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 m² (approximately / ft²) basis.

E33.3.10 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 m² (approximately / ft²) basis.

E33.4 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.

E33.5 Method of Measurement

E33.5.1 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.

E33.5.2 Weed Control is considered a lump sum item. No measurement shall be made.

E33.6 Basis of Payment

- (a) 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.

E33.6.1 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:

- (a) Fifty (50%) percent of payment following year 1 of warranty period.
- (b) Remaining fifty (50%) percent of payment following year 2 of warranty period.

E34. SEWER CLEANING AND INSPECTIONS

E34.1 Description:

- (a) This specification describes the requirements for sewer cleaning and CCTV inspections required to verify condition assessments of sewers pre- and post-construction.
- (b) The following circular land drainage sewers have significant amounts of settled deposits, i.e. soil present below the springline of the pipe, with the following percentage of deposits observed during last inspections completed in February 2022:

- ◆ S-MA20007200 – 10%
- ◆ S-MA20007202 – 40%
- ◆ S-MA20007205 – 30%
- ◆ S-MA20007208 – 40%
- ◆ S-MA70109465 - 35%

- (c) This specification amends and supplements specification CW 2140 & CW2145.

E34.2 Methods

E34.2.1 Perform the following actions for removal of settled deposits in accordance with CW 2140 and as outlined herein:

- (a) Deposit Removal:
 - (i) Notwithstanding CW2140, sewers must have settled deposits removed to facilitate inspection where a minimum of 95% of the deposits are removed from the pipe prior to inspections.

E34.2.2 Perform the following sewer inspections in accordance with CW 2145 and as outlined herein:

- (a) Pre-Construction Inspections:
 - (i) Notwithstanding CW2140, sewers must have settled deposits removed to facilitate inspection as per E34.2.1
 - (ii) Intent is to confirm the condition of the sewers prior to construction to determine if any repairs are required prior to commencement of box culvert and road works for the following assets:
 - ◆ S-MA20007202 – 1350 mm Conc LDS
 - ◆ S-MA20007205 – 1350 mm Conc LDS
 - ◆ S-MA20007208 – 1050 mm CMP LDS
 - ◆ S-MA70109465 – 1050 mm CMP LDS
 - (iii) Full coding of the submission is required.
- (b) Post-Construction Inspections:

- (i) Intent is to confirm the condition of the sewers after construction is complete to determine if any damage was done during culvert and road works construction for the following assets:
 - ◆ S-MA20007200 – 1500 mm Conc LDS
 - ◆ S-MA20007202 – 1350 mm Conc LDS
 - ◆ S-MA20007205 – 1350 mm Conc LDS
- (ii) Inspections to be completed no later than two (2) weeks after of achievement of Substantial Performance. Inspections may be completed prior to achievement of Substantial Performance after all major construction works are complete at the discretion of the Contract Administrator.
- (iii) Full coding of the submission is required.

E34.2.3 Submit all inspection videos to the Contractor Administrator for review in accordance with CW 2145 and as specified herein.

E34.3 Sewer Inspection Reports

- (a) Provide the Contract Administrator with the following sewer inspection reports prepared in accordance with CW 2145.
 - (i) Pre-construction inspection and reports prior to start of culvert or road works.

E34.4 Amendments and Supplements to CW 2145:

E34.4.1 Replace Section 3.4 with:

- (a) Ensure each operator is fully trained and certified in all aspects of sewer inspections and capable of making accurate observations and recording all conditions that may be encountered in the sewers.
- (b) Inspection shall be performed by certified operators in accordance with the National Association of Sewer Service Companies (NASSCO) having attained and retained their “Pipeline Assessment Certification Program” (PACP) and “Manhole Assessment Certification Program” (MACP) certification.

E34.4.2 Replace Section 3.5 with:

- (a) Perform sewer condition coding in accordance with the requirements of the NASSCO PACP and to Version 7.0.0 of the manual, or greater in accordance with E34.4.1 of this specification, and with the following additional requirements.

Pipe Header Section	Field No.	Field Name	NASSCO Mandatory	REQUIRED (Yes / No)?
General Information	1	Surveyed By (<i>Operator / PACP User Name</i>)	Yes	Yes
	2	Certificate Number	Yes	Yes
	3	Reviewed By	No	No
	4	Reviewer Certificate Number	No	No
	5	Owner	No	Yes
	6	Customer	No	Yes
	7	P/O Number (<i>Contract No.</i>)	No	Yes
	8	Work Order	No	Yes
	9	Media Label	No	Yes
	10	Project	No	Yes
	11	Date	Yes	Yes
	12	Time	No	Yes

Pipe Header Section	Field No.	Field Name	NASSCO Mandatory	REQUIRED (Yes / No)?
	13	Sheet Number	Yes	Yes
	14	Weather	No	Yes
	15	Pre-Cleaning	Yes	Yes
	16	Date Cleaned	No	No
	17	Flow Control	No	No
	18	Purpose of Survey	No	Yes
	19	Direction of Survey	Yes	Yes
	20	Inspection Technology Used	No	Yes
	21	Inspection Status	Yes	Yes
	22	Consequence of Failure	No	No
	23	Pressure Value	No	No

Location	24	Drainage Area	No	Yes
	25	Pipe Segment Reference (<i>Asset ID</i>)	No	Yes
	26	Street (<i>Name and Number</i>)	Yes	Yes
	27	City	Yes	Yes
	28	Location Code	No	Yes
	29	Location Details	No	Yes

Pipe	30	Pipe Use	Yes	Yes
	31	Height (<i>Diameter</i>)	Yes	Yes
	32	Width	Yes	Yes
	33	Shape	Yes	Yes
	34	Material	Yes	Yes
	35	Lining Method	No	No
	36	Coating Method	No	No
	37	Pipe Joint Length	No	Yes
	38	Total Length (<i>Steel Tape Measurement</i>)	No	Yes
	39	Length Surveyed	No	Yes
	40	Year Constructed	No	No
	41	Year Renewed	No	No

Measurements	42	Upstream MH No.	Yes	Yes
	43	Upstream MH Rim to Invert	No	No
	44	Upstream MH Rim to Grade	No	Yes
	45	Upstream MH Grade to Invert	No	No
	46	Upstream MH Northing	No	No
	47	Upstream MH Easting	No	No
	48	Upstream MH Elevation	No	No
	49	Downstream MH No.	Yes	Yes
	50	Downstream MH Rim to Invert	No	Yes

Pipe Header Section	Field No.	Field Name	NASSCO Mandatory	REQUIRED (Yes / No)?
	51	Downstream MH Rim to Grade	No	No
	52	Downstream MH Grade to Invert	No	No
	53	Downstream MH Northing	No	No
	54	Downstream MH Easting	No	No
	55	Downstream MH Elevation	No	No
	56	MH Coordinate System	No	No
	57	MH Vertical Datum	No	No
	58	GPS Accuracy	No	No
	59	Additional Information	No	Yes*

Yes* - when required.

(b) Record place names in accordance with Clause 3.9.4 of the CW 2145.

E34.4.3 Further to CW 2145 Clause 3.7.4, operators failing to provide copies of their NASSCO certification and / or meet the accuracy requirements on two occasions will not be permitted to code on the remainder of the Contract until they can demonstrate to the Contract Administrator that they can code in accordance with the requirements of the NASSCO PACP and MACP version 7.0.0 of the manual or greater.

E34.4.4 Further to Section 3.13, a paper or "hard copy" of the sewer inspection reports is not required and the digital format should be submitted on a CD-R.

- (a) The Contractor shall maintain backup copies of all digital video and inspection data submissions for the duration of the Warranty Period as stated in C13.
- (b) The Contractor shall supply inspection data for review by the Contract Administrator on a DVD.
- (c) The Contractor shall supply separately one (1) set of archival grade digital versatile discs, DVD-R format in accordance with E34.4.7 to the City upon completion of the project.

E34.4.5 The Contract drawings are based on information contained in the City's GIS database. If the Contractor has trouble interpreting the drawings, or if they believe them to be wrong, the Contract Administrator shall be approached for assistance/clarification.

- (a) The Contractor shall assist the Contract Administrator in making any required measurements for the correction of errors found on the Drawings.

E34.4.6 Replace Clause 3.8.1 with:

- (a) Provide a minimum of 400 lines of resolution around the periphery of the picture for digital MPEG video playback.

E34.4.7 Replace Clause 3.11.1 with:

- (a) Capture the inspections in digital format in colour from the live video source on archival grade digital versatile discs, DVD-R format to the following minimum requirements. Adjust requirements as required to achieve 400 lines of resolution specified in Clause E34.4.5 of this Specification.
 - (i) XDVD MPEG-2 or MPEG-4 format (MPEG-4 preferred).
 - (ii) Picture Size: NTSC 720 x 480 @ 29.97 frames per second.
 - (iii) Data/Bit Rate: 6.0 M-bits/sec.

E34.4.8 Replace Clause 3.16.1 with:

- (a) Measure the distance between the centre of the start and finish manholes on the ground surface above the sewer to the nearest 0.01 of a metre using a survey grade ISO 16331-1:2012(E) approved outdoor laser distance measurer capable of attaining

150m minimum steel tape distance, or alternative measuring methods approved by the Contract Administrator, before beginning the sewer inspection. The centre of the manhole will be based on the centre of the manhole cover regardless of the manhole configuration. If bends are identified to exist within the sewer segment, the Contractor shall approximate the measurement on the ground surface using incremental distances to the approximate alignment of the sewer between the start and finish manholes, to the approval of the Contract Administrator's Site Inspector.

E34.4.9 Further to Clause 3.17.7.8:

- (a) Service connection tap observation distances must occur at the centre of the tap and the side periphery. To determine use and deficiencies of the tap, the camera must continue to travel, camera centred in the perspective view (to capture other observations), to stop perpendicular to the tap and pan so that the camera can view directly into the barrel of the lateral, to enable the inspector to apply modification and descriptor codes to the tap as per NASSCO PACP standards as necessary.

E34.4.10 Replace Clause 3.17.7.6, with:

- (a) Record the distance from the centre of the manhole to the cable calibration location at the start of the inspection and adjust the distance reading so that zero is at the centre of the start manhole. This distance is known as the cable calibration distance. The cable calibration location is the intersection point between the camera's widest horizontal viewing angle and the pipe's side periphery (03 or 09 o'clock) when the camera is level and looking forward.

E34.4.11 The sewer inspected distance shall represent the distance from the center of the start to the center of the end manhole, access or control structure unless incomplete as per Section 3.19.2.

E34.4.12 Further to Section 3.19.2, incomplete inspections for sewer and manhole inspections shall be communicated to the Contract Administrator, indicating the date and time of the attempt, reasoning, efforts and actions set out by Section 3.19.

E34.4.13 Further to Section 3.19.2, manholes identified being in a surcharged environment (standing water) or in imminent failure shall be communicated to the Contract Administrator, indicating the issues observed in the inspection.

E34.4.14 Further to Section 3.22.1, clear water infiltration observations shall be communicated to the Contract Administrator, providing asset number, location, date and time of the observation, description with attached screen captures to help facilitate Section 3.19.

E34.5 Sewer Inspection Equipment

E34.5.1 Notwithstanding CW 2145, CCTV equipment meet the following requirements:

- (a) In-Line sewer inspection equipment shall be comprised of a self-propelled track-mounted platform bearing multiple inspection sensors / technologies that can undertake simultaneous remote inspection in sewers of all diameter ranges.
- (b) In areas where a self-propelled track-mounted platform is not possible to use during the inspections, the inspections shall be performed using a float or skid system. The Contractor shall notify the Contract Administrator prior to the use of a float or skid platform, tethered by use of flusher hosing capable at distances stated in E34.5.2(b)

E34.5.2 Minimum requirements of the in-line inspection platform include:

- (a) Independently controlled drive tracks that enable the platform to manoeuvre around bends and climb over debris up to 300mm in height.
- (b) Operable under partially or fully submerged flow conditions, for distances up to 500m upstream or downstream from a single access point.
- (c) Operable in sewers of various cross-sections and constructed of standard pipe materials including brick, concrete, PVC, HDPE, and steel.

- (d) Tethered to facilitate extraction of the platform from the sewer, without causing damage to the sewer infrastructure, in the event the equipment fails or otherwise becomes uncontrollable within the sewer.
- (e) Equipped with sufficient high intensity lighting to illuminate the sewer for visual inspection.
- (f) Equipment shall be capable of continuously capturing digital video from first generation recordings with no frame loss, regardless of the progression of the inspection.
- (g) Equipment shall be used to acquire continuous digital video images of the sewer for the entire length being inspected.

E34.6 Video Coding

- (a) Perform sewer condition coding in accordance with the requirements of the National Association of Sewer Service Companies (NASSCO) "Pipeline Assessment Certification Program" (PACP) and to version 7.0.0 of the manual or better.
- (b) Perform condition coding using certified operators in accordance with the NASSCO PACP and MACP. Ensure each operator is fully trained in all aspects of sewer inspection and capable of making accurate observations and recording all conditions that may be encountered in the sewers.
- (c) Operators failing to provide copies of their NASSCO certification and / or failing to meet the accuracy requirements on two occasions will not be permitted to code on the remainder of the Contract until they can demonstrate to the Contract Administrator that they can code in accordance with the requirements of the NASSCO PACP and MACP version 7.0.0 of the manual or greater.
- (d) Incorporate a suitable distance-reading device to measure the location of the equipment in the pipe, to an accuracy of $\pm 0.5\%$ of the length of the inspection.

E34.7 Measurement and Payment

E34.8 Measurement and payment shall be in accordance with CW2140 and CW2145