



THE CITY OF WINNIPEG

TENDER

TENDER NO. 584-2019

**REPLACEMENT OF THE DUBLIN AVENUE BRIDGE OVER OMAND'S CREEK AND
ASSOCIATED REGIONAL STREET IMPROVEMENTS**

TABLE OF CONTENTS

PART A - BID SUBMISSION

- Form A: Bid
- 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	8

PART C - GENERAL CONDITIONS

C0. General Conditions	1
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PART D - SUPPLEMENTAL CONDITIONS

General

D1. General Conditions	1
D2. Scope of Work	1
D3. Definitions	3
D4. Contract Administrator	4
D5. Contractor's Supervisor	4
D6. Ownership of Information, Confidentiality and Non Disclosure	4
D7. Notices	5
D8. Furnishing of Documents	5

Submissions

D9. Authority to Carry on Business	5
D10. Safe Work Plan	5
D11. Insurance	6
D12. Contract Security	7
D13. Subcontractor List	7
D14. Detailed Work Schedule	7

Schedule of Work

D15. Commencement	8
D16. Working Days	8
D17. Restricted Work Hours	8
D18. Work By Others	9
D19. Sequence of Work	10
D20. Critical Stages	10
D21. Substantial Performance	11

D22. Total Performance	11
D23. Liquidated Damages	11
D24. Scheduled Maintenance	11
Control of Work	
D25. Job Meetings	12
D26. Prime Contractor – The Workplace Safety and Health Act (Manitoba)	12
D27. The Workplace Safety and Health Act (Manitoba) – Qualifications	13
D28. Layout of the work	13
D29. Cooperation with others	13
Measurement and Payment	
D30. Payment	13
Warranty	
D31. Warranty	13
Third Party Agreements	
D32. Funding and/or Contribution Agreement Obligations	14
Form H1: Performance Bond	16
Form H2: Labour and Material Payment Bond	18
Form J: Subcontractor List	20

PART E - SPECIFICATIONS

General	
E1. Applicable Specifications and Drawings	1
E2. Reports	2
E3. Environmental Protection Plan	2
E4. Working In Proximity to Manitoba Hydro Overhead Lines	12
E5. Mobilization and Demobilization	12
E6. Office Facilities	14
E7. Shop Drawings	15
E8. Creek Flow Maintenance	17
E9. Creek Bank Excavation	20
E10. Protection of Existing Trees	24
E11. Water Obtained from the City	25
E12. Traffic and Pedestrian Control Management During Bridge Construction	25
E13. Traffic Control	25
E14. Traffic Management	26
E15. Pedestrian Safety	27
E16. Surface Restorations	27
E17. Infrastructure Signs	27
E18. Bridge Demolition	27
E19. Clearing and Grubbing	28
E20. Structural Excavation	32
E21. Silt Fence Barrier	33
E22. Supply and Driving of Steel Piles	35
E23. Structural Backfill	41
E24. Random Stone Riprap and Geotextile	45
E25. Reinforcing Steel	46
E26. Structural Concrete	51
E27. Bridge Aluminum Barrier Rail	78
E28. Chain Link Fence on the Bridge	78
E29. Timber Bumper Fence	79
E30. Natural Seeding	80
E31. TopSoil and Finish grading	85
E32. Erosion Control Blanket	88
E33. Interlocking Paving Stones	89
E34. Hydro Excavation	90
E35. Working Near Rail	91

E36. Excavation of Contaminated Soils for Roadway Construction	92
E37. Operating Constraints for Work in Close Proximity to Critical Water Infrastructure	92
E38. Concrete Sidewalk and approach With Blockouts	95
E39. Concrete Retaining Curbs at back of Sidewalk	96
E40. Outflow Restriction of Catch Basins	97
E41. Bonding Agent	97
E42. Insulation of Existing Water Services	97

PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

- B1.1 Replacement of the Dublin Avenue Bridge over Omand's Creek and Associated Regional Street Improvements

B2. SUBMISSION DEADLINE

- B2.1 The Submission Deadline is 12:00 noon Winnipeg time, October 23, 2019.
- 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.
- B3.2 The Bidder is advised that an existing building operated by Capitol Steel is located beside the construction area and on the shore of Omand's Creek. The preconstruction condition of the building shall be preserved during the entire duration of the project.

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. 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 D4.1.

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.
- B7.7 Further to B7.6, 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.
- B7.8 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B7.9 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 B18.1B17.1.
- B7.10 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 Further to B8.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B7.
- B8.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely.
- B8.4 The Bid shall be submitted electronically through MERX at www.merx.com.
- B8.4.1 Bids will **only** be accepted electronically through MERX.
- B8.5 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B18.1(a).

B9. BID

- B9.1 The Bidder shall complete Form A: Bid, making all required entries.
- B9.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his/her own name, his/her name shall be inserted;
 - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
 - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
 - (d) if the Bidder is carrying on business under a name other than his/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

- 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, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.
- B9.4 Paragraph 2 of Form A: Bid shall be signed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his/her own name, it shall be signed by the Bidder;
 - (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
 - (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, shall be affixed;
 - (d) if the Bidder is carrying on business under a name other than his/her own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.
- B9.4.1 The name and official capacity of all individuals signing Form A: Bid 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.
- B10.2 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.

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) Bayview Construction Limited in regard to productivity rates and constructability of the St. James Street and Dublin Avenue intersection.
 - (b) Maple Leaf Construction Limited in regard to productivity rates and constructability of the St. James Street and Dublin Avenue intersection.

- (c) Cematrix Cellular Concrete Solution in regard to access and productivity rates related to the constructability of the St. James Street and Dublin Avenue intersection.

B12. CONFLICT OF INTEREST AND GOOD FAITH

B12.1 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://winnipeg.ca/finance/findata/matmgt/listing/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);

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 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.

B13.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B14. BID SECURITY

B14.1 A sample Bid Bond and Agreement to Bond are available on The City of Winnipeg, Corporate Finance, Materials Management Division website at <https://www.winnipeg.ca/MatMgt/templates/files/eBidsecurity.pdf>.

B14.2 The Bidder shall provide digital bid security in the form of a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond).

B14.3 Bid security shall be submitted in an electronic or digital format meeting the following criteria:

- (a) 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; all digital seals; with the surety company, or an approved verification service provider of the surety company.
- (b) 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.
- (c) 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.
- (d) The results of the verification must provide a clear, immediate and printable indication of pass or fail regarding B14.3(a).

B14.4 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).

B14.5 Bonds passing the verification process will be treated as original and authentic.

B14.5.1 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.

B14.6 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.

B14.7 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.

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.

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.

B18.3 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 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 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.

B19.3.1 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 2019-09-01) 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. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of:

- (a) Bridge Works
 - (i) Demolition of an existing concrete and timber piled bridge.
 - (ii) Construction of a new cast-in-place single span concrete solid slab bridge with cast-in-place concrete abutments supported by driven steel H-piles.
- (b) Soil Remediation Works
 - (i) Removal of contaminated soils along Omand's Creek for appropriate disposal as outlined in the Remediation Plan approved by Manitoba Sustainable Development. The soils are to be disposed of at an appropriate facility as outlined in the Remediation Plan. Should the remedial method change or disposal facility or location change, approval from Manitoba Sustainable Development would be required in advance of the alteration of the disposal facility.
- (c) Creek Alteration Works
 - (i) Omand's Creek to be reshaped approximately 11m south and 33m north of the proposed bridge.
- (d) Road Works
 - (i) Reconstruction of Dublin Avenue from Notre Dame Avenue to St James Street including the Dublin Avenue and St. James Street intersection.
 - (ii) Major Rehabilitation of St. James Street from Saskatchewan Avenue to 100m North of Dublin Avenue including construction of a new concrete sidewalk on the east side of St. James Street
 - (iii) Asphalt mill and fill of St. James Street starting from approximately 40m south of Bangor Avenue to the intersection at Notre Dame Avenue including construction of a new concrete sidewalk on the east side of St. James Street.
- (e) Landscaping Works
 - (i) Omands Creek each side of the bridge extending to approximately 11m south and 33m north.
 - (ii) Various boulevards and private land due to regrading.

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

D2.3 Protection of Existing Building

D2.3.1 The existing building operated by Capitol Steel located next to the construction area and on the shore of Omand's Creek shall have its preconstruction condition preserved, by the Contractor, for the entire duration of the project. The Contractor shall contact the building owner to gain access to and review and document the preconstruction condition of the building. The selected Contractor will be held responsible for any required repairs to return the structure to the preconstruction condition including the organization, completion and costs of the repairs. The Contractor is required to obtain written documentation from the owner that they accept the building in its current condition either at the end of construction or after remedial measures have been completed. This written confirmation must be provided by the Contractor to the Contract Administrator before Total Performance Certificate will be issued.

D2.4 Bridge Works

D2.4.1 General

- (a) Demolition and removal of the existing bridge and timber piles;
- (b) Excavation and hauling of contaminated soils at bridge abutments and portions of the creek embankments and creek bed for appropriate disposal as outlined in the Remediation Plan approved by Manitoba Sustainable Development. The soils are to be disposed of an appropriate facility as outlined in the Remediation Plan. Should the remedial method change or disposal facility or location change, approval from Manitoba Sustainable Development would be required in advance of the alteration of the disposal facility;
- (c) Installation of steel piles;
- (d) Construction of concrete abutment, wingwalls, bridge deck, sidewalks;
- (e) Construct concrete barriers with control joints and expansion joints;
- (f) Install aluminum guardrail along concrete barriers;
- (g) Construction of concrete approach slab, transition slab, and sleeper slab;
- (h) Install Emseal joints.

D2.4.2 Soil Remediation Works

- (i) Excavation and hauling of contaminated soils along both banks and bed of Omand's Creek from the bridge and extending 33m north and 11m south for appropriate disposal as outlined in the Remediation Plan approved by Manitoba Sustainable Development. The soils are to be disposed of an appropriate facility as outlined in the Remediation Plan. Should the remedial method change or disposal facility or location change, approval from Manitoba Sustainable Development would be required in advance of the alteration of the disposal facility.
- (j) Creek Alteration Works
 - (i) Excavate and realign a portion of Omand's Creek extending approximately 11m south and 33m north of the bridge per the drawings;
 - (ii) Remediate soils as required by the Environmental Protection Plan Specification section E3 and the Remediation Plan in Appendix B;
 - (iii) Transition the creek channel to meet the existing creek alignment within the last 10m at the north end of the project per the drawings;
 - (iv) Provide non-woven geotextile and riprap on the creek slopes and creek bed per the drawings;
 - (v) Top of slope areas disturbed by the construction activities shall be regraded and naturalized per the drawings.

D2.5 Road Works

D2.5.1 Reconstruction of Dublin Avenue from Notre Dame Avenue to St James Street including the Dublin Avenue and St. James Street intersection

- (a) Removal of existing road pavement and sidewalk;
- (b) Excavation including excavation and proper disposal of contaminated soils between Omand's Creek and Notre Dame Avenue;
- (c) Installation of subdrains;
- (d) Installation of catch basins and sewer pipe;
- (e) Sewer repairs;
- (f) Fire hydrant relocations;
- (g) Placement of geotextile fabrics and geo-grid;
- (h) Placement and compaction of sub-base and base materials;
- (i) Place and adjust manholes, water valves and appurtenances;

- (j) Construction of 230mm plain dowelled concrete pavement;
- (k) Construction of 180mm integral barrier curbs;
- (l) Construction of retaining curbs;
- (m) Construction of 100mm concrete sidewalk with block outs for paving stone bands;
- (n) Installation of detectable warning surface tiles.

D2.5.2 Major Rehabilitation of St. James Street from Saskatchewan Avenue to 100m North of Notre Dame Avenue including construction of a new concrete sidewalk on the east side of St. James Street

- (a) Sewer repairs;
- (b) Installation of catch pits and catch basins;
- (c) Fire hydrant relocations;
- (d) Adjustment of drainage inlets, water valves, manholes, and utility manholes;
- (e) Milling of existing asphalt;
- (f) Full depth concrete repairs of existing slabs and joints (200mm thick reinforced);
- (g) Renewal of existing curbs with 125mm reveal;
- (h) Renewal of existing sidewalk on the west side of St. James Street with block out for paving stone band;
- (i) Construction of new concrete sidewalk on the east side of St. James Street with block out for paving stone band;
- (j) Installation of detectable warning surface tiles;
- (k) Construction of retaining curbs;
- (l) Placement of asphalt overlay with average thickness of 80mm;
- (m) Resurfacing of CP Rail crossing.

D2.5.3 Asphalt mill and fill of St. James Street starting from approximately 40m south of Bangor Avenue to the intersection at Notre Dame Avenue

- (a) Milling of existing asphalt;
- (b) Full depth concrete repairs of existing slabs and joints (200mm thick reinforced);
- (c) Installation of catch pits and lead repairs;
- (d) Installation of 50mm of asphalt;
- (e) Renewal of section of existing concrete curbs and sidewalk;
- (f) Construction of new concrete sidewalk with block out for paving stone band on the east side of St. James Street;
- (g) Installation of detectable warning surface tiles.

D2.5.4 Landscaping Works

- (a) Placing topsoil;
- (b) Seeding, Sodding and naturalization;
- (c) Maintenance of landscaping works.

D3. DEFINITIONS

D3.1 When used in this Tender:

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

- (b) "ASTM" means the American Society for Testing and Materials that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.
- (c) "CSA" means the Canadian Standards Association that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.
- (d) "ICRI" means the International Concrete Repair Institute that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.
- (e) "RSIC" means the Reinforcing Steel Institute of Canada that complies with the latest edition of standards including amendments and supplements in effect on the date of issue of this Bid Opportunity shall apply to the Work.

D4. CONTRACT ADMINISTRATOR

- D4.1 The Contract Administrator is Stantec Consulting Ltd., represented by:
Kevin Amy, M.Sc., P.Eng
Project Manager 500-311 Portage Ave., Winnipeg, MB R3B 2B9
Telephone No. 204 488-5743
Email Address kevin.amy@stantec.com
- D4.2 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.
- D4.3 Bids Submissions must be submitted to the address in B8

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. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

- D6.1 The Contract, all deliverables produced or developed, and information provided to or acquired by the Contractor are the property of the City and shall not be appropriated for the Contractors own use, or for the use of any third party.
- D6.2 The Contractor shall not make any public announcements or press releases regarding the Contract, without the prior written authorization of the Contract Administrator.
- D6.3 The following shall be confidential and shall not be disclosed by the Contractor to the media or any member of the public without the prior written authorization of the Contract Administrator;
- (a) information provided to the Contractor by the City or acquired by the Contractor during the course of the Work;
 - (b) the Contract, all deliverables produced or developed; and
 - (c) any statement of fact or opinion regarding any aspect of the Contract.
- D6.4 A Contractor who violates any provision of D6 may be determined to be in breach of Contract.

D7. NOTICES

- D7.1 Except as provided for in C22.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.
- D7.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D7.3 D7.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator identified in D3.1(a).
- D7.3 Notwithstanding C21, all notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following:
- The City of Winnipeg
Attn: Chief Financial Officer
Office of the Chief Administrative Officer
Susan A. Thompson Building
2nd Floor, 510 Main Street
Winnipeg MB R3B 1B9
- D7.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following facsimile number:
- The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services
Facsimile No.: 204-947-9155

D8. FURNISHING OF DOCUMENTS

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

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

- D9.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D10. SAFE WORK PLAN

- D10.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract 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>

D11. INSURANCE

- D11.1 The Contractor shall provide and maintain the following insurance coverage to remain in place at all times during the performance of the Work and throughout the warranty period unless otherwise stated below:
- (a) Wrap-up liability insurance in an amount of no less than five million dollars (\$5,000,000) inclusive per occurrence and five millions dollars (\$5,000,000) general aggregate, covering bodily injury, property damage, demolition, personal injury, unlicensed motor vehicle liability, sudden and accidental pollution with 120 hour reporting, hook liability, if required, and products and completed operations consistent with industry standard insurance policy wordings. Wrap up liability insurance to also include evidence of contractual liability and cross liability clauses.
 - (i) The Contractor will carry such insurance to cover the City, Contractor, Subcontractors, consultants and sub-consultants as insured's. Provision of this insurance by the City is not intended in any way to relieve the Contractor from his obligations under the terms of the Contract. Specifically, losses relating to deductibles for insurance, as well as losses in excess of limits of coverage and any risk of loss that is not covered under the terms of the insurance provided by the City remains with the Contractor.
 - (ii) Canadian Pacific Railway Company, Manitoba and its Ministers, officers, employees and agents, BellMTS, Manitoba Hydro, Shaw and Telus shall be shown as additional insured, as required by contract(s).
 - (iii) Wrap-up liability insurance shall be maintained from the date of the commencement of the Work until the date of Total Performance of the work and shall include an additional 24 months completed operations coverage which will take affect after Total Performance.
 - (b) All risks course of construction insurance in the amount of one hundred percent (100% of the total Contract Price. Such policy shall be written in the joint names of the Contractor the City and Subcontractors and shall remain in place until Substantial Performance.
 - (c) 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 \$5,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.
 - (d) Contractor's pollution liability (cpl) in the amount of at least two million dollars (\$2,000,000) per occurrence and five million dollars (\$5,000,000) general aggregate insuring against claims covering third-party injury and property damage claims, and including clean-up costs and transported cargo as a result of pollution conditions arising suddenly or gradually from the Contractor's operations and completed operations. Such policy shall include Canadian Pacific Railway Company, Manitoba and its Ministers, officers, employees and agents and the City as additional insureds and a cross liability clause.
 - (e) Property insurance for all equipment, tools, field office and portable toilets used by the Contractor directly or indirectly in the performance of the Work on the project that may be owned, rented, leased or borrowed.
- D11.2 Deductibles shall be borne by the Contractor.
- D11.3 All Subcontractors performing Work on the Project shall be registered with Workers Compensation Board of Manitoba, shall provide and maintain workers compensation coverage throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.
- D11.4 All policies shall be taken out with insurers duly licensed to carry on business in the Province of Manitoba.
- D11.5 The Contractor shall provide the City Solicitor with a certificate(s) of insurance for the City and Province, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the

commencement of any Work but in no event later than the date specified in C4.1 for the return of the executed Contract.

- D11.6 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D12. 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.

- D12.2 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. SUBCONTRACTOR LIST

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

D14. DETAILED WORK SCHEDULE

- D14.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least 5 (5) 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.

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

- (a) a Gantt chart for the Work based on the C.P.M. schedule;

- D14.3 Further to D14.2 the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path:

- D14.4 Further to D14.2(a), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

SCHEDULE OF WORK

D15. COMMENCEMENT

- D15.1 The Contractor shall not commence any Work until he/she is in receipt of an award letter from the Award Authority authorizing the commencement of the Work.
- D15.2 The Contractor shall not commence any Work on the Site until:
- (a) the Contract Administrator has confirmed receipt and approval of:
 - (i) evidence of authority to carry on business specified in 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 subcontractor list specified in D13;
 - (viii) the detailed work schedule specified in D14;
 - (ix) submittals as stated in E37 for working in close proximity to critical water infrastructure.
 - (x) submittals as stated in E3 for environmental protection plan
 - (xi) submittals as stated in E8 for creek flow maintenance plan.
 - (b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a pre-construction meeting.
- D15.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the award letter, however the Contractor shall not implement or cause to be implemented any lane closures on Dublin Avenue on or before December 31, 2019.
- D15.3 The Contractor shall not commence road works Work before May 18, 2019 unless permitted by the Contract Administrator.
- D15.4 The City intends to award this Contract by December 6, 2019.
- D15.4.1 If the actual date of award is later than the intended date, the dates specified for Commencement, Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D16. WORKING DAYS

- D16.1 Further to C1.1(II);

The Contract Administrator will determine daily if a Working Day has elapsed and will record his/her assessment. On a weekly basis the Contract Administrator will provide the Contractor with a record of the Working Days assessed for the preceding week. The Contractor shall sign each report signifying that he/she agrees with the Contract Administrator's determination of the Working Days assessed for the report period.

Work done to restore the Site to a condition suitable for Work, shall not be considered "work" as defined in the definition of a Working Day.

D17. RESTRICTED WORK HOURS

- D17.1 Further to clause 3.10 of CW 1130, the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed between 2000 hours and 0700 hours, or on Saturdays, Sundays, Statutory Holidays and or Civic Holidays.

D17.2 In accordance with the Manual of Temporary Traffic Control, Sections 2.03, 2.04, 2.05 and 2.06, should the Traffic Management Branch of the Public Works Department require that work on Regional Streets be carried out at night or on Sundays or on public holidays, where permitted by the City of Winnipeg Police Department, or that work be restricted or suspended during peak traffic hours, no additional compensation will be considered to meet these requirements.

D17.3 Night Work and Noise Limitation

- (a) Night work may have to be undertaken by the Contractor, as required by his Schedule of Work and by his actual work progress, to ensure timely completion of all Works of this Contract, all at his own cost.
- (b) Further to the General Conditions, the Contractor shall show that he has the approval of all applicable authorities in regard to said night work and to the anticipated/actual construction noise levels. In particular, such Work shall conform with the Noise Control By-Law No. 2480/79. Also, the Contractor, at his own cost, incidental to these Works, shall supply sufficient lighting to enable all night work to be done in a safe and efficient manner, satisfactory to the Contract Administrator.
- (c) The Contractor is advised that possible noise level problems may limit his Work activities on Sundays and at night. The Contractor must request and receive approval from the Contract Administrator at least 48 hours in advance of any Contract Work to be undertaken on Sundays or at night. It will be the Contractor's responsibility to schedule work activities to minimize potential problems and/or to employ noise-reduction measures to lower the noise to an acceptable level. Time extension will not be granted on the basis of the Contractor being ordered to limit his activities at night.

D18. WORK BY OTHERS

D18.1 Work by others on or near the Site will include but not necessarily be limited to:

- (a) Manitoba Hydro – Renewal of the existing street lighting on Dublin located at the back of sidewalk;
- (b) Manitoba Hydro –Relocation of overhead distribution lines to the back of sidewalk on Dublin Avenue, this is anticipated to be completed fall 2019;
- (c) Manitoba Hydro – Relocation of the existing 100 gas line on Dublin Avenue so it is not under the existing or proposed structure as demonstrated in the Drawings, this is anticipated to be completed in fall 2019;
- (d) BellMTS – Removal of existing overhead lines on Dublin Avenue and burial of new lines. Casting adjustment of two manholes on Dublin Avenue and provision of manholes riser rings. Relocation of the large DSLAM cabinet on St. James Street to the property line. The overhead lines are anticipated to be buried in fall 2019. The DSLAM cabinet on St. James Street will be relocated by spring 2020;
- (e) Shaw – Relocation of the above surface cabinet on St. James Street. Removal of the existing timber poles on Dublin Avenue west of Orange Street and installation of new buried lines. This work is expected to be completed in fall 2020.
- (f) City of Winnipeg Traffic Services – Sign clamps, replace any signage, and paint lines;
- (g) City of Winnipeg W&WD – Relocation of the existing watermain to the north of the proposed structure as demonstrated in the Drawings.
- (h) City of Winnipeg Traffic Signals – Traffic signal loop will require decommissioning and reinstallation. Traffic Signal upgrades and renewals at the St. James Street and Saskatchewan Avenue intersection and the St. James Street and Dublin Avenue intersection.
- (i) CP Rail – Installation of new pre-cast concrete planks and rail seal at the crossing.
- (j) Further to D18.1 the Contractor is expected to cooperate with parties performing required works to facilitate their works.

D19. SEQUENCE OF WORK

D19.1 Further to C6.1, the sequence of work shall be as follows:

- (a) Commence in January 2020 to March 1, 2020:
 - (i) Close portion of Dublin Avenue as required for winter staging area, as detailed on the Drawings.
 - (ii) Demolition of the existing bridge structure
 - (iii) Any soils removed within 30m east and west of Omand's Creek during excavations shall be removed and remediated as specified.
 - (iv) Contractor to design and construct temporary retaining walls as required to protect or add support to items that have the potential to be damaged as a result of the construction activities. Retaining walls shall be in place prior to any excavations.
 - (v) Drive steel piles at abutments and wingwalls.
 - (vi) Installation of temporary shoring at the southeast corner of the bridge to protect the building.
 - (vii) Construct abutments and wingwalls.
 - (viii) Place soils and reshaped creek bed with erosion control measures in place.
 - (ix) Place rip rap.
 - (x) Form and construct bridge deck.
 - (xi) Ensure silt fences and erosion control are in place along any disturbed bank areas.
- (b) Completed Prior to April 30, 2019
 - (i) Form and construct approach slabs, transition slabs, sleeper slabs and expansion joints.
 - (ii) Form and construct sidewalks, concrete barriers, chain link fences, and aluminum railing.
 - (iii) Ensure silt fences and erosion control are in place along any disturbed bank areas.
- (c) May 2020 to Fall 2020
 - (i) Perform roadworks for Dublin Avenue and St. James Street as permitted in the Contract Documents for roadworks.
- (d) July 2020 to Substantial Performance
 - (i) Finish grading and landscaping along Omand's Creek
 - (ii) Finish landscaping along Dublin Avenue and St. James Street.

D19.2 Further to D19.1 a recommended traffic staging plan is included in the Drawings.

D20. CRITICAL STAGES

D20.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

- (a) All in water works shall be completed by March 1, 2020
- (b) Bridge Construction Works, except landscaping plantings, shall be completed and Dublin Avenue shall be re-opened to traffic in both directions by April 30, 2020

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

D20.3 The date on which the Critical Stage has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of the Critical Stage has been achieved.

D21. SUBSTANTIAL PERFORMANCE

- D21.1 The Contractor shall achieve Substantial Performance within ninety (90) consecutive Working Days of the commencement of the Road Work as specified in D15.
- D21.2 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.
- D21.3 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.

D22. TOTAL PERFORMANCE

- D22.1 The Contractor shall achieve Total Performance within ninety five (95) consecutive Working Days of the commencement of the Road Work as specified in D15.
- D22.2 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.
- D22.3 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.

D23. LIQUIDATED DAMAGES

- D23.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:
- (a) Critical stage listed in D20.1(a) – two thousand five hundred dollars (\$2,500);
 - (b) Critical stage listed in D20.1(b) – four thousand dollars (\$4,000).
 - (c) Substantial Performance – Five thousand five hundred dollars (\$5,500);
 - (d) Total Performance – two thousand eight hundred dollars (\$2,800).
- D23.2 The amounts specified for liquidated damages in D23.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days fixed herein for same.
- D23.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D24. SCHEDULED MAINTENANCE

- D24.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:
- (a) Seeding and Salt tolerant grass seeding as specified in the latest version of the City of Winnipeg Standard Construction Specification as specified in CW 3520 and Section E25 of the Specifications shall have a maintenance period of one year.;
 - (b) Sodding as specified in CW 3510-R9;

- (c) Natural grass plantings maintenance period and weed control as specified in E30;
- (d) Reflective crack maintenance during one year maintenance period on St. James Street as specified in the latest version of City of Winnipeg Standard Construction Specification as specified in CW 3250;

D24.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D25. JOB MEETINGS

- D25.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.
- D25.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.
- D25.3 Shortly after award but prior to the start of construction the Contractor shall organize and manage a meeting with representatives from Manitoba Hydro, Stantec Consulting, and the City of Winnipeg to review conditions required to allow piling along the south side of Dublin Ave when in proximity of the existing active hydro lines. Representatives present at the meeting shall be a responsible person capable of expressing the position of the group they are representing. The representatives shall be prepared to discuss the piling with regard to the following:
- (a) Manitoba Hydro's safety measures or devices required to be in place to allow all aspects of piling to be fully completed per the Contract requirements;
 - (b) the types of equipment being used or required;
 - (c) the dates, duration and timing of the work.
- D25.4 The Contractor shall bear all associated costs for the work as follows:
- (a) For labour and materials required to perform the work;
 - (b) For safety measures or devices required by Manitoba Hydro, Stantec Consulting or the City of Winnipeg to perform all piling per the Contract;
 - (c) For requirements for evening or night work if desired or required;
 - (d) For the coordination with other utilities as required; and
 - (e) For any additional requirements by Manitoba Hydro for watches or shutdowns to allow the work to be completed.

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

- D26.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

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

D27.1 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.

D28. LAYOUT OF THE WORK

D28.1 Bridge Work

- (a) The Contract Administrator shall provide the basic centrelines and a benchmark for construction of Bridge Work.
- (b) 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.
- (c) The Contract Administrator shall be notified at least two (2) Business Days prior to any Work being commenced in order to have the option to check and review all elevations and layouts at his discretion.
- (d) 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 the Contractor's expense.
- (e) 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.

D28.2 Road Work

- (a) The Contract Administrator shall provide layout for roadworks in accordance with CW 1130.

D29. COOPERATION WITH OTHERS

D29.1 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 on the structure, approach roadways, adjacent roadways or rights-of-way. The activities of these agencies may coincide with the Contractor's execution of the Work, and it will be the Contractor's responsibility to cooperate to the fullest extent with the other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of the Contract.

MEASUREMENT AND PAYMENT

D30. PAYMENT

D30.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D31. WARRANTY

D31.1 Notwithstanding C13.2, the warranty period for the bridge construction shall begin on the Critical Stage date for Bridge Construction Completion 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.

- D31.2 Further to D31.1 and notwithstanding C13.2, the warranty period, for the Dublin Ave. Reconstruction 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.
- D31.2.1 Further to D31.1 the warranty period for the St. James Street Major Rehabilitation and Mill and Fill shall expire one (1) year thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder, this excludes
- (a) The St. James Street and Dublin intersection which limits include portions to be reconstructed, which shall be two years warranty.
 - (b) New sidewalk on the east side of James Street where one previously did not exist, which shall be two years.
- D31.3 Notwithstanding C13.2 or D31.1, 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.
- D31.3.1 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.
- D31.4 At least two (2) weeks prior to the expiration of the Warranty Period, or upon correction of all outstanding defects and deficiencies, whichever is later, the Contractor shall arrange, attend, and assist in the acceptance inspection of the Work. The Contract Administrator shall, on being satisfied that all outstanding defects and deficiencies in the Work have been corrected, issue a Certificate of Acceptance for the Work to be dated not earlier than two(2) years after the date of the Certificate of Total Performance, or the date that the Contractor corrects the final defects and deficiencies, whichever is the later, thereby terminating the Warranty Period. The Certificate of Acceptance will indicate acceptance of the due performance of the Contract.

THIRD PARTY AGREEMENTS

D32. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

- D32.1 Funding for the Work of the Contract is being provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada and accordingly, as required by the applicable funding agreements, the following terms and conditions shall apply.
- D32.2 For the purposes of D32:
- (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.
- D32.3 Indemnification By Contractor
- D32.3.1 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.

D32.4 Records Retention and Audits

D32.4.1 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.

D32.4.2 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 D32.4.1 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.

D32.5 Other Obligations

D32.5.1 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.

D32.5.2 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.

D32.5.3 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.

D32.5.4 The Contractor shall properly account for the Work provided under this Contract and payment received in this respect, prepared in accordance with generally accepted accounting principles in effect in Canada, including those principles and standards approved or recommended from time-to-time by the Chartered Professional Accountants of Canada or the Public Sector Accounting Board, as applicable, applied on a consistent basis.

FORM H1: PERFORMANCE BOND
(See 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. 584-2019

Replacement of the Dublin Avenue Bridge over Omand's Creek and associated Regional Street Improvements
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. 584-2019

Replacement of the Dublin Avenue Bridge over Omand's Creek and associated Regional Street Improvements

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
 - (ii) 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;

- (iii) 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;
 - (iv) other than in a court of competent jurisdiction in the Province of Manitoba.
- (d) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.
- (e) The Surety shall not be liable for a greater sum than the specified penalty of this bond.

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

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

_____ day of _____, 20____.

SIGNED AND SEALED
in the presence of:

(Witness as to Principal if no seal)

(Name of Principal)

Per: _____ (Seal)

Per: _____

(Name of Surety)

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

FORM J: SUBCONTRACTOR LIST
(See D13)

Replacement of the Dublin Avenue Bridge over Omand's Creek and associated Regional Street Improvements

<u>Portion of the Work</u>	<u>Name</u>	<u>Address</u>
SURFACE WORKS:		
<i>Supply of Materials:</i>		
<i>Concrete</i>		
<i>Asphalt</i>		
<i>Base Course & Sub-Base</i>		
<i>Topsoil & Sod</i>		
<i>Installation/Placement:</i>		
<i>Concrete</i>		
<i>Asphalt</i>		
<i>Base</i>		
<i>Topsoil & Sod</i>		
UNDERGROUND WORKS:		
<i>Supply of Materials:</i>		
<i>Frame & Covers</i>		
<i>Catch Pits and Catch Basins</i>		
<i>Sewer pipe and hydrants</i>		
<i>Installation/Placement:</i>		
<i>Catch pits and catch basins</i>		
<i>Sewer Televising</i>		
<i>Sewer Repairs</i>		
OTHERS:		

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.

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>

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

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>Drawing No.</u>	<u>Drawing Name/Title</u>	<u>Drawing (Original) Sheet Size</u>
B105-19-1	Cover Sheet Drawing Index & Design Data	A1 (594x841)
B105-19-2	Drawing Index & Design Data	A1 (594x841)
B105-19-3	Testhole Log and Location Plan	A1 (594x841)
B105-19-4	Proposed Bridge Structure – Scope of Work	A1 (594x841)
B105-19-5	Proposed Bridge Structure – General Arrangement	A1 (594x841)
B105-19-6	Proposed Bridge Structure – Excavation	A1 (594x841)
B105-19-7	Proposed Bridge Structure – Foundation & Substructure Plans	A1 (594x841)
B105-19-8	Proposed Bridge Structure – Substructure Sections and Details	A1 (594x841)
B105-19-9	Proposed Bridge Structure – Substructure Reinforcing Details 1 of 2	A1 (594x841)
B105-19-10	Proposed Bridge Structure – Substructure Reinforcing Details 2 of 2	A1 (594x841)
B105-19-11	Proposed Bridge Structure – Deck Concrete Details	A1 (594x841)
B105-19-12	Proposed Bridge Structure – Deck Reinforcing Details	A1 (594x841)
B105-19-13	Proposed Bridge Structure – Approach Slab Details	A1 (594x841)
B105-19-14	Proposed Bridge Structure – Transition Slab Details	A1 (594x841)
B105-19-15	Proposed Bridge Structure – Barriers Details	A1 (594x841)
B105-19-16	Proposed Bridge Structure – Curbs Details	A1 (594x841)
B105-19-17	Proposed Bridge Structure – Aluminum Guardrail	A1 (594x841)
B105-19-18	Proposed Bridge Structure – Creek Works - Sections	A1 (594x841)
P-3503-2	Key Plan – Road Works	A1 (594x841)
P-3503-3	Dublin Avenue – Sta 1+220.302 to Sta 1+731.246 – Horizontal Geometry	A1 (594x841)
P-3503-4	Dublin Avenue – Sta 0+990 to Sta 1+125 – Roadworks - Reconstruction	A1 (594x841)
P-3503-5	Dublin Avenue – Sta 1+125 to Sta 1+250 – Roadworks - Reconstruction	A1 (594x841)
P-3503-6	Dublin Avenue – Sta 1+250 to Sta 1+375 – Roadworks - Reconstruction	A1 (594x841)
P-3503-7	Dublin Avenue – Sta 1+375 to Sta 1+500 – Roadworks - Reconstruction	A1 (594x841)

<u>Drawing No.</u>	<u>Drawing Name/Title</u>	<u>Drawing (Original) Sheet Size</u>
P-3503-8	Dublin Avenue – Sta 1+500 to Sta 1+625 – Roadworks - Reconstruction	A1 (594x841)
P-3503-9	Dublin Avenue – Sta 1+625 to Sta 1+750 – Roadworks - Reconstruction	A1 (594x841)
P-3503-10	St. James Street – Sta 1+999.290 to Sta 2+707.856 - Horizontal Geometry	A1 (594x841)
P-3503-11	St. James Street – Sta 1+980 to Sta 2+120 - Roadworks	A1 (594x841)
P-3503-12	St. James Street – Sta 2+120 to Sta 2+245 - Roadworks	A1 (594x841)
P-3503-13	St. James Street – Sta 2+245 to Sta 2+370 - Roadworks	A1 (594x841)
P-3503-14	St. James Street – Sta 2+370 to Sta 2+495 - Roadworks	A1 (594x841)
P-3503-15	St. James Street – Sta 2+495 to Sta 2+620 - Roadworks	A1 (594x841)
P-3503-16	St. James Street – Sta 2+620 to Sta 2+745 - Roadworks	A1 (594x841)
P-3503-17	St. James Street & Dublin Avenue – St. James Street & Saskatchewan Avenue – Intersection Details	A1 (594x841)
P-3503-18	Miscellaneous Sections & Details	A1 (594x841)
P-3503-19	Miscellaneous Sections & Details	A1 (594x841)
P-3503-20	Dublin Avenue – St. James Street to Sta 1+370 - Municipal Utilities	
P-3503-21	Dublin Avenue – Sta 1+370 to Sta 1+650 - Municipal Utilities	A1 (594x841)
P-3503-22	Dublin Avenue – Sta 1+650 to Notre Dame Avenue - Municipal Utilities	A1 (594x841)
P-3503-23	St. James Street – Saskatchewan Ave to Sta 2+310 – Municipal Utilities	A1 (594x841)
P-3503-24	St. James Street – Sta 2+310 to Dublin Ave - Municipal Utilities	A1 (594x841)
P-3503-25	Dublin Avenue – Construction Staging – Stage 1 and Stage 2	A1 (594x841)
P-3503-26	Dublin Avenue – Staging and Turn Restrictions	A1 (594x841)
P-3503-27	St. James Street – Sta 2+800 to Sta 2+960 – Road Mill and Fill	A1 (594x841)
P-3503-28	St. James Street – Sta 2+960 to Sta 3+130 – Road Mill and Fill	A1 (594x841)
P-3503-29	Dublin Avenue – Concrete Pavement Joint Layout	A1 (594x841)
P-3503-30	St James Street – Saskatchewan Ave to Sta 2+550 - Sidewalk Pavement Joint Layout	A1 (594x841)
P-3503-31	James Street – Sta 2+550 to Dublin Avenue - Sidewalk Pavement Joint Layout	A1 (594x841)

E2. REPORTS

- E2.1 Further to C3.1, the geotechnical reports are provided to aid the Contractor's evaluation of the pavement structure and/or existing soil conditions and other site items. The geotechnical report is contained in Appendix 'A'.
- E2.2 Further to C3.1, the Remediation Plan, for excavated site soil remediation, is provided in Appendix 'B'.
- E2.3 Further to C3.1, the environmental site assessment report is available for viewing at the offices of Stantec Consulting Ltd. Bidders may contact the Contract Administrator identified in D4.1. The report may not be copied or removed from Stantec's office.
- E2.4 Further to C3.1, the hydrologic and hydraulic assessment report is available for viewing at the offices of Stantec Consulting Ltd. Bidders may contact the Contract Administrator identified in D4.1. The report may not be copied or removed from Stantec's office.

E3. ENVIRONMENTAL PROTECTION PLAN

- E3.1 The Contractor will plan and implement the Work of this Contract strictly in accordance with the requirements of this Environmental Protection Plan as herein specified.

- E3.2 The Contractor shall submit an Environmental Protection Plan which shall outline all environmental protection works to be utilized to complete the Works. This plan shall be submitted to the Contract Administrator at least seven (7) days prior to the commencement of any on Site work. This plan is to include such items as the location of stock piles for materials, refuelling of machinery and all items required by this Specification and the Regulatory Agencies.
- E3.3 The Contractor is advised that at a minimum the following Acts, Regulations and By-laws apply to the Work and are available for viewing online at the applicable websites (www.canlii.ca and/or <http://www.winnipeg.ca/CLKDMIS/>) or at the office of the Contract Administrator.
- (a) Federal
- (i) Canadian Environmental Protection Act;
 - (ii) Fisheries Act, 1985 c. F-14;
 - (iii) Transportation of Dangerous Goods Act and Regulations, c. 34;
 - (iv) Migratory Birds Convention Act and Regulations, c. 22;
 - (v) Species at Risk Act, c. 29;
 - (vi) Transportation Association of Canada's Transportation Association of Canada *National Guide to Erosion and Sediment Control on Roadway Projects*, 2005;
 - (vii) Applicable Fisheries and Oceans Canada Operational Statements for Manitoba for temporary stream crossings;
 - (viii) The Department of Fisheries and Oceans *Freshwater Intake End-of-Pipe Fish Screen Guidelines*, DFO 1995;
 - (ix) Fisheries and Oceans Policy for the Management of Fish Habitat 1986;
 - (x) And any other applicable Acts, Regulations and By-laws;
- (b) Provincial
- (i) The Contaminated Sites Remediation Act, c. 40
 - (ii) The Dangerous Goods Handling and Transportation Act, D12;
 - (iii) The Endangered Species and Ecosystems Act, c. 39;
 - (iv) The Fire Prevention and Emergency Response Act, c.F80;
 - (v) The Fisheries Act, c. F90;
 - (vi) The Noxious Weeds Act, c. N110;
 - (vii) The Pesticides Regulation, M.R. 94/88R
 - (viii) The Public Health Act, c. P210;
 - (ix) Waste Management Facilities Regulation, M.R. 37/2016;
 - (x) The Waste reduction and Prevention Act, c. 60;
 - (xi) The Water Protection Act, c. 26;
 - (xii) The Water Resources Administration Act, c. W70;
 - (xiii) The Wildlife Act, c. W130;
 - (xiv) Workplace Safety and Health Act, c. W210;
 - (xv) The Manitoba Stream Crossing Guidelines for the *Protection of Fish and Fish Habitat, Manitoba Natural Resources*, 1996.
 - (xvi) Current applicable associated regulations; and
 - (xvii) 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 Traffic By-law No. 1573/77 and all amendments up to and including 57/2018;
 - (iii) The 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 *Tree Removal and Tree Planting Guidelines*;
- (v) The City of Winnipeg Sewer By-Law N0. 92/2010;
- (vi) The City of Winnipeg Waterway By-Law N0. 5888/92;
- (vii) Our Winnipeg Plan By-law No. 67/2010; and
- (viii) Any other applicable Acts, Regulations and By-laws.

E3.4 Work shall be undertaken in compliance with mitigation measures outlined in DFO's response letter, once received. A copy of the material must be on Site at all times..

E3.5 A Manitoba Infrastructure Provincial Waterways Authorization is currently underway for this Project. The authorization shall be provided to the Contractor when it is formally issued. The Contractor shall comply with the requirements outlined in the Authorization, plans and specifications. A copy of the material must be on Site at all times.

E3.6 City of Winnipeg Waterways Permit is currently underway for this Project. The permit shall be provided to the Contractor when it is formally issued. The Contractor shall comply with the requirements outlined in the permit. A copy of the material must be on Site at all times.

E3.7 The Contractor is advised that the following environmental protection measures apply to the Work.

(a) Materials Handling and Storage

- (i) Storage of construction materials and equipment shall be confined to the defined laydown areas as shown on the Drawings or at a location of at least 30 metres away from the waterbody as approved by the Contract Administrator.
- (ii) Construction materials shall not be deposited or stored on the watercourse bank or near watercourses unless written acceptance from the Contract Administrator is received in advance.
- (iii) Construction materials and debris shall be tied down or secured if severe weather and high wind velocities or highwater conditions are forecasted. Work shall be suspended during extreme high wind or highwater 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 Sustainable Development 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* and the Storage and Handling of Petroleum Products and Allied 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 dike and located a minimum distance of 100 metres from the highwater mark of Omand's Creek. Dikes 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 dikes shall be constructed of clay or similar impervious material. If this type of material is not available, the dike 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 barrier such as a high fence and gate to prevent vandalism.
- (v) The Contractor shall ensure that all fuel storage containers are inspected daily

- for leaks and spillage.
- (vi) Products transferred from the fuel storage area(s) to specific Work Sites shall not exceed the daily usage requirement.
 - (vii) When servicing requires the drainage or pumping of fuels, lubricating oils or other fluids from equipment, a groundsheet of suitable material (such as HDPE) and size shall be spread on the ground to catch the fluid in the event of a leak or spill.
 - (viii) Washing, refuelling, and servicing of machinery and storage of fuel and other materials for the machinery shall take place at least 100 metres from a watercourse to prevent deleterious substances from entering the water.
 - (ix) The area around storage sites and fuel lines shall be distinctly marked and kept clear of snow and debris to allow for routine inspection and leak detection.
 - (x) The deposit of deleterious substances into water frequented by fish is prohibited under the *Fisheries Act*, 1985. The Contractor shall take appropriate precautions to ensure that potentially deleterious substances (such as fuel, hydraulic fluids, oil, sediment, etc.) do not enter any water body.
 - (xi) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on Site. The Contractor shall ensure that additional material can be made available on short notice.
 - (xii) Machinery shall arrive on Site in a clean condition and shall be maintained to be free to fluid leaks.
 - (xiii) 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 Waste Management Facilities Regulation 37/2016. Exceptions are liquid industrial and hazardous wastes which require special disposal methods at an approved facility capable of accepting such wastes.
 - (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.
 - (i) The Contractor shall be familiar with *The Dangerous Goods Handling and Transportation Act* and Regulations.
 - (ii) 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.
 - (iii) Different waste streams shall not be mixed.
 - (iv) Disposal of dangerous goods/hazardous wastes shall be at approved hazardous waste facilities.
 - (v) Liquid hydrocarbons shall not be stored or disposed of in earthen pits on Site.
 - (vi) 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.
 - (vii) Used oil filters shall be drained, placed in suitable storage containers, and buried or incinerated at approved hazardous waste treatment and disposal facilities.
 - (viii) Dangerous goods/hazardous waste storage areas shall be located at least 100 metres away from the edge of the water line for normal summer water levels and be diked.
 - (ix) Dangerous goods/hazardous waste storage areas shall not be located so as to block natural drainage.
 - (x) Runoff from dangerous goods/hazardous waste storage areas shall not be allowed to cause siltation of a watercourse.
 - (xi) Dangerous goods/hazardous waste storage areas shall be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.
- (e) Emergency Response
 - (i) The Contractor shall ensure that due care and caution is taken to prevent spills.
 - (ii) The Contractor shall report all major spills of petroleum products or other hazardous substances with significant impact on the environment and threat to human health and safety (as defined in Table 1 below) to Manitoba Sustainable Development, immediately after occurrence of the environmental accident, by calling the 24-hour emergency phone number (204) 944-4888. The Contract Administrator shall also be notified.
 - (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;

- Type of spill or leak, name of product(s) if known;
 - Indicate injuries, if any;
 - Request assistance as required by magnitude of accident (Manitoba Sustainable Development 24-hour Spill Response Line (204) 944-4888, 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;
 - Dike spill material with dry, inert absorbent material or dry clay soil or sand;
 - Prevent spill material from entering waterways and utilities by diking;
 - Prevent spill material from entering manholes and other openings by covering with rubber spill mats or diking; 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 Sustainable Development 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 Sustainable Development.
- (viii) City Emergency response, 9-1-1, shall be used if other means are not available.

(f)

TABLE 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	Acute Toxic	1 kg or 1 L
PG** II & 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
9.1	PCB Mixtures	500 g
9.2	Aquatic Toxic	1 kg or 1 L
9.3	Wastes (chronic toxic)	5 kg or 5 L
* Container capacity (refers to container water capacity)		
** PG = Packing Group(s)		

(a) Noise and Vibration

- (i) Noise-generating activities shall be limited to the hours indicated in the City of Winnipeg Neighbourhood Liveability By-law unless otherwise accepted in advance by the Contract Administrator. The activities will generally be restricted to 7:00 a.m. to 9:00 p.m. weekdays with written permission of the Contract Administrator and the City of Winnipeg for any afterhours or weekend work required for special cases. No extended or alternative working hours/dates will be permitted for pile driving activities.
- (ii) The Contractor shall be responsible for scheduling Work to avoid potential noise problems and/or employ noise reduction measures to reduce noise to acceptable limits. The Contractor shall also demonstrate to the Contract Administrator that Works to be performed during the night-time period, on Sundays, and Holidays 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.

(b) Dust and Emissions

- (i) Construction vehicles and machinery shall be kept in good working order by the Contractor through inspection and maintenance.
- (ii) 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.
- (iii) The Contractor shall minimize construction equipment idling times and turn off machinery, when feasible.
- (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.

(c) 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) Sediment control will be applied to all in-water works to prevent the release or re-suspension of sediments to the watercourse. A turbidity curtain will be used to contain sediments from coffer dam construction/removal, excavation and riprap placement, if warranted. The turbidity curtain should isolate as small an area as possible to complete the works and should be completely removed once turbidity within the isolated area has returned to background levels.
 - (iii) 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.
 - (iv) 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.
 - (v) 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.
 - (vi) 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.
 - (vii) 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.
 - (viii) 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.
 - (ix) 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.
 - (x) Construction activities will be avoided during periods of high winds to prevent erosion and the creation of dust.
- (d) 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 diked to redirect surface runoff around the area prior to spring runoff.
 - (iii) Construction activities on erodible slopes shall be avoided during spring runoff and heavy rain fall events.
 - (iv) Soil and fill shall not be stockpiled on immediate watercourse bank areas. Stockpile locations shall be presented for review and approval to the Contract Administrator.
- (e) Fish
- (i) The Contractor will adhere to all of the protection measures below and the measures included in Appendix 'C' and DFO guidance (DFO Self-assessment and Request for Review) to avoid causing harm to fish and fish habitat (also found at the following website: <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html>) related to timing, site selection, containment and spill management, erosion and sediment control, shoreline revegetation and stabilization, fish protection, and operation of machinery.
 - (ii) Due to the presence of spring and summer spawning fish species no instream works will occur between April 1 and June 30 of any given year.
 - (iii) A turbidity curtain will be installed downstream of the site to mitigate sediment transportation and turbidity monitoring will be conducted during in-channel excavation and alteration.
 - (iv) Bridge removal, instream bridge construction works, and specified underground works occurring within the channel or riverbank shall be constructed during periods of low flow. Flowing water should be diverted around the construction area using a cofferdam and bypass pump. Water will be diverted in a manner that avoids sediment generation to downstream areas and does not alter the volume of flow in the watercourse. Use cofferdams made of non-earthen material such as

aquadams, sand bags, sheet pile or clean granular material wrapped in poly-plastic or other suitable isolation materials. Ensure any pump inlets are appropriately screened following the DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines. Ensure all isolation materials are completely removed from the watercourse once construction is complete.

- (v) Any fish trapped within the isolated area will be captured and returned to the watercourse unharmed. The Contractor is responsible for obtaining a Live Fish Handling Permit from the Provincial Fisheries Branch prior to salvaging fish and for fish salvage and reporting. Fish includes fin fish, crayfish, and mussels (clams).
 - (vi) A buffer of vegetation will be maintained when working along waterways, where possible.
 - (vii) The duration of Work and amount of disturbance to the bed and banks of the waterbody will be minimized.
 - (viii) If mobile equipment is required to enter the watercourse the Contractor will design and implement an isolation/ contamination plan to isolate temporary in-water work zones to maintain clean flow downstream/around the work zone at all times.
 - (ix) All stockpiled material should be stored above the highwater mark.
 - (x) Limit access to the waterbody and banks beyond the work area to protect riparian vegetation and minimize bank erosion.
 - (xi) Riparian vegetation removal will be minimized where necessary, using proper techniques and protecting remaining vegetation.
 - (xii) The Contractor will design and implement a vegetation rehabilitation plan, including woody species for disturbed areas as necessary.
 - (xiii) The Contractor will reinstate, stabilize and rehabilitate banks, exposed soils and disturbed areas as necessary.
 - (xiv) Manage excess material, store, handle and dispose of all material generated during site preparation, construction and clean-up in a manner that prevents their entry into the watercourse.
 - (xv) The Contractor will develop a spills management plan.
 - (xvi) Maintenance of vehicles and machinery should be conducted in a dedicated area at least 100 m from the creek. Any equipment entering the waterbody or operating on the bank shall be free of fluid leaks and externally cleaned/degreased.
- (f) Wildlife
- (i) No clearing of trees, shrubs, or vegetation is permitted generally between April 19 and August 28 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) If a nest is encountered, work will cease in the immediate area and the Contract Administrator will be contacted for further direction.
 - (iv) 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.
- (g) Vegetation
- (i) Vegetation shall not be disturbed without written permission from the Contract Administrator. 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.
 - (ii) The Contractor will limit the removal of trees and snags (standing dead trees), surface disturbance, and vegetation clearing.
 - (iii) Herbicides and pesticides shall not be used adjacent to any surface watercourses.
 - (iv) Trees or shrubs shall not be felled into watercourses.
 - (v) 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.

- (vi) Tree removal associated with bridge replacement and road works will be conducted in consideration of the City of Winnipeg Tree Removal Guidelines. The Contractor will liaise with the City of Winnipeg Forestry Branch with respect to tree removal.
- (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.
- (ix) Ensure minimum disturbance of existing vegetation cover adjacent to work area.
- (h) Heritage Resources
 - (i) If heritage material is located during the construction and soil removal process, all work will cease and the Contractor will immediately contact the Contract Administrator. The Historic Resources Branch, Manitoba Sport, Culture and Heritage will be contacted by the Contract Administrator to determine the nature and extent of the archaeological material and to arrange for its recovery. The archaeological remains will be recovered by salvage excavation upon authorization by the Contract Administrator, having consulted the Historic Resources Branch, Manitoba Sport, Culture and Heritage.
 - (ii) The Contractor will be prepared to continue his work elsewhere on the project while the Archaeologist investigates the find and determines its heritage value.
 - (iii) The Contractor is advised that he may be denied access to such areas of the project until such time as a thorough archaeological investigation is conducted or the find is deemed to have no heritage value.
 - (iv) Construction and excavation work will not resume until the Contract Administrator, having consulted with the Historic Resources Branch, Manitoba Sport, Culture and Heritage authorizes a resumption of work.
 - (v) If human remains are uncovered during the construction and soil removal process, all work will cease and the Heritage Resource Branch, Manitoba Sport, Culture and Heritage will be contacted by the Contract Administrator. The Historic Resources Branch will contact the RCMP.
 - (vi) If the human remains are not considered forensic, (i.e., no foul play suspected), they will be removed by the Historic Resources Branch, Manitoba Sport, Culture and Heritage and turned over to the Province.
 - (vii) If the human remains are considered forensic, the RCMP will be responsible for their removal.
 - (viii) Additional information may be obtained by contacting: Archaeological Assessment Services, Historic Resources Branch, Phone: (204) 945-2118, email: hrb@gov.mb.ca.
- (i) Landscaping
 - (i) Construction waste (excluding common construction gravel, sand etc.) shall be removed to a minimum depth of 600 mm below final grade in all areas that are to be backfilled with suitable material and revegetated in accordance with City of Winnipeg Standard Construction Specifications.
 - (ii) The Contractor shall adhere to the landscaping plan for maintenance of initial stage and development stages of the plant community
- (j) 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) Large equipment will be equipped with flashing beacons and/or audible "back-up" warning device that is audible when the transmission is in reverse.
 - (iii) The Contractor shall adhere to the Standard Provisions of the Standard Construction Specifications, and of the Manual of Temporary Traffic Control in Work Areas on City Streets of The City of Winnipeg, Works & Operations Division.
 - (iv) 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.
- (v) 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.

(k) Access

- (i) The Contractor shall maintain access to the site to the satisfaction of the Contract Administrator.
- (ii) The Contractor shall maintain access to affected residential properties.
- (iii) The Contractor shall provide or maintain general and off-street access to any affected business during construction.

E3.8 Measurement and Payment

E3.8.1 Environmental Protection Plan will be considered incidental to E5, "Mobilization and Demobilization". No measurement and payment will be made within this section.

E4. WORKING IN PROXIMITY TO MANITOBA HYDRO OVERHEAD LINES

E4.1 Description

E4.2 Any work within 3m of a Manitoba Hydro overhead line requires Manitoba Hydro Safety watch, unless altered by Manitoba Hydro in writing.

E4.3 The Contractor shall organize all safety watches that may be required.

E4.4 Measurement and Payment

E4.4.1 Manitoba Hydro Safety watch will be considered incidental to the Work. No measurement and payment will be made within this section.

E5. MOBILIZATION AND DEMOBILIZATION

E5.1 Description

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

E5.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all works hereinafter specified.

E5.2 Scope of Work

- (a) The Work under this Specification shall include but not be limited to:
 - (i) Mobilizing and demobilizing on-site Work facilities;
 - (ii) Supplying, setting up, laying out, and removing site office facilities as detailed in E6, "Office Facilities".
 - (iii) Supplying and installing secure chain link fencing around the site;
 - (iv) Maintaining and removing any access roadways;
 - (v) Supplying and installing chain link fencing around the site;
 - (vi) Restoring all Site facilities

E5.3 Materials

E5.3.1 The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials to be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E5.3.2 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.

E5.3.3 Work Site Construction Fencing

- (a) The bridge construction Site and the staging area shall be protected from the public by a chain link fence. Lockable gates, with locks and keys, shall be provided at entrances to the Site. The area to be protected from the public is indicated on the Drawings.
- (b) The Work Site construction fencing shall not allow the public access to the site but shall allow access to Emergency Services via gates, removal of panels, removal of the fence at this location, or some other means that will not inhibit the access of the emergency personnel.
- (c) The Contractor shall be responsible for maintenance of the Work Site construction fencing.

E5.3.4 The Contractor's Site supervisor is required to carry, at all times, a cellular telephone, with voice mail.

E5.3.5 This section also includes travel and accommodation, set-up and demobilization of Site offices, storage conveniences and other temporary facilities, construction plant, and other items not required to form part of the permanent works and not covered by other prices.

E5.4 Equipment

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

E5.5 Construction Methods

E5.5.1 Layout of On-Site Work Facilities

- (a) The Contractor shall mobilize all on-site Work and other temporary facilities.
- (b) Possible locations for the Contractor's staging are shown on the Drawings. The Contractor shall coordinate with relevant parties to make arrangements for use of these areas.
- (c) Upon completion of construction activities, the Contractor shall remove all on-site Work and other temporary facilities.

E5.5.2 Secure Site Fencing

- (a) A minimum 1.8 m high chain-link secure fence around the site lay-down and Work site areas shall be installed prior to commencement of site activities.
- (b) The fencing shall remain secure and in place during all construction facilities.
- (c) The fencing shall be removed upon demobilization of on-site Work facilities.
- (d) Fencing shall be complete with lockable gates

E5.5.3 Access Roadway

- (a) The Contractor shall maintain any access roadway they install.
- (b) The access road shall be maintained on a regular basis to provide continual unrestricted site access, to the satisfaction of the Contract Administrator.
- (c) Upon completion of the Work, the area shall be restored to its original condition. The Limits of Work Area will be reviewed at the Pre-Construction Meeting. If the Contractor requests a Change in the Limits of the Work Area, they shall do so formally in writing at least ten (10) business days prior to mobilization. The Contract Administrator will respond within five (5) business days with a response; the Contract Administrator has the right to dismiss the request.

E5.5.4 Restoration of Existing Facilities

- (a) Upon completion of the Work and demobilization, the Contractor shall restore existing facilities.
- (b) Restoration of areas disturbed by the Contractor's laydown areas and access to the works shall be performed as directed by the Contract Administrator. Restoration of

disturbed areas outside of those areas identified in the Drawings will be considered incidental to Mobilization and Demobilization and no measurement or payment will be made for the restoration work.

E5.6 Quality Control

E5.6.1 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.

E5.6.2 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 his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E5.6.3 The intent of the Limits of the Work Area is to preserve existing trees and vegetation by minimizing removals.

E5.7 Measurement and Payment

E5.7.1 Mobilization and demobilization will not be measured and will be paid for at the Contract Lump Sum Price for "Mobilization and Demobilization", 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.

Mobilization and demobilization will be paid for at a percentage of the Contract Lump Sum Price, measured as specified herein. These percentages shall be as follows:

- (a) 30% when the Contract Administrator is satisfied that construction has commenced.
- (b) 60% when Substantial Performance has been met, or sooner as determined by the Contract Administrator.
- (c) 10% upon completion of the project.

E6. OFFICE FACILITIES

E6.1 Description

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

E6.2 The Contractor shall supply office facilities meeting the following requirements:

- (a) The field office shall be for the exclusive use of the Contract Administrator;
- (b) The office shall be conveniently located within the site lay-down area near the Work site;
- (c) The building, having a minimum floor area of 30 square metres, a ceiling height of 2.4 m and two windows (complete with security bars) to provide for cross ventilation, with door entrance(s) with suitable lock(s);

- (d) The office shall be suitable for all weather use. It shall be equipped with an electric heating and air conditioning systems, so that the interior room temperature can be maintained between 18 to 25°C at any outside ambient temperature;
 - (e) The office shall be adequately lighted with fluorescent fixtures and have a minimum of three – 120 volt AC electrical receptacles;
 - (f) The office shall be furnished with two office desks and chairs, one drafting table, one table 3m x 1.2m, one stool, one legal size filing cabinet, two bookcases, and a minimum of 15 chairs;
 - (g) WiFi internet shall be supplied and serviced by the Contractor;
 - (h) One refrigerator, approximately 5 ft 3 inch and one mid-size microwave shall be supplied by the Contractor;
 - (i) A bottled water supply, with associated consumables, shall be supplied fresh regularly by the Contractor;
 - (j) A portable flush or chemical-type toilet, lavatory, and mirror shall be located near the site office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and personnel from the City;
 - (k) The site office building and the portable toilet shall be cleaned on a weekly basis. The Contract Administrator may request additional cleaning when he deems it necessary;
 - (l) A minimum of three parking stalls shall be made available for use by the Contract Administrator immediately adjacent to the site office; and
 - (m) All site office facilities and furnishings shall be approved by the Contract Administrator;
- E6.3 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.
- E6.4 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance..
- E6.5 On a one time basis, where directed by the Contract Administrator, the Contractor shall relocate the office facilities to a location more convenient for the remaining Work.
- E6.6 Measurement and Payment
- E6.6.1 The supply of site office facilities will considered incidental to E5, "Mobilization and Demobilization." No measurement and payment will be made within this section.

E7. SHOP DRAWINGS

- E7.1 Description
- (a) This Specification provides instructions for the preparation and submission of Shop Drawings. The term 'Shop Drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data including Site erection drawings which are to be provided by the Contractor to illustrate details of the portion of the Work.
 - (b) Further to C6.9, the Contractor shall arrange for the preparation of Shop Drawings required by the Contract, or as reasonably required by the Contract Administrator.
 - (c) The Contractor shall submit to the Contract Administrator for review, all specified Shop Drawings. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be shown on all submissions for the Contract Administrators review.
- E7.2 Shop Drawings
- (a) Original drawings shall be prepared by the Contractor, to illustrate the appropriate portion of Work including fabrication, layout, setting, or erection details as specified in the appropriate sections.

- (b) Shop Drawings shall bear the seal of a Professional Engineer licenced to practice in the Province of Manitoba.
- (c) Shop Drawings shall be prepared by the Contractor.

E7.3 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 requirement of Work and Contract Documents. Individual Shop Drawings will not be reviewed until all related drawings are available.
- (d) Promptly submit Shop Drawings in an orderly sequence to prevent delay in the Work or the Work of other Contractors.
- (e) Notify the Contract Administrator, in writing at the time of submission, of deviations from requirements of Contract Documents.
- (f) Responsibility of 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 submissions 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 copies, distribute 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.

E7.4 Submission Requirements

- (a) Allow for a ten (10) Business Day period for review by the Contract Administrator of each individual and re-submission, unless noted in the Contract Documents.
- (b) Accompany submissions with transmittal letter containing:
 - (i) Date;
 - (ii) Project title and Tender Number;
 - (iii) Contractor's name and address;
 - (iv) Number of each Shop Drawing, product data and sample submitted;
 - (v) Specification Section, Title, Number, and Clause;
 - (vi) Drawing Number and Detail/Section Number; and
 - (vii) Other pertinent data.
- (c) Submission shall include:
 - (i) Date revision dates; and
 - (ii) Project title and tender number.
- (d) Name of:
 - (i) Contractor;
 - (ii) Subcontractor;

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

E7.5 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, resubmissions, and the review of the Shop Drawings.

E8. CREEK FLOW MAINTENANCE

E8.1 Description

- (a) This Specification shall cover all operations relating to maintaining flows in Omand's Creek through Dublin Avenue for the duration of the construction Works. As is required to complete the Works construct a cofferdam to facilitate removal of the existing bridge, and to accommodate riprap works and construction of the replacement bridge.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.
- (c) Contractor shall refer to Appendix E "Hydraulic Report" for hydraulic information regarding Omand's Creek. While the Critical Stage date for in water works, noted in D20.1 and E3 "Environmental Protection Plan" requires that all in-water work be completed as noted therein, the Contractor is reminded that spring runoff in the creek may be present prior to these dates.

E8.2 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 of Omand's Creek; and
 - (vi) Bypass pumping of Omads Creek from upstream to downstream of the Site.
 - (vii) Complying with all requirements outlined in E3, "Environmental Protection Plan".

E8.3 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 detailed plan and schedule for the construction of cofferdams, turbidity barrier and other items as required, clearly illustrating the method and sequence by which he proposes to perform the Work, including a description of the measures that will be implemented to meet the environmental requirements outlined in E3, "Environmental Protection Plan". The submission shall also include detailed drawings and design details of the proposed cofferdam and other requirements for maintaining creek flow.
- (b) 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. 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. Cofferdams are to be designed by the Contractor.

E8.4 Materials

E8.4.1 General

- (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 handles in a careful and workman like manner, to the satisfaction of the Contract Administrator.

E8.4.2 Cofferdams

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

E8.4.3 Floating Turbidity Barrier (Chained)

- (a) The floating turbidity barrier shall be a Layfield Construction Product – Type 1 DOT or approved equal as accepted by the Contract Administrator, in accordance with B7 "Substitutes".

E8.5 Construction Methods

E8.5.1 In general, the Work shall include, but not necessarily be limited to:

- (a) 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
- (b) Maintenance of creek flows for the duration of construction.
- (c) Removal of materials and/or equipment required to maintain flows, at the end of their use.
- (d) 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 a cofferdam and floating turbidity barrier through the creek to confine the suspended matter.

E8.5.2 Silt Fence

- (a) A silt fence, as approved by the Contract Administrator, shall be installed across Omand's Creek and maintained at the downstream extent of the work area. Additional silt fences shall be installed and maintained parallel to the creek as required during melting conditions to prevent debris from entering the waterway.

E8.5.3 Bypass Pumping Operations

- (a) Structural removals, riprap works, and new bridge construction are anticipated to take place during freezing conditions, when flow within Omand's Creek is minimal. As such, the Contractor shall install a cofferdam at the upstream limit of the work area and install and maintain temporary by-pass diversion pumps to handle any flows.
- (b) The Contractor shall be required to supply and operate a minimum of one (1) 100 mm diameter flood pump, in the event that creek levels rise prior to or on March 1, 2020
- (c) To fairly mitigate anticipated costs
 - (i) If the flows encountered in the creek during the period from commencement of bridge construction up to and including March 1, 2020 exceed the capacity of the required pump, the Contractor shall be reimbursed for expenses as specified in C7.4(d)
 - (ii) If the flows encountered in the creek after March 1, 2020 exceed the capacity of the required pump, the contractor bears all risk and responsibility for any and all schedule and cost impacts.

E8.5.4 Cofferdam Construction

- (a) The construction of cofferdams may be required in order to dewater Omand's Creek to remove the existing bridge, excavate channel material for the new bridge, and complete construction of the new bridge.
- (b) The proposed cofferdam locations if required shall be proposed by the Contractor. Cofferdams shall be provided at the upstream and downstream limits of the site to allow structural removals of the existing bridge and perform all required channel works under dry conditions. Cofferdams shall be designed and constructed with granular materials and as watertight as is necessary for proper performance of the Work. The cofferdams shall be designed and constructed by the Contractor to meet the requirements of the Contractor's Creek Flow Maintenance Plan.
- (c) Efforts shall be made to minimize the period of time for which Omand's Creek is dewatered. As part of the submittals noted in E7.3 the Contractor shall provide an anticipated timeline for which the channel is dewatered.

E8.5.5 Complying with Environmental Protection Requirements

- (a) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment release into Omand's Creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of E3, "Environmental Protection Plan". Specific sediment and erosion control measures are outlined in E21, "Silt Fence Barrier" and E32, "Erosion Control Blanket".
- (b) The Contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales, and other measures as required in the event that there is runoff from the site.
- (c) 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.
- (d) Disturbed areas shall be restored. Erosion control blankets, as approved by the Contract Administrator, shall be used to control erosion of areas where vegetation has been damaged, up until permanent vegetation has been re-established

E8.5.6 The Contractor shall complete all bridge works, not included in the Critical Stage date of March 1, 2020 for in water works, to accommodate the 2% water elevation as noted in the Hydraulic Report in Appendix E.

E8.6 Measurement and Payment

E8.6.1 Creek Flow Maintenance

- (a) 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%

E8.6.2 The supply, placement, maintenance and removal of turbidity barrier shall be measured on a length basis and will be paid for at the Contract Unit Price per lineal metre for "Floating Turbidity Barrier", 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. The length to be paid for shall be the total number of metres supplied and placed in accordance with this Specification, accepted and measured by the Contract Administrator. Payment of turbidity barrier shall be in accordance with the following payment Schedule:

- (a) Seventy percent (70%) of the Contract Unit Price per lineal metre for "Floating Turbidity Barrier" shall be paid following supply and installation.
- (b) Thirty percent (30%) of the Contract Unit Price per lineal metre for "Floating Turbidity Barrier" shall be paid following final removal.

E9. CREEK BANK EXCAVATION

E9.1 Description

- (a) This Specification shall cover the requirements for surface excavation near Omand's Creek including removal of topsoil and vegetation, and shall amend the 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 herein specified.

E9.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
 - (i) CW 2030 – Excavation Bedding and Backfilling;
 - (ii) CW 2130 – Gravity Sewers;
 - (iii) CW 2160 – Concrete Underground Structures and Works;
 - (iv) CW 3130 – Supply and Installation of Geotextile Fabrics;
 - (v) CW 3610 – Installation of Culverts; and
 - (vi) CW 3615 – Riprap.

E9.3 Scope of Work

- (a) The Work under this Specification shall involve;
 - (i) Excavating all materials required to construct the Works;
 - (ii) The design, fabrication and erection of all stay-in-place 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 to include;
 - a. Removal of all grass, weeds and other organics,
 - b. Removal of marked trees,
 - c. Removal of roots or other debris that are partially exposed,
 - d. Removal of boulders or large rocks that are partially exposed,
 - (iv) Excavating topsoil where excavation is required;

- (v) Off-site disposing of all excavations, as required; and
- (vi) Complying with the requirements outlines in E3, "Environmental Protection Plan".

E9.4 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 schedule Work on the Site, the proposed material(s) to undertake the Work.
- (c) Shop drawings for the temporary shoring in accordance with Specification E7 for information purposes, bearing the seal of a Professional Engineer registered in the Province of Manitoba.

E9.5 Materials

E9.5.1 General

- (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 workman like manner, to the satisfaction of the Contract Administrator.

E9.5.2 Testing

- (a) 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.

E9.5.3 Excavation

- (a) Excavated material shall be unclassified excavation and shall include the excavation and satisfactory disposal of all cleared and grubbed materials, surplus concrete pavement, asphalt pavement, earth, gravel, sandstone, loose detached rock, shale, rubbish, cemented gravel or hard pan, disintegrated stone, rock in ledge or mass formation wet or dry, trees, shrubs, ice or all other materials of whatever character which may be encountered.
- (b) 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) All material excavated within 30m of Omand's Creek and within the Creek or it's embankments shall be considered contaminated.

E9.6 Equipment

E9.6.1 General

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

E9.7 Construction Methods

E9.7.1 Excavations

E9.7.2 Alterations to Site

- (a) The Contractor shall excavate only material that is necessary for the expeditious construction of the Works or as set out by the Contract Administrator in the field. If the

Contract Administrator permits the excavation of runways, existing stock piling, or trenches within the right-of-way, the Contractor shall, on completion of the Work, backfill the runways and trenches to the elevation of the original ground existing at the time of excavation and compact the backfill material, all at his own expense and as directed by the Contract Administrator.

E9.7.3 Protection of Existing Embankment Slopes

- (a) The Contractor shall not disturb the embankment slopes outside the excavation limits and shall not dump excavated material onto the roadway embankment or the riverbank.

E9.7.4 Excess Material

- (a) 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.

E9.7.5 Excavating Creek Bank Material

- (a) 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.
- (b) Prior to completing any excavation Works the Contractor shall mark out the locations of the relocated watermain that runs along the north side of the proposed bridge. During excavation and construction activities no equipment shall park directly over the watermain. Equipment shall not drive directly over the watermain without protection. Excavations shall be limited to the required depths. The watermain shall be shut off for short durations during periods where the surface material depth is less than 2.0m. The Contractor shall remove and replace materials to maintain a 2.0m depth without delay.
- (c) 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.
- (d) In general creek bank excavation shall consist of removing material to facilitate, channel excavation to provide the new channel profile and cross-sections for installation of riprap.
- (e) 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.
- (f) 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 river 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.
- (g) 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 materials 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.

E9.7.6 Clearing and Grubbing

- (a) Comply with the requirements of E19 "Clearing and Grubbing." Some removal of bush 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.

E9.7.7 Excavating Topsoil

- (a) Some 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.

- (b) Stripping of topsoil and creek bank excavation shall not be measured or paid for directly, but shall be considered incidental to other construction work including slope stabilization, outfall installation, and riprap placement.

E9.7.8 Off-Site Disposing of Contaminated and Unsuitable Material

- (a) All excavations of contaminated material shall become the property of the Contractor and shall be removed from the Site and disposed of in accordance with the Remediation Plan. Excavated material shall not be disposed of in a manner that will obstruct the flow of Omand's Creek.
- (b) Stockpiling will not be permitted.

E9.7.9 Alterations to Site.

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

E9.7.10 Protection of Existing Embankment Slopes

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

E9.7.11 Complying with Environmental Protection Requirements

- (a) The Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into Omand's Creek from areas disturbed as a result of his work during and following construction. Sediment and erosion control measures shall comply with the requirements of E3, "Environmental Protection Plan" and E8, "Creek Flow Maintenance". Specific sediment and erosion control measures are outlined in E21, "Silt Fence Barrier" and E32, "Erosion Control Blanket".
- (b) The contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales, or other measures as required in the event that there is runoff from the site.
- (c) 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.
- (d) 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.

E9.8 Quality Control

E9.8.1 Inspection

- (a) After each excavation is complete, the Contractor shall notify the Contract administrator to inspect the excavation.

E9.8.2 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 his inspector for testing purposes as required. There will be no charge to the City for samples taken.

E9.9 Measurement and Payment

E9.9.1 Creek Bank Excavation

- (a) Creek bank excavation shall not be measured. This item or 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.

E10. PROTECTION OF EXISTING TREES

E10.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities:

- (a) All trees will have a 3m radius protective zone calculated from the circumference at the base of the trunk which will remain free of digging, trenching, grade changes, stock piling of materials and soil compaction, except as minimum to construct berm or swales throughout the duration of the Contract. Protective fencing around these areas is required.
- (b) Trees within and immediately adjacent to proposed construction and those identified to be at risk by the Contract Administrator are to be strapped with 25 x 100 x 2400 mm wood planks, or suitably protected as approved by the Contract Administrator. Do not use nails or other fasteners that penetrate the tree trunk. The width and length of strapping may be reduced to suit the tree being protected as approved by the Contract Administrator.
- (c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the excavation shall be a minimum of 1.5 times the diameter (measured in inches) where 1 inch diameter equals 1 foot measured from the outside edge of the trunk of the tree at 6 inches above grade. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation. They must be properly trimmed with sharp tools to prevent crushing or being pulled by construction equipment. No paint is required. All exposed roots must be mulched until the excavated area is filled with clean earth to avoid exposure to sunlight and desiccation.
- (d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the Work required. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.
- (e) Work on-site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.
- (f) Repair, replace and maintain tree protection materials during construction until the Project completion.
- (g) Carefully remove safety fencing and strapping material without harming the tree as soon as the construction and restoration Work is complete.

E10.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the City Forester or his designate.

E10.3 Measurement and Payment

E10.4 Protection of existing trees will be considered incidental to E5, "Mobilization and Demobilization." No measurement and payment will be made within this section.

E11. WATER OBTAINED FROM THE CITY

- E11.1 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-law.

E12. TRAFFIC AND PEDESTRIAN CONTROL MANAGEMENT DURING BRIDGE CONSTRUCTION

E12.1 Description

- (a) This Specification shall cover all operations relating to the supply, erection, and maintenance of all applicable traffic control for the completion of the Bridge Works only.

E12.2 General

- (a) The City of Winnipeg is responsible for traffic control for the full closure of Dublin Ave. and the sidewalks for Bridge Works. The City shall bear all costs associated with these Works.
- (b) The Contractor shall coordinate with the City of Winnipeg for the full closure of Dublin Ave.
- (c) The Contractor is responsible for controlling public access to the site and for safety within the site.
- (d) The Contractor is responsible for the maintenance of the traffic control throughout the Bridge Works.

E12.3 Measurement and Payment

- E12.4 Traffic and Pedestrian Control During Bridge Construction will be considered incidental to E5, "Mobilization and Demobilization." No measurement and payment will be made within this section.

E13. TRAFFIC CONTROL

- E13.1 Further to clauses 3.6, 3.7 and 3.8 of CW 1130:

- (a) Where directed by the Contract Administrator, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planing drop-offs to the satisfaction of the Contract Administrator. Payment shall be in accordance with CW3410.
- (b) In accordance with the Manual of Temporary Traffic Control on City Streets (MTTC), the Contractor ("Construction Agency" in the manual) shall be responsible for placing, maintaining and removing the appropriate temporary traffic control devices as specified by the MTTC or by the Traffic Management Branch of the City of Winnipeg Public Works Department. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by their own forces or subcontractor.

- E13.2 Notwithstanding E13.1, in accordance with the MTTC, the Contract Administrator shall make arrangements with the **Traffic Services Branch of the City of Winnipeg** to place, maintain, and remove all **regulatory signs** and traffic control devices authorized and/or required by the Traffic Management Branch in the following situations:

- (a) Parking restrictions,
- (b) Stopping restrictions,
- (c) Turn restrictions,
- (d) Diamond lane removal,
- (e) Full or directional closures on a Regional Street,
- (f) Traffic routed across a median,

- (g) Full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure.
- (h) Approved Designated Construction Zones with a temporary posted speed limit reduction. Traffic Services will be responsible for placing all of the advance signs and 'Construction Ends' (TC-4) signs. The Contractor is still responsible for all other temporary traffic control including but not limited to barricades, barrels and tall cones.

E13.3 Further to E12.2.3, the Contractor shall coordinate and supply temporary traffic control devices including barricades and poly posts to Traffic Services to complete full of directional closures on Dublin Avenue.

E13.3.1 An exception to E13.2 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.

E13.3.2 Further to E13.2, 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.

E13.3.3 Further to E13.3.2, the Contractor shall at the request of the Contract Administrator shall supplement or supply barricades and poly posts (traffic control devices) to Traffic Services Branch

E14. TRAFFIC MANAGEMENT

E14.1 Further to clause 3.7 of CW 1130:

E14.1.1 Bridge Works

- (a) Full closure of Dublin Ave. shall not occur prior to January 1, 2020.
- (b) All lanes on Dublin Ave. are to re-open upon completion of the Bridge Construction Critical Stage D20.1 (b).

E14.1.2 The Contractor shall be responsible for coordinating approach access during construction directly with Capitol Steel (address is 1355 Saskatchewan Ave.) on Dublin Avenue including;

- (a) Maintaining access for delivery of materials to their shop;
- (b) Maintaining access for delivery of goods from their shop;
- (c) Providing temporary gates as required to maintain their existing security;

E14.1.3 Road Works

- (a) Maintain a minimum of one lane of traffic in each direction on St. James Street at all times during construction. When no work is being performed on site, non-essential lane closures will not be permitted.
- (b) Maintain a minimum of one lane of traffic westbound (Stage I) on Dublin Avenue including during paving operations.
- (c) Left turns shall only be restricted as approved by the Contract Administrator. Wherever possible, additional lanes shall be provided for left turning vehicles.
- (d) Intersecting streets and private access shall be maintained at all times. Temporary complete closures shall be no longer than 10 minutes during asphalt planing/paving operations and shall be completed during off peak hours.
- (e) Flag persons may be necessary to maintain the flow of traffic during certain work operations.
- (f) Maintain pedestrian and vehicles access to properties within the planned work area.
- (g) Transit Route 28 operates during AM and PM peak hours during weekdays. This route shall be maintained in the west bound direction during road construction at all times that it operates. The eastbound route will be detoured by turning left on to St. James

northbound, and utilizing Bangor as an alternative route. The Contractor is to maintain the east bound to north bound left turns for Transit buses and a flag person will be required due to the tight turning radius as part of the intersection reconstruction. Turning restrictions will be provided for non Transit vehicles as required. No payment will be made for this flag person.

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

- (h) Pedestrian access must be maintained on one side of each street at all times. One pedestrian crossing of the street must be maintained at each of the intersections at all times.
- (i) The Contractor shall be responsible for coordinating approach access during construction directly with Capitol Steel (address is 1355 Saskatchewan Ave.) on Dublin Avenue, including;
 - (i) Maintaining access for delivery of materials to their shop;
 - (ii) Maintaining access for delivery of goods from their shop;
 - (iii) Providing temporary gates as required to maintain their existing security;
- (j) The Contractor shall refer to the traffic staging drawings provided for more traffic management details.
- (k) Ambulance/emergency vehicle access must be maintained at all times.

E15. PEDESTRIAN SAFETY

- E15.1 During the project, a temporary snow fence or equivalent delineation shall be installed where required to maintain access to pedestrian corridors, businesses and residences, and adjacent to open excavations to protect pedestrians. The Contractor shall be responsible for maintaining the snow fence or other delineation in a proper working condition. No measurement for payment shall be made for this work.

E16. SURFACE RESTORATIONS

- E16.1 Further to clause 3.3 of CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E17. INFRASTRUCTURE SIGNS

- E17.1 The Contractor shall obtain infrastructure signs from the Traffic Services Sign Shop at 421 Osborne Street. The Contractor shall mount each sign securely to a rigid backing material approved by the Contract Administrator. The Contractor shall fasten each sign to a suitable support and erect and maintain one sign at each street as directed by the Contract Administrator. When the Contract Administrator considers the Work on the street complete, the Contractor shall remove and dispose of the signs and supports. No measurement for payment will be made for performing all operations herein described and all other items incidental to the work described

E18. BRIDGE DEMOLITION

- E18.1 Description

- (a) This Specification shall cover all operations related to the demolition and removal of the existing bridge.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishings of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

E18.2 Scope of Work

- (a) The Work under this Specification shall involve the following:
 - (i) Removal of all existing components of the existing bridge;
 - (ii) Piles are to be removed completely or to a minimum of 1000mm below the existing grade. In addition the requirements of E3 , "Environmental Protection Plan" shall be strictly adhered to and shall govern;
 - (iii) All material from the demolished bridge shall be removed from Site by the Contractor in accordance with the Contractor's Environmental Protection Plan; and
 - (iv) Excavation or any other works beyond the limits shown on the Drawings to facilitate the demolition of the existing bridge.

E18.3 Materials

E18.3.1 General

- (b) The Contractor shall be responsible for design and construction works related to the demolition and removal of the existing bridges and is subject to the approval of the Contract Administrator.
- (c) The Contractor shall assume that the timber components of the bridge structure are creosote treated and shall perform all work and disposal in accordance with E3 and in accordance with any and all applicable regulatory requirements.

E18.4 Submittals

- (a) The Contractor shall prepare a demolition plan. The plan shall include the design and drawings, Sealed by an Engineer Registered in the Province of Manitoba, the sequence and methods to be used to demolish and remove the existing bridges. The demolition plan shall be in strict accordance with the Regulatory Approvals and Letters of Advice and E3 , "Environmental Protection Plan."
- (b) The demolition plan shall indicate the sequence, machinery, methods and proposed access to accomplish the demolition of the existing bridges.
- (c) The demolition plan shall be submitted a minimum of 14 days prior to the commencement of the demolition of the existing bridge.

E18.5 Measurement and Payment

- E18.5.1 Bridge demolition will not be measured and will be paid for at the Contract Lump Sum Price for "Bridge Demolition", 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.

E19. CLEARING AND GRUBBING

E19.1 References

- E19.1.1 Section E3, "Environmental Protection Plan".
- E19.1.2 U.S. Environmental Protection Agency (EPA)/Office of Water

- (a) EPA 832, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

E19.2 Definitions

- E19.2.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- E19.2.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- E19.2.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- E19.2.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
- E19.2.5 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments of specified size to not less than specified depth below existing ground surface.
- E19.3 Quality Assurance
- E19.3.1 Safety Requirements: worker protection.
- (a) Workers must wear gloves, eye protection and protective clothing when applying herbicide materials.
 - (b) Workers must not eat, drink, or smoke while applying herbicide material.
 - (c) Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.
- E19.4 Submittals
- E19.4.1 Samples:
- (a) Submit a sample of each material listed below for approval prior to delivery of materials to project site.
 - (b) Tree wound paint: one litre can with manufacturer's label.
 - (c) Herbicide: one litre can with manufacturer's label.
- E19.4.2 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- E19.4.3 Submit manufacturer's installation instructions.
- E19.5 Storage and Protection
- E19.5.1 Prevent damage to fencing, trees, natural features, bench marks, existing buildings existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
- E19.5.2 Repair damaged items to approval of Contract Administrator. Replace trees designated to remain, if damaged, as directed by Contract Administrator.
- E19.5.3 The Contractor shall not remove any trees or perform any clearing and grubbing that has not been clearly marked by the Contract Administrator. If the Contractor removes any tree, regardless of size or species, that was not approved by the Contract Administrator, the Contractor shall supply and install five (5) trees of a species and calliper equal to or greater than that which was removed. The replaced trees shall be installed at a location determined by the Contract Administrator, which may be in or near the Site.
- E19.5.4 Protect existing trees to remain on-site with snow fencing as indicated by the Contract Administrator.
- E19.5.5 Limit site disturbance including earthwork and clearing of vegetation to
- (a) 12 m beyond the building perimeter.
 - (b) 1.5m beyond road way, walkways, ditches and main utility trenches.

- (c) 5m beyond sports fields and parking.
- E19.5.6 Maintain access roads to prevent accumulation of construction related debris on roads.
- E19.6 Waste Management and Disposal
 - E19.6.1 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
 - (a) Trim limbs and tops, and saw into saleable lengths for pulpwood, for poles, for ties, and for fuel wood.
 - (b) Stockpile adjacent to site.
 - (c) City to have first right of refusal for saleable timber.
- E19.7 Materials
 - E19.7.1 Herbicide: effective for killing annual and perennial weeds, by being absorbed through roots and foliage.
 - E19.7.2 Soil Material for Fill:
 - (a) Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
 - (b) Remove and store soil material for reuse.
- E19.8 Temporary Erosion and Sedimentation Control
 - E19.8.1 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 engineering controls such as silt fence, silt traps and filter cloth placement during construction.
 - E19.8.2 Excavation and reuse of soil must not create fugitive dust. Contractor to cover or dampen soil to prevent blowing dust or debris under dry conditions. All stockpiled materials must be covered with 6mil poly at the end of each day.
 - E19.8.3 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - E19.8.4 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- E19.9 Preparation
 - E19.9.1 Inspect site and verify with Contract Administrator items designated to remain.
 - E19.9.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
 - E19.9.3 Notify Contract Administrator immediately of damage to or when unknown existing utility lines are encountered.
 - E19.9.4 Keep roads and walks free of dirt and debris.
 - E19.9.5 Supply and install protective strapping as per E10.1(b) and / or snow fencing around existing trees to remain as directed by the Contract Administrator.
- E19.10 Application
 - E19.10.1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- E19.11 Clearing

- E19.11.1 Clearing includes cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush and rubbish occurring within cleared areas.
- E19.11.2 Clear as directed by Contract Administrator, by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- E19.11.3 Cut off unsound branches on trees designated to remain as directed by Contract Administrator.
- E19.11.4 Apply herbicide in accordance with manufacturer's label to top surface of stumps designated to be removed.
- E19.12 Close Cut Clearing
- E19.12.1 Close cut clearing to ground level for gravel pathway areas as indicated
- E19.13 Underbrush Clearing
- E19.13.1 Clear underbrush from areas as indicated at ground level.
- E19.14 Grubbing
- E19.14.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas except gravel pathway areas.
- E19.14.2 Grub out stumps and roots to not less than 100 mm below ground surface.
- E19.14.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m³.
- E19.14.4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.
- E19.15 Removal and Disposal
- E19.15.1 Remove cleared and grubbed materials off site.
- E19.15.2 Dispose of cleared and grubbed materials by burning, burying or mulching.
- E19.15.3 Burning is not permitted.
- E19.15.4 Bury to approval of Contract Administrator by:
- (a) Consolidating.
 - (b) Covering with minimum 500 mm of mineral soil.
 - (c) Finishing surface.
- E19.15.5 Chip or mulch and spread cleared and grubbed vegetative material on site as directed by Contract Administrator.
- E19.16 Finished Surface
- E19.16.1 Leave ground surface in condition suitable for immediate grading operations to approval of Contract Administrator.
- E19.17 Cleaning
- E19.17.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- E19.18 Measurement and Payment
- E19.18.1 Clearing and Grubbing will be considered incidental to E9, "Creek Bank Excavation." No measurement and payment will be made within this section.

E20. STRUCTURAL EXCAVATION

E20.1 Description

- (a) This Specification shall cover all operations related to excavation for the bridge works, not include the Creek Bank works.
- (b) The work to be done by the Contractor under this Specification shall include the furnishings of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

E20.2 Submittals

E20.2.1 The design of all temporary shoring shall be completed by a Professional Engineer registered and in the Province of Manitoba. Shop drawings shall be developed, sealed and submitted to the Contract Administrator for review a minimum of five (5) days prior to the commencement of construction.

E20.3 Materials

E20.3.1 General

- (a) The Contractor shall be responsible for the excavation, stockpiling and removal of all materials as set forth in this Specification. Materials to be stockpiled shall be handled in careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (b) The Contractor shall be responsible for design, construction and removal of any temporary shoring deemed necessary by the Contractor to ensure the safety of the workers and to preserve in original conditions any existing structures or buildings that may be affected by the excavations.
- (c) The shoring design shall be sealed by a Professional Engineer licensed to practice in the Province of Manitoba.
- (d) The shoring shall be removed to a minimum of 500mm below the final grade.
- (e) The Contractor shall also be responsible for all utility locates and required permits required to complete this work.

E20.3.2 Excavation

- (a) Excavated material shall be unclassified excavation and shall include the excavation and satisfactory disposal of all cleared and grubbed materials, surplus concrete pavement, asphalt pavement, earth, gravel, sandstone, loose detached rock, shale, rubbish, cemented gravel or hard pan, disintegrated stone, rock in ledge or mass formation wet or dry, trees, shrubs, ice or all other materials of whatever character which may be encountered.
- (b) 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) All material excavated within 30m of Omand's Creek and within the Creek or it's embankments shall be considered contaminated.

E20.4 Equipment

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

E20.5 Construction Methods

- (a) Excavation: The excavation of material to complete the structural bridge works.

- (b) The limits for structural excavation works are as shown on the Drawings however these limits are approximate. The Contractor shall determine the required limits of excavation and the requirements for temporary shoring.
- (c) The Contractor shall review the Site and the Drawings to determine the limits of the excavations and proximity of existing buildings, utilities and property limits to determine if temporary retaining walls or shoring are required in order to complete the work. The Contractor shall account for slope stability at the site, limited access areas, utilities, etc. An existing Capitol Steel building located next to the bridge as noted in section B3, "Site Investigation". Other hidden conditions may present themselves during construction also could result in additional temporary shoring. All shoring shall be designed installed, maintained and paid for by the Contractor.
- (d) Prior to completing any excavation Works the Contractor shall mark out the locations of the relocated waterline that runs on the north side of the proposed bridge. During excavation activities no equipment shall park directly over the waterline. Equipment shall not drive directly over the waterline without protection. Excavations shall be limited to the required depths. The water line shall be shut off for short durations during periods where the surface material depth is less than 2.0m. The Contractor shall remove and replace materials to maintain a 2.0m depth without delay.
- (e) All excavated materials for bridge works shall be considered contaminated materials and shall be safely disposed of according to section E3, "Environmental Protection Plan".
- (f) Dewatering and or precipitation removal of the excavations as may be required for construction of the structure in the dry.

E20.5.2 Off-Site Disposing of Contaminated and Unsuitable Material

- (a) All excavations of contaminated material shall become the property of the Contractor and shall be removed from the Site and disposed of in accordance with the Remediation Plan. Excavated material shall not be disposed of in a manner that will obstruct the flow of Omand's Creek.
- (b) Stockpiling will not be permitted.

E20.6 Survey Monuments

- (a) The Contractor shall avoid damaging survey monument and shall take all necessary precautions to protect the same. The Contract Administrator at the sole expense of the Contractor will rectify any damage to the survey monuments.

E20.7 Permits and Workplace Safety and Health Requirements

- (a) Contractor shall obtain an excavation permit from Manitoba Workplace Safety and Health as may be required by the applicable regulations. A copy of the permit shall be provided to the Contract Administrator.

E20.8 Measurement and Payment

E20.8.1 Structural excavation will not be measured and will be paid for at the Contract Lump Sum Price for "Structural Excavation", 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.

E20.8.2 Temporary shoring will not be measured and will be paid for at the Contract Lump Sum Price for "Temporary Shoring", which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E21. SILT FENCE BARRIER

E21.1 Description

E21.1.1 This Specification shall cover all operations relating to the work necessary for the supply, installation and maintenance of silt fence barriers, as herein specified.

- E21.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all works as hereinafter specified.
- E21.2 Materials
- E21.2.1 The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.
- E21.2.2 The silt fence fabric shall be proposed by the Contractor and approved by the Contract Administrator.
- E21.2.3 The stakes shall be of sufficient strength to satisfy silt fence barrier performance and maintenance requirements. The stakes shall be a minimum of 1.2 metres in length with a maximum spacing of 2.5 metres between stakes.
- E21.3 Construction Methods
- E21.3.1 The locations of the reinforced silt fence barriers are not shown on the Drawings. The Contractor shall review the DFO requirements and determine the final locations of the silt fence barriers. The locations will be dependent on site conditions. The Contractor's activities and methods of construction will be monitored with direction of the Contract Administrator.
- E21.3.2 The different types of reinforced silt fence barriers are required under the following conditions:
- (a) The sandbag reinforced silt barrier (frozen ground conditions) is required to isolate all works at or near the waterway during freezing/ice conditions.
 - (b) The chained reinforced silt barrier.
- E21.3.3 Sandbag Reinforced Silt Barrier
- (a) Sandbags shall be filled with a type of sand as recommended by the sandbag supplier. When lying flat the filled sandbags shall measure not less than 250mm (width) by 450mm (length) by 180mm (height).
- E21.3.4 Chained reinforced silt barrier
- (a) Posts shall be spaced a maximum of 2.5 m apart, and shall be driven vertically into the ground to a minimum depth of 600 mm.
 - (b) A trench measuring approximately 200 mm wide by 200 mm deep shall be excavated along the entire line of stakes. The trench shall be on the side of the stakes where grading work is to be conducted.
 - (c) The geotextile from the silt fence shall extend into the trench a minimum of 300 mm. The prefabricated silt fence shall be installed without sags and have an overlap of 450 mm wherever its length is extended.
 - (d) The trench shall be backfilled and tamped to existing grade so as to hold the base of the geotextile firmly in place. The completed silt fence barrier shall have a minimum height of 600 mm above the ground surface.
- E21.4 Maintenance
- E21.4.1 All silt fences shall be inspected immediately after runoff event and at least daily during prolonged rainfall or runoff. Any required repairs shall be made immediately. The silt fence barriers shall be maintained in place, without gaps, and without undermining, so as to prevent sediment passage through or under the barrier. Silt fence barriers shall be maintained vertical without tears and without sagging and maintain a 450 mm overlap on seams.
- E21.4.2 Accumulated sediment shall be removed at the direction of the Contract Administrator in a manner that avoids escape to the downstream side of the barriers. Sediment shall be removed to the level of the grade existing at the time of barrier installation and shall conform to the following:

- (a) accumulated sediment shall be removed when it reaches a depth of one-half the height of the silt fence barrier;
- (b) accumulated sediment shall be removed as necessary to perform maintenance repairs;
- (c) accumulated sediment shall be removed immediately prior to the removal of the silt fence.

E21.5 Measurement and Payment

E21.5.1 The supply, placement, maintenance and removal of silt fence shall be measured on a length basis and will be paid for at the Contract Unit Price per lineal metre for "Supply and Install Silt Fence Barrier", 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. The length to be paid for shall be the total number of metres supplied and placed in accordance with this Specification, accepted and measured by the Contract Administrator. Payment of silt fence shall be in accordance with the following payment Schedule:

- (a) Seventy percent (70%) of the Contract Unit Price per lineal metre for "Supply and Install Silt Fence" shall be paid following supply and installation.
- (b) Thirty percent (30%) of the Contract Unit Price per lineal metre for "Supply and Install Silt Fence" shall be paid following final removal.

E22. SUPPLY AND DRIVING OF STEEL PILES

E22.1 Description

- (a) This specification shall cover all operations related to the pre-boring for piles, supplying, handling, hauling, storing, supplying and installing pile tips, aligning and driving, splicing, cutting off of piles at the required elevations for the steel bearing piles;
- (b) Steel piles, steel "H" piles, and "H" Piles shall be considered one and the same for the Drawings and this Specification.
- (c) The work to be done by the Contractor under this Specification shall include the furnishings of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

E22.2 References and Related Specifications

- (a) All reference standards and related specifications shall be current issue or latest revision as of December 1, 2011.

E22.2.2 References

- (a) CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel
- (b) CSA W59, Welded Steel Construction (Metal Arc Welding)
- (c) AASHTO/AWS D1.5M/D1.5 Bridge Welding Code
- (d) City of Winnipeg's Approved Products List

E22.3 Submittals

The Contractor shall submit the following to the Contract Administrator:

- (a) Copies of Mill Test Certificates showing chemical analysis and physical tests for piling material. Piling material without this certification will be rejected.
- (b) Details of the proposed pile driving system and manufacturer's specifications and catalogue for all mechanical hammers to be used to perform preconstruction wave equations analysis and determine adequacy of the driving system and hammer and the preliminary pile driving criteria.

- (c) Certificate of mass for gravity or drop hammers. If this certificate is not available, the gravity or drop hammers shall be weighed in the presence of the Contract Administrator. Hammers so weighed shall have the exact mass marked on them. Gravity hammers shall weigh at least 1.5 ton but in no case shall the mass of the hammer be less than the combined mass of the pile and pile cap.
- (d) Proof of certification for the welders conducting the Work (if applicable). All welders shall satisfy one of the following requirements:
 - (i) Welders qualified in accordance with the requirements of AASHTO/AWS D1.5M/D1.5,
 - (ii) Valid Canadian Welding Bureau (CWB) Welding ticket, or
 - (iii) Valid "Welder's Licence" as issued by the Mechanical and Engineering Division,
- (e) Department of Labour and Manpower, Province of Manitoba, with a minimum of 5 years of experience welding on steel structures.
- (f) Welding procedures specific to the Work.
- (g) Detailed design notes and Shop Drawings for proposed splice connections and pile tip installations that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba (if applicable).

E22.4 Materials

E22.4.1 Steel Bearing Piles

- (a) Steel bearing piles shall conform to the requirements of CAN/CSA G40.21M, Grade 350W. All piles crushed excessively or bent through negligence or carelessness in driving operations shall be replaced by the Contractor at their own expense unless, at the discretion of the Contract Administrator, the damage is so slight that the pile can be repaired properly by the Contractors own expense.

E22.4.2 Pile Tips

- (a) Pile tips shall conform to the requirements of CAN/CSA G40.21M, Grade 300W. Pile tips shall be Hard-Bite Point Model HP-77750-B.

E22.4.3 Splice Plates

- (a) Splice Plates shall conform to the requirements of CAN/CSA G40.21M, Grade 350W.

E22.4.4 Welding Materials

- (a) The Contractor is responsible for supplying all welding materials. All welding materials shall conform to the requirements of Welded steel construction (Metal Arc Welding) shall conform to the requirements and satisfy the testing procedures of CSA W59 and Welded Highway & Railway Bridges - AWS D1.1 of The American Welding Society & Addendum.

E22.4.5 Abutment Pile Pre-bore Fill Material

- (a) The abutment pile pre-bore annulus fill material is to be 13mm diameter regular river wash material, also known as pea gravel. The Contract Administrator shall approve the abutment pile casing material prior to placing.

E22.5 Construction Methods

E22.5.1 Handling and Storage

- (a) Piling shall be handled, hauled and stored in a manner that avoids damage to the piling materials. Loading and unloading shall be by crane, loader or other appropriate hoisting equipment.
- (b) The Contractor, in the handling and lifting of the piles, will not be permitted to drag them along the ground.

- (c) If piles are damaged due to the Contractor's handling operations, the Contractor shall, at his own expense, replace all damaged piles with piles meeting the requirements of this Specification and as shown on the Drawings.

E22.5.2 Location and Alignment

- (a) The piles shall be driven in the positions shown on the Drawings or as directed by the Contract Administrator. Piles shall be driven vertically unless shown otherwise on the Drawings and shall not deviate more than 2 percent out-of-plumb. Batter piles shall be driven to the batter specified and shall not deviate more than 2 percent from the batter specified. Piles shall not be more than 75 mm off center measured at cut-off elevation.
- (b) Piles shall not be jacked or pulled into their final positions.

E22.5.3 Driving Steel Bearing Piles

- (a) All piles within a 10m of proposed watermain or as directed by the Contract Administrator are to be pre-bored. The depth of pre-bore length shall be equal the lowest invert elevation of the bottom of the proposed watermain.
- (b) Piles shall be driven to the depths as shown on the Drawings or as directed by the Contract Administrator. All piles shall be driven to practical refusal which shall consist of three consecutive sets of 13 hammer blows per 25 mm of pile penetration. To minimize the risk of damage to the piles, the pile driving can be terminated if the penetration for a set of 13 hammer blows is less than 13 mm. The Contractor shall remove any surface and/or shallow depth obstructions to obtain the required penetration of the piles.
- (c) Pile driving equipment to be used by the Contractor shall be of such capacity that the required bearing and penetration shall be obtained without damage being done to the piles. The piles shall be driven using a hammer capable of delivering a minimum of 40 kJ at the pile head. The hammer energy is to be verified by the dynamic testing as outlined in this specification. Driving of all piles shall be continuous and without interruption until the pile has been driven to cut-off elevation or the refusal criteria has been met.
- (d) If the Contractor can demonstrate conclusively that special methods, other than providing a higher capacity hammer, are necessary to advance the pile to the required penetration, such supplementary methods will be subject to the Contract Administrator's approval.
- (e) Pile driver leads shall be used to support the piles while they are being driven and shall be braced to the supporting crane so as to hold the piles securely and accurately in the required position during driving. Leads shall be of sufficient length to be supported firmly on the ground. The use of hanging or swinging leads will not be allowed unless they can be held in a fixed position during the driving operations. Batter piles shall be driven with inclined leads.
- (f) The heads of steel piles shall be squared and protected by a cap of a design approved by the Contract Administrator. The cap shall be designed to hold the axis of the pile in line with the axis of the hammer. The top of the cap shall have a timber shock block.
- (g) If upheaval does occur, the Contractor shall re-drive the lifted piles to the specified elevations. The Contractor shall excavate material that has boiled up during pile driving operations. The elevation of all piles previously driven or redriven shall be confirmed to detect uplift. If uplift of 5 mm or more occurs in any pile, that pile shall be redriven to its original elevation and thereafter to the required final driving resistance. If cavities remain around the piles after driving, the cavities shall be filled with sand or other approved material to the satisfaction of the Contract Administrator.
- (h) The Contractor shall ensure the safety of all personnel during pile driving operations. In particular, overhead protection shall be provided for all personnel located adjacent to the pile driving lead and under the pile driving hammer. The overhead protection shall be designed and constructed so as to safely withstand forces from falling debris or other matter.

E22.5.4 Pile Cut-Offs

- (a) The piles shall be cut off level at the required elevations as specified on the Drawings or as directed by the Contract Administrator.

E22.5.5 Splicing Piles and Installing Pile Tips

- (a) The Contractor shall splice piles and install pile tips in accordance with the Drawings, welding procedures, Shop Drawings and the following:
 - (i) The butting ends of the driven pile and its extension or the pile and the pile tip shall be cut square to give reasonable bearing between the mating surfaces.
 - (ii) The butting surface shall be bevelled to facilitate a full penetration butt weld. Temporary clamping plates may be used as required.
 - (iii) Before welding over previously deposited metal, the slag shall be removed. This requirement shall apply to successive layers, to successive beads, and to the cratered area when welding is resumed after any interruption.
 - (iv) All butt welds shall have the root of the initial weld arc-air gouged, to sound metal and cleaned by grinding and wire brushing before welding is started from the second side.
 - (v) Material to be welded shall be preheated in accordance with CSA W59.
 - (vi) The piles shall not have more than one splice per pile unless otherwise approved by the Contract Administrator. The location of the splice(s) shall be approved by the Contract Administrator.

E22.6 Dynamic Testing of Steel Piles

E22.6.1 Description

- (a) The dynamic testing shall be performed to monitor and confirm hammer and driving system performance, assess pile installation stresses and integrity, as well as to evaluate pile capacity. The Contractor shall secure the services of a Dynamic Testing Consultant with demonstrated experience in similar projects. Dynamic testing shall be performed on at least 1 pile per abutment.

E22.6.2 Reference and Related Specifications

- (a) All related Specifications and reference Standards shall be current issue or latest revision at the first date of tender advertisement.
 - (i) References
 - ◆ ASTM D-4945-00, "Standard Test Method for High Strain Dynamic Testing of Piles".
 - ◆ Specifications for Supplying and Driving Steel Bearing Pile".

E22.6.3 Submittal

- (a) At least 14 days prior to driving the test piles, the Contractor shall submit specifications for the pile driving equipment to the Contract Administrator.

E22.6.4 Material

- (a) Equipment and Personnel
 - (i) The dynamic testing work will be carried out using the Contractor's pile driving equipment and the Pile Driving Analyzer (PDA) equipment provided by the Dynamic Testing Consultant.
 - (ii) The PDA testing equipment shall conform to the requirement of ASTM D-4945-08, "Standard Test Method for High Strain Dynamic Testing of Piles". An engineer with documented experience shall operate the Pile Driving Analyzer in the field. An engineer with at least five years related experience shall carry out the analysis of the PDA data and sign the engineering reports.
 - (iii) The Contractor shall provide the pile driving equipment, operators, labor and power supply to the test pile locations for the duration of the dynamic testing. The Contractor shall provide a step ladder or other safe lifting means to enable attachment of cables to the pile head. The pile driving equipment shall be the same as that to be used for the pile driving work.

E22.6.5 Execution

(a) Construction Access

- (i) The Dynamic Testing Consultant shall prepare and attach the gages to the pile after the pile has been driven to the depth identified by the Contract Administrator. Driving shall then continue using routine pile installation procedures. When the level of the gages is within 0.3 m of the ground surface, water surface, or a pile template, driving shall be halted to remove the gages from the pile. If additional driving is required, the pile shall be spliced and the gages shall be reattached to the head of the extension pile segment prior to the resumption of driving.
- (ii) The Contractor must take good care to ensure that no damage is done to the dynamic monitoring transducers, cables, or equipment.

(b) Dynamic Testing Program

- (i) The selected piles shall be driven to attain static capacity of at least 2.0 times the pile design capacity. Adjustments to the preliminary driving criteria may be made by the Contract Administrator based upon the dynamic testing results.
- (ii) All or part of the tested piles as determined by the Geotechnical Engineer shall be re-struck with dynamic testing. The re-strike driving sequence shall be performed with a warmed up hammer and shall consist of striking the piles for about 10 to 20 blows or until the pile penetrates an additional 50 mm, whichever occurs first.
- (iii) The Contract Administrator may request additional piles to be dynamically tested if the hammer and/or driving system is replaced or modified, the pile type or installation procedures are modified, the pile capacity requirements are changed, unusual blow counts or penetrations are observed or any other piling behavior that differs from normal installation.

(c) Dynamic Testing Reports

- (i) Within one day pile testing, the Dynamic Testing Consultant shall prepare a hand written daily field report summarizing the dynamic testing results. As a minimum, the daily reports shall include the calculated driving stresses, transferred energy, and estimated pile capacity at the time of testing. Variations from previous trends in the dynamic test data shall also be noted. Daily field reports shall be faxed or emailed to the Contract Administrator.
- (ii) The Dynamic Testing Consultant shall prepare and submit a written report not later than 7 days after the test completion. This report shall include the results of dynamic test(s) and shall contain a discussion of the pile capacity obtained from the dynamic testing. The report shall also discuss hammer and driving system performance, driving stress levels, and pile integrity. CAPWAP analyses shall be performed on dynamic testing data obtained from the end of initial driving and the beginning of re-strike of all tested piles or as instructed by the Contract Administrator. CAPWAP analyses shall be performed by an engineer with demonstrated experience.

E22.7 Quality Control / Quality Assurance

E22.7.1 Quality Control

- (a) The Contractor shall provide a detailed survey of all of the pile locations and provide that to the Contract Administrator prior to cutting off any piles for that pile cap. The Contractor shall replace any piles, or add additional pile(s), for piles that do not meet the following tolerances: +/-2% out of alignment for battered piles, +/-2% out of plumb for vertical piles, and 75 mm off centre of the specified locations. Any modifications required to the pile cap, due to piles out of tolerance or due to required additional piles to compensate for out of tolerance piles, shall be carried out as detailed by the Contract Administrator at the Contractor's own costs.
- (b) The Contractor shall replace any piles, or add additional pile(s), to compensate for piles that do not meet the specified refusal criteria. Any modifications required to the pile cap, required due to additional piles, shall be carried out as detailed by the Contract Administrator at the Contractor's own costs.

E22.7.2 Quality Assurance

- (a) All welds will be inspected visually by the Contract Administrator. The Contractor shall allow the Contract Administrator unhindered access to the piling and shall assist the Contract Administrator in carrying out any inspection, including suitable access.

E22.7.3 Pile Driving Records

- (a) The Contractor shall keep a record of each and every pile driven. The records shall give the date, time, diameter, length, location, type, total depth of penetration, rate of penetration, number of blows per 300 mm, penetration of the last five blows, steam, air or diesel pressure and the kind and size of hammer used in driving. Any unusual phenomena shall be noted and recorded, especially if they indicate possible damage to the pile.
- (b) Energy output of driving equipment at the time of final set shall be carefully recorded by the Contractor, along with the final penetration readings, and reported immediately to the Contract Administrator. The required set per blow will be subject to acceptance by the Contract Administrator, in regard to the specified driving equipment and piles permitted.

E22.8 Measurement and Payment

E22.8.1 Piling Mobilization and Demobilization

Piling Mobilization and Demobilization will not be measured and will be paid for at the Contract Lump Sum Price for "Piling Mobilization and Demobilization", which price shall be payment in full for mobilizing and demobilizing all personnel and equipment for piling operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator

E22.8.2 Supplying Steel Piles

Supplying steel piles will be measured on a length basis and will be paid for at the Contract Unit Price per linear metre for "Supply Steel Piles," which price shall be payment in full for performing operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator. The length to be paid for shall be the total number of lineal metres of piling shown on the Drawings or authorized by the Contract Administrator

E22.8.3 Driving Steel Piles

Driving steel piles will be measured on a length basis and will be paid for at the Contract Unit Price per linear metre for "Drive Steel Piles," which 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. The length to be paid for shall be the total number of lineal metres of piling shown on the Drawings or authorized by the Contract Administrator

The measurement for the driving of steel piles shall be the total linear metres supplied less fifty (50) percent of the number of linear metres of piling cut-off after driving, except where piles are driven to within 500mm their final elevation.

E22.8.4 Pre-Bore

Pre-bore of piles shall be considered incidental to the "Piling Mobilization and Demobilization", "Supply Steel Piles" and "Drive Steel Piles", no measurement or payment shall be made for this Work.

E22.8.5 Pile Splice

Splicing steel piles will be measured on a unit basis and will be paid for at the Contract Unit Price each for "Splice Steel Pile," which price shall be payment in full for performing operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E22.8.6 Supplying and installing all the listed or required materials, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Piling Mobilization and Demobilization", "Supply Steel Piles", "Drive Steel Piles", "Steel H-Pile Splice", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E23. STRUCTURAL BACKFILL

E23.1 Description

- (a) This Specification shall cover all operations related to backfill work as herein specified and in the latest versions of City of Winnipeg Standard Construction Specifications CW 2030, CW 3110 and CW 3170, and as shown on the Drawings.
- (b) This Specification shall cover all granular backfill types for bridge and road works including as noted in E23.3, "Scope of Work: to the limits shown on the Drawings or as required by the Contractor based on site and or weather conditions..
- (c) The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supply, and all things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

E23.2 Referenced Specifications and Drawings

- (a) The latest version of the City of Winnipeg Standard Construction Specifications
 - (i) CW 2030 – Excavation Bedding and Backfill
 - (ii) CW 3110 – Subgrade, Sub-Base, and Base Course Construction; and
 - (iii) CW 3170 – Earthwork and Grading.

E23.3 Scope of Work

- (a) The Work under this Specification shall involve:
 - (i) Supplying and placing Backfilling, imported clay backfill, granular backfill and free draining backfill at the abutments;
 - (ii) Supply of flowable cement – stabilized fill backfill in winter conditions, between November and March, in place of compacted granular backfill for wingwall and abutment fill;
 - (iii) Build hoarding enclosures and provide appropriate heating as required based on the fill materials and construction methods employed. Costs of hoarding and heating shall be incidental to this section.
 - (iv) Supplying and placing granular backfill for the north and south approach slabs;
 - (v) Supplying and placing granular backfill for reinforced roadway slab;
 - (vi) Supplying and placing granular backfill for the approach sidewalk slabs;
 - (vii) Supplying and placing structural backfill for all other elements required to construct the Works.
 - (viii) The limits of structural backfill are as shown on the Drawings are for reference, with final limits to structural excavation determined by the Contractor based on site and weather conditions.
 - (ix) Includes the supply and placement of geogrid and geotextiles.

E23.4 Submittals

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

E23.5 Materials

E23.5.1 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.

E23.5.2 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (b) 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 the Contract Administrator for testing purposes.
- (c) All material 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, so not conform to the Specification detailed herein, or are found to be defective in manufacture, or have become damaged in transit, storage or handling operation, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E23.5.3 Granular Backfill

- (a) Granular Backfill Material
 - (i) Granular sub-base material shall be in accordance with CW 3110 Sub-Base Materials 50 mm MAX AGG.
- (b) Granular Base Material
 - (i) Granular base material shall be in accordance with CW 3110 Base Course Material.
- (c) Granular Sub-Base Material
 - (i) Granular sub-base material shall be in accordance with CW 3110 Sub-Base Materials 50 mm or 100 mm MAX AGG..

E23.5.4 Free Draining Granular Backfill Material

- (a) Free draining granular backfill shall consist of hard crushed stone, free from organic material meeting the gradation and material requirements of concrete coarse aggregate as per E26.5.5(c) or approved equal in accordance with B7, "Substitutes".

E23.5.5 Clay Borrow Material

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

E23.5.6 Flowable Cement – Stabilized Fill

- (a) Flowable Cement – Stabilized Fill backfill material shall be in accordance with CW 2160 – R7

E23.5.7 Geotextile Fabric

- (a) The non-woven geotextile shall conform to:
 - (i) Mass 240 g/m² min in accordance with ASTM D5261
 - (ii) Grab Tensile Strength 60 N min in accordance with ASTM D 4632
 - (iii) Mullen Burst Strength 2000 kPa min in accordance with ASTM D3786
 - (iv) The non-woven geotextile shall be Armtex 250 supplied by Armtex Construction Products and Century Petroleum Construction, Geotex 701 supplied by Specialty Construction or ProPex 4552 supplied by Brock White Company Canada or equal in accordance with B7 as accepted by the Contract Administrator.

E23.6 Geogrid

- (a) Shall be in accordance with CW 3135-R1

E23.7 Equipment

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

E23.8 Construction Methods

E23.8.1 Backfilling

- (b) 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.
- (c) 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.
- (d) 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.

E23.8.2 Geotextile Fabric

- (a) Install geotextile fabric under all backfill material.
- (b) Unroll geotextile fabric as smooth as possible.
- (c) Install the geotextile fabric in the longest continuous practical length, free from tension, stress, folds, wrinkles and creases.
- (d) Install geotextile fabric in accordance with this Specification and procedures recommended by the manufacturer.
- (e) Overlap joint a minimum of 600 millimetres and as indicated on the Drawings.
- (f) Install pins as required to hold geotextile fabric in place.
- (g) Cut or fold geotextile fabric to conform to curves.
- (h) Construction vehicles shall be permitted directly on the geotextile fabric.
- (i) Remove or replace geotextile fabric improperly installed or damaged as directed by the Contract Administrator.

E23.8.3 Backfill Operations

- (a) The Contract Administrator shall be notified at one (1) working day in advance of any backfilling operation. No backfill shall be placed against any concrete until approved by the Contract Administrator and in no case before the curing requirements of E26 "Structural Concrete" are met.
- (b) The geotextile fabric shall be placed prior to any backfilling operations.
- (c) The abutments shall be backfilled with backfill materials described below to the grade line as shown on the Drawings. 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.
- (d) The Contractor shall be required to provide necessary water or equipment during compaction of backfill material to achieve the required densities.
- (e) The Contractor shall place backfill material in 150 mm lifts and shall compact each lift. The backfill shall be compacted to 100% Standard Proctor.

E23.8.4 Embankment Slope Backfill

- (a) Backfill the embankment slopes where required producing the embankment grades shown on the Drawings. Use suitable Site backfill or clay backfill compacted to a minimum of 98% Maximum Standard Proctor Density. Generally the intent is to cut the embankments to meet the grades shown on the Drawings. Existing low areas to filled

with geotextile and riprap. If the embankments are over excavated the Contractor may be required to bench cut the area, provide and place suitable imported backfill to meet the required embankment grades at the Contractors own expense, determined at the discretion of the Contract Administrator.

E23.9 Quality Control

E23.9.1 Inspection

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

E23.9.2 Materials

- (a) All material supplied and placed under this Specification shall be subject to testing and acceptance by the Contract Administrator in accordance with E23.5 and E23.8 of this Specification.

E23.9.3 Quality of Backfill Material

- (a) The Standard Proctor Density for granular backfill material shall be determined at the optimum moisture content in accordance with standard laboratory Proctor Compaction Test Procedure. The field density of each backfill layer shall be 100% of the applicable Proctor Density, as specified in E23.8.4 of this Specification.
- (b) Quality control test will be used to determine the acceptability of each backfill layer, as place and compacted by the Contractor before any succeeding layer may be applied.
- (c) The filed density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard D155560-64, Test for Density of Solid in Place by the Sand-Cone Method, or equivalent as accepted by the Contract Administrator.
- (d) The frequency and number of tests to be made shall be as determined by the Contract Administrator. The Contract Administrator will select the Testing Agency.
- (e) Holes made by removal of samples from the layer shall be promptly filled by the Contractor with appropriate material and thoroughly compacted so as to conform in every way with the adjoining compacted material.

E23.9.4 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.

E23.9.5 Corrective Action

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

E23.10 Measurement and Payment

- E23.10.1 Structural backfill will not be measured and will be paid for at the Contract Lump Sum Price for "Structural Backfill", 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.

E24. RANDOM STONE RIPRAP AND GEOTEXTILE

E24.1 Description

E24.1.1 Riprap shall be random stone riprap and supplied and installed in accordance with Specification CW 3615, except as specified herein.

E24.2 Materials

E24.2.1 Rock

- (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 for 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:

Size (mm)	Class 250	Class 350
350		100%
250	100%	
200		15-50%
150	15-50%	
100		0-15%
50	0-15%	

E24.2.2 Geotextile Fabric

- (a) Geotextile fabric shall be non-woven and conform to the requirements of CW 3130 Clause 2.5.

E24.3 Construction Methods

E24.3.1 Place a layer of the geotextile fabric under the riprap and anchor the upstream and downstream end of rock filled trenches as shown on the Drawings. The inlet and outlet proposed riprap are to blend into the existing riprap.

E24.3.2 Place the rock riprap carefully on the geotextile fabric so that it does not tear.

E24.4 Measurement and Payment

E24.4.1 Supply and placement of riprap and geotextile fabric will be measured on a volume basis and will be paid for at the Contract Unit Price per cubic metre for "Class 250 - Random Stone Riprap and Geotextile" and "Class 350 - Random Stone Riprap and Geotextile", 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.

- (a) Supply and placement of class 250 riprap and geotextile fabric measurement will be calculated by surface area of riprap placed and accepted by the Contract Administrator multiplied by the specified depth as indicated on the Drawings.
- (b) Supply and placement of class 350 riprap and geotextile fabric measurement will be calculated by surface area of riprap placed and accepted by the Contract Administrator multiplied by the specified depth as indicated on the Drawings.

E25. REINFORCING STEEL

E25.1 Description

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

E25.2 Referenced Specifications and Drawings

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

E25.3 Scope of Work

- (a) The Work under this Specification shall involve supplying and placing all black and stainless steel reinforcing (including dowels), as shown on the Drawings for the following Works:
 - (i) Abutments
 - (ii) Deck and backwalls
 - (iii) Approach slabs
 - (iv) Reinforced road slabs
 - (v) Barriers
 - (vi) Sidewalks on the bridge deck and approach
 - (vii) Pier Cap

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.
- (b) Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any Work on Site a Certificate of Compliance from the Manufacturer stating that the stainless steel materials supplied comply with the provisions of ASTM A955M and these Specifications, including corrosion resistance.
- (c) Contractor shall submit all original mill certificates to the Contract Administrator prior to placement of reinforcing on site.
- (d) Contractor to submit Quality Control Testing Program to the Contract Administrator in accordance with E25.9, "Quality Assurance".

- (e) 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).

E25.5 Materials

E25.5.1 General

- (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.

E25.5.2 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with the latest edition and all subsequent revisions of CAN/CSA-A23.1, "Storage of Materials", except as otherwise specified herein.
- (b) Bundles of reinforcing steel shall be identified by tags containing bar marks.
- (c) 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.
- (d) 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.

E25.5.3 Handling and Storage of Stainless Steel Reinforcing

- (a) 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.
- (b) Chains or steel bands used for shipping shall not be in direct contact with stainless steel reinforcing. Use wood or other soft material to protect the bars, or use nylon or polypropylene slings.
- (c) Nylon or polypropylene slings shall be used for moving stainless steel reinforcing.
- (d) Keep carbon steel tools, chains, slings, etc. off stainless steel reinforcing.

E25.5.4 Reinforcing Steel

- (a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.
- (b) Black steel as shown on the Drawings and shall conform to the requirements of CAN/CSA G30.18, Grade 400W.
- (c) Stainless steel, as shown on the Drawings, shall be a high-manganese, low-nickel, nitrogen-strengthened austenitic stainless steel. Stainless steel reinforcing shall meet or exceed the minimum requirements of ASTM A955M, 300 Series, minimum Grade 420, of the Types listed below in Table E25.1, "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 dimensions recommended by RSIC.
- (d) 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.
- (e) All reinforcing steel shall be straight and free from paint, oil, millscale, and injurious defects. Rust, surface seams, or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross sectional area, and tensile properties of a hand-wire-brushed specimen are not less than the requirements of ASTM A955M.

TABLE E26.1 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

E25.5.5 Bar Accessories

- (a) Bar accessories shall be of types suitable for each type of reinforcing and 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.
- (b) Bar chairs, bolsters, and bar supports shall be made from cementitious material. No plastic or PVC, or galvanized bar supports shall be used.
- (c) The use of pebbles, pieces of broken stone or brick, plastic, metal pipe, and wooden blocks, will not be permitted.
- (d) Placing of bar supports shall be done to meet the required construction loads.
- (e) Tie wire shall be the following:
 - (i) Black, soft-annealed 1.6 mm diameter wire for black steel reinforcing;
 - (ii) Nylon-, epoxy-, or plastic-coated wire for black steel reinforcing; and
 - (iii) Stainless steel, fully annealed 1.6 mm diameter wire, Type 316 or 316L for stainless steel reinforcing.
- (f) Bar accessories shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices that may be approved by the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E25.5.6 Mechanical Splices

- (a) Mechanical splices shall be stainless steel, meeting the requirements of ASTM A955M, Type 316L, Type 2005, or Type XM-28.

E25.5.7 Bonding Agent/Grout

- (a) Epoxy resin shall conform to the requirements of ASTM C881. Type I or Type IV, Grade 3 epoxy shall be used for bonding reinforcing steel into hardened concrete. An approved product is Hilti RE500 or equal, as approved by the Contract Administrator in accordance with B6 "Substitutes".
- (b) An aggregate filler may be used in accordance with manufacturer's directions when the drilled hole is sized for the head of a stud rather than a shaft only.
- (c) Bonding agents for bonding reinforcing steel into holes in hardened concrete other than epoxy resin may be permitted provided that they develop a minimum pullout resistance of 50 kN within 48 hours after installation.
- (d) Fabrication of stainless steel reinforcing shall take place in an area isolated from carbon steel reinforcing to prevent surface contamination.
- (e) Stainless steel reinforcing shall be stored separately from carbon steel reinforcing.
- (f) All equipment shall be cleaned prior to bending stainless steel reinforcing.

E25.6 Equipment

E25.6.1 General

- (a) All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.
- (b) All tools used for stainless steel reinforcing shall be stainless steel and shall not be contaminated with iron or non-stainless steel.

E25.7 Construction Methods

E25.7.1 Fabrication of Reinforcing Steel

- (a) All reinforcing steel shall be fabricated in accordance with the latest edition of the Reinforcement Steel Manual of Standard Practice by the RSIC, to the lengths and shapes as shown on the Drawings.
- (b) Stainless steel reinforcing shall be bent to the proper shape in a plant that has suitable devices for bending stainless steel as recommended in Reinforcing Steel Institute of Canada (RSIC) Manual of Standard Practice. Heating shall not be used as an aid in bending. The equipment used in the plant shall not cause any surface contamination or damage to the surface of the bars. Stainless steel shall be tagged, indicating the mill and fabricator, stainless steel type and grade, and bar mark number including stainless designation.

E25.7.2 Fabrication of Stainless Steel Reinforcing

- (a) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and non-stainless steels.
- (b) The stainless steel reinforcing shall be mechanically or chemically de-scaled prior to fabrication, leaving a totally passive stainless steel finish free of millscale, slag, or oxidation. Iron contamination shall be removed with picking paste or by wire brushing. Wire brush cleaning shall be done with stainless steel brushes only.
- (c) All hand tools shall be stainless tools that have not been previously used on carbon steel.

E25.7.3 Placing and Fastening of Reinforcing Steel

- (a) General
 - (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 shall not be permitted.
 - (iv) Reinforcing steel shall be placed 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 shall not be permitted without prior acceptance by the Contract Administrator.
 - (vii) Reinforcing steel shall be placed within the tolerances specified in CAN/CSA A23.1.
 - (viii) 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.

- (ix) 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 E25.5.5, "Bar Accessories".
 - (x) Welding or tack welding is not permitted.
 - (xi) Unless otherwise shown on the Drawings, the minimum distance between bars shall be 40 mm.
- (b) Placing Stainless Steel Reinforcing
- (i) Stainless steel reinforcing will be rejected if:
 - ◆ Any area of contamination of the stainless steel by iron exceeds 100 mm in length;
 - ◆ Two or more areas of iron contamination greater than 25 mm in length occur along the length of the bar; or
 - ◆ There are frequent small occurrences of rust contamination along the full length of the bar.
 - (ii) If stainless steel reinforcing bars have been rejected due to excessive iron contamination, the Contractor may attempt to treat the bar to remove the contamination. This treatment can be accomplished by mechanical cleaning with a stainless steel wire brush, or by a polishing machine, or by chemical treatment, pickling. If the treatment(s) are not successful, the contaminated bar(s) shall be replaced at no cost to the City.
 - (iii) If the stainless steel reinforcing is mechanically damaged, the bars will be rejected and the Contractor shall replace the rejected bars at no cost to the City. Any cuts into a bar, sharp tears, or flattening of the deformations on the bars will be cause for rejection.
 - (iv) Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections may be tied.
 - (v) All tools used for placing shall be stainless steel and shall not be contaminated with iron or non-stainless steel.
 - (vi) For lapping steel reinforcing bars at the joints and intersection, an ample supply of stainless steel wire shall be provided. The wire shall not be contaminated with non stainless steel.
 - (vii) Proper stainless steel cutting pliers shall be used and the bending and tying of the wires done as neatly as possible.
 - (viii) Twisted ends of the tie wire shall be bent away from forms and surfaces so that they do not project into the concrete cover over the reinforcing steel.

E25.7.4 Splicing

(a) 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 thirty-five (35) bar diameters lap length shall be provided.

E25.8 Quality Control

E25.8.1 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) A minimum of two (2) Business Days advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcing steel.
- (d) 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.

E25.8.2 Access

- (a) 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.

E25.9 Quality Assurance

E25.9.1 Testing

- (a) Quality Assurance testing shall be used to determine the acceptability of the reinforcing steel supplied by the Contractor.
- (b) The Contractor shall provide, without charge, the samples of reinforcing steel required for Quality Assurance Tests and provide such assistance and use of tools and construction equipment as is required.

E25.10 Measurement and Payment

- E25.10.1 Supplying and placing reinforcing steel will be measured on a mass basis and will be paid for at the Contract Unit Price per kilogram for the "Items of Work" listed here below, 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.

Items of Work:

Supplying and placing reinforcing steel:

- (a) Supply Black Reinforcing Steel
- (b) Place Black Reinforcing Steel
- (c) Supply Stainless Steel Reinforcing
- (d) Place Stainless Steel Reinforcing

E26. STRUCTURAL CONCRETE

E26.1 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.

E26.2 Referenced Specifications and Drawings

- (a) The latest edition and subsequent revisions of the following:
- (i) ACI 309 – Guide for Consolidation of Concrete;
 - (ii) ACI 347 – Guide to Formwork for Concrete;
 - (iii) American Concrete Publication SP4 – Formwork for Concrete;
 - (iv) ASTM A780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings;
 - (v) ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine;
 - (vi) ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete;
 - (vii) ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete;
 - (viii) ASTM C457 – Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete;
 - (ix) ASTM C494 – Standard Specification for Chemical Admixtures for Concrete;
 - (x) ASTM C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete;
 - (xi) ASTM C1202 – Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration;
 - (xii) ASTM C1399 – Standard Test Method for Obtaining Average Residual-Strength of Fibre-Reinforced Concrete;
 - (xiii) ASTM C1609 – Standard Test Method for Flexural Performance of Fibre-Reinforced Concrete (Using Beam with Third Point Loading);
 - (xiv) ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types);
 - (xv) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
 - (xvi) CAN/CSA A3001 – Cementitious Materials for Use in Concrete;
 - (xvii) CAN/CSA G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;
 - (xviii) CAN/CSA G164-M92 – Hot Dip Galvanizing of Irregularly Shaped Articles;
 - (xix) CAN/CSA O121 – Douglas Fir Plywood;
 - (xx) CAN/CSA-S6 – Canadian Highway Bridge Design Code;
 - (xxi) CAN/CSA S269.1 – False Work for Construction Purposes;
 - (xxii) CAN/CSA S269.3 – Concrete Formwork;
 - (xxiii) ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Coatings, Sealers, and Polymer Overlays;
 - (xxiv) Ministry of Transportation Ontario MTO Lab Test Method LS 609 – Petrographic Analysis of Coarse Aggregate; and
 - (xxv) Ontario Provincial Standard Specification OPSS 1010 – Material Specification for Aggregates – Base, Sub-base, Select Subgrade, and Backfill Material.

E26.3 Scope of Work

- (a) The Work under this Specification shall involve the following structural concrete Works:
- (i) Abutments backwalls, and Wingwalls;
 - (ii) Deck slab;

- (iii) Approach slabs;
 - (iv) Transition slabs;
 - (v) Barriers;
 - (vi) Sidewalks on the bridge deck, approach and transition slabs
 - (vii) Flowable Cement-Stabilized fill
- (b) The Work under this Specification shall include the supply and placement of the aluminum railing pre-set anchor units.

E26.4 Submittals

E26.4.1 General

- (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, the proposed materials to be used.

E26.4.2 Concrete Mix Design Requirements

- (a) 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.).
- (b) The Supplier shall submit directly, in confidence, to the City of Winnipeg, the concrete mix designs for each of the concrete types specified herein. The purpose of this confidential submission will be for record keeping purposes only. The concrete mix design shall contain a description of the constituents and proportions, and at the minimum the following:
 - (i) Cementitious content in kilograms per cubic metre or equivalent units, and type of cementitious materials;
 - (ii) Designated size, or sizes, of aggregates, and the gradation;
 - (iii) Aggregate source location(s);
 - (iv) Weights of aggregates in kilograms per cubic metre or equivalent units. Mass of aggregates is saturated surface dry basis;
 - (v) Maximum allowable water content in kilograms per cubic metre or equivalent units and the water/cementitious ratio;
 - (vi) The limits for slump;
 - (vii) The limits for air content;
 - (viii) Quantity of other admixtures; and
 - (ix) The dosage and type of synthetic fibres.
- (c) The concrete mix design statements must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled commencement of concrete placement for each of the concrete types. The concrete mix designs must be received by the City of Winnipeg a minimum of five (5) Business Days prior to the scheduled commencement of concrete placement for each the concrete types.
- (d) The mix design statement shall also include the expected slump measurement for each concrete type. The tolerances for acceptance of slump measurements in the field, by the

Contract Administrator, shall be in accordance with the requirements of the CAN/CSA A23.1 Clause 4.3.2.3.2.

- (e) 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.
- (f) Sealed concrete deck shore drawings must be received by the Contract Administrator a minimum of ten (10) Business Days prior to the scheduled commencement of shore construction. The shores shall be designed by Professional Engineer registered in the Province of Manitoba and the drawings shall be sealed.

E26.4.3 Concrete Mix Design Test Data

(a) 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 performance and post-cracking residual strength index (Ri) for Fibre Reinforced Concrete (FRC) only air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. Testing of Ri of concrete shall be completed in accordance with E26.8.5.
- (iii) Testing for air void system shall be completed in accordance with E26.8.5(c).
- (iv) Testing for rapid chloride permeability shall be completed in accordance with E26.8.5(d).
- (v) All tests shall be based on the concrete samples taken from the point of discharge into the formwork. For example, at the concrete chute from the delivery truck if being placed by buggies, or at the end of the pump line should the Contractor choose to pump the concrete into place.

(b) 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 100 to 120.

- (vi) The Contractor shall submit to the Contract Administrator for review and approval recent test information on resistance to degradation of large-size coarse aggregate by abrasion and impact in the Los Angeles Machine, in accordance with CSA Standard Test Method A23.2-16A.
 - (vii) The Contractor shall submit to the Contract Administrator for review and approval recent test information on potential alkali reactivity of cement aggregate combinations (mortar bar method), in accordance with CSA Standard Test Method A23.2-27A.
- (c) The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

E26.4.4 Notification of Ready Mix Supplier

- (a) The Contractor shall submit to the Contract Administrator the name and qualifications of the Ready Mix Concrete Supplier that he is proposing to use, at least 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.

E26.4.5 Temporary False Work, Formwork and Shoring Works

- (a) 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, detailed design calculations and Shop Drawings for any temporary Works, including false work, formwork, and shoring.
- (b) Design Requirements
 - (i) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.
 - (ii) The false work, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. False work shall be designed according to the requirements of the requirements of the CAN/CSA S269.1. The Shop Drawings shall bear the Professional Engineer's seal. Shop Drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such Shop Drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.
 - (iii) The false work, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with the requirements of CAN/CSA S269.3. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval. Drilling into the precast concrete girders will not be accepted.
 - (iv) The loads and lateral pressures outlined in Part 3, Section 102 of ACI 347 and wind loads as specified by the Manitoba Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.
 - (v) As a minimum, the following spacings shall apply, for studding and waling:
 - (vi) 20-mm plywood: studding 400 mm centre to centre (max.),
 - (vii) Walers 760 mm centre to centre (max.)
 - (viii) Forms shall be designed and constructed so that the completed Work will be within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.

- (ix) Formwork shall be designed to provide camber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.
 - (x) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be accommodated in the design, in coordination and cooperation with the trade concerned. No openings in structural members are to be shown on the Shop Drawings without the prior written approval of the Contract Administrator.
 - (xi) Shores shall be designed with positive means of adjustment (jacks or wedges). All movements shall be taken up before or during concreting as required.
 - (xii) Mud sills shall not be used.
 - (xiii) The Contractor shall design supports for shores that are attached to the abutments or supported by piles. The design of the supports for the shores installed on the abutments shall be designed by the Contractor to ensure the abutments can withstand the shoring loads as noted in section E27.4.5(b)(iii) and meet the requirements of the shoring and false work as noted in this section. All items that shall remain permanently within the abutments shall be hot dip galvanized. All ferrule inserts or similar shall have bolts permanently installed. The supports shall be designed by a Professional Engineer registered in the Province of Manitoba and sealed drawings shall be prepared and provided to the Contract Administrator for review 10 days prior to installation.
 - (xiv) The supports for the shores can be founded on piles. The pile shall be designed by a Professional Engineer registered in the Province of Manitoba. The pile shall be designed for all loads to be supported during construction, any movements that may occur such as settlements and shall be removed to a minimum of 1m below the finished grade. If a portion of the pile remains it must be designed to resist all up-lift forces, after the piles have been cut to their final length below grade. sealed drawings shall be prepared and provided to the Contract Administrator for review 10 days prior to installation.
 - (xv) Shores must be designed to accommodate construction of the shore in frozen conditions and then allow for a change to unfrozen conditions and saturated soils prior to, during or after concrete placement without any effect on the shoring system or the resulting finished concrete adherence to the shapes, lines, and dimensions of the members shown on the Drawings.
 - (xvi) Shores shall be designed and braced as necessary so that they can safely withstand all dead and moving loads to which they will be subjected.
 - (xvii) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.
 - (xviii) Formwork shall be designed to have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
 - (xix) Forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.
- (c) Shop Drawings shall show design loads, type, and number of equipment to be used for placing the concrete, method of construction, method of removal, type and grade of materials, and any further information that may be required by the Contract Administrator. The Contractor shall not proceed with any Work on site until the Shop Drawings have been reviewed and approved in writing by the Contract Administrator. False work must be designed to carry all loads associated with construction of overhangs including deflection due to dead loads, placement of concrete, hoarding, construction live loads, and any other loads that may occur.
- (d) For timber formwork and false work, the Shop Drawings shall specify the type and grade of lumber and show the size and spacing of all members. The Shop Drawings shall also show the type, size and spacing of all ties or other hardware, and the type, size and spacing of all bracing.

E26.4.6 Screed for Structural Deck Concrete

- (a) Plans for anchoring support rails shall be submitted to the Contract Administrator for review and acceptance at least ten (10) Business Days prior to the scheduled commencement of concrete placement. The Contract Administrator's written acceptance must be received by the Contractor prior to the installation of any anchorage devices. Any permanent anchorage devices shall be a minimum of Type 304 stainless steel.

E26.4.7 Enclosed Deck Hoarding

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the scheduled commencement of the structural deck concrete work on site, Shop Drawings showing the fabricated details of the enclosed deck hoarding, design loads, method of construction, type and grade of materials, and any further information that may be required by the Contract Administrator.
- (b) The enclosed deck hoarding shall be designed by a Professional Engineer registered in the Province of Manitoba and constructed to the following requirements:
 - (i) Sufficient clearances shall be provided to enable the placing and finishing the structural deck concrete to proceed unhindered inside the hoarding.

E26.4.8 Concrete Structural Deck Pour Sequence and Schedule

- (a) The Contractor shall submit to the Contract Administrator for review, at least ten (10) Business Days prior to the placement of concrete, details of the construction joints.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to scheduled commencement of concrete placement, the proposed concrete placement schedule for all other structural concrete placements of this Specification.

E26.5 Materials

E26.5.1 General

- (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.

E26.5.2 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with the latest edition and all subsequent revisions of CAN/CSA-A23.1.

E26.5.3 Concrete

- (a) Concrete materials susceptible to frost damage shall be protected from freezing.
- (b) Concrete shall have nominal compressive strengths (f'_c) and meet the requirements for hardened concrete as specified in the following Table E26.1.

TABLE E26.1 REQUIREMENTS FOR HARDENED CONCRETE							
Type of Concrete	Location	Nominal Compressive Strength MPa	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Minimum Post Residual Cracking Index
Type 1	Structural Deck, Approach Slabs,	45 @ 28 Days	C-XL	1	20 mm	Synthetic Fibers	0.15

	Sidewalk, Barriers						
Type 2	Reinforced Transition Slab and Footing, Wingwalls, Abutments and Backwalls	35 @ 28 Days	C-1	1	20 mm	-	-
Type 3	Structural Backfill	CW 2160-RT Flowable Cement – Stabilized Fill					

E26.5.4 Working Base Concrete

- (a) Working base concrete shall be placed in the locations as shown on the Drawings.
- (b) The Contractor shall construct a working base concrete slab as shown on the Drawings to provide a stable, clean and level working area for subsequent operations required to construction Works as shown on the Drawings.

E26.5.5 Aggregates

(a) General

- (i) All aggregates shall be handled to prevent segregation and inclusion of any foreign substances, and to obtain uniformity of materials. The two sizes of coarse and fine aggregates, and aggregates secured from different sources, shall be piled in separate stockpiles. The site of the stockpiles shall be cleaned of all foreign materials and shall be reasonably level and firm or on a built-up platform. If the aggregates are placed directly on the ground, material shall not be removed from the stockpile within 150 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.
- (ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA Standard Test Method A23.2-27A. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA Standard Test Method A23.2-1 4A or CSA A23.2-25A is required.
- (iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.

(b) Fine Aggregate

- (i) Fine aggregate shall meet the grading requirements of CAN/CSA A23.1, Table 10, FA1, be graded uniformly and not more than 3% shall pass a 75 um sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.
- (ii) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12.

(c) Coarse Aggregate - Standard

- (i) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CAN/CSA A23.1, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 um sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.

- (ii) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, an excess of thin particles or any other extraneous material.
- (iii) Course aggregate when tested for abrasion in accordance with the requirements of the ASTM C131 shall not have a loss greater than 30%.
- (iv) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

E26.5.6 Admixtures

- (a) Air-entraining admixtures shall conform to the requirements of ASTM C260.
- (b) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.
- (c) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators and air-reducing agents, will not be permitted, unless otherwise approved by the Contract Administrator.

E26.5.7 Cementitious Materials

- (a) Cementitious materials shall conform to the requirements of CAN/CSA A3001 and shall be free from lumps.
- (b) Should the Contractor choose to include a silica fume admixture in the concrete mix design, the substitution of silica fume shall not exceed 8% by mass of cement.
- (c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class CI or F and the substitution shall not exceed 30% by mass of cement.
- (d) Cementitious materials shall be stored in a suitable weather-tight building that shall protect these materials from dampness and other destructive agents. Cementitious materials that have been stored for a length of time resulting in the hardening, or the formation of lumps, shall not be used in the Work.

E26.5.8 Water

- (a) Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall conform to the requirements of CAN/CSA A23.1 and shall be free of oil, alkali, acidic, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

E26.5.9 Corrosion Inhibitor

- (a) Corrosion inhibitor shall be MCI 2005 NS at a dosage of 1 L/m³, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E26.5.10 Synthetic Fibres

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

E26.5.11 Formwork

- (a) Formwork materials shall conform to CAN/CSA A23.1, and American Concrete Publication SP4, "Formwork for Concrete."
- (b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121-M1978, a minimum of 20 mm thick.
- (c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CAN/CSA "O121". Approved Manufacturers are "Evans" and "C-Z."

- (d) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.
- (e) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a nonrusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.
- (f) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.
- (g) 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.
- (h) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.
- (i) Stay-in-place formwork or false work is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E26.5.12 Form Coating

- (a) Form coating shall be "Sternson C.R.A." by Sternson, "SCP Strip Ease" by Specialty Construction Products, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E26.5.13 Permeable Formwork Liner

- (a) Formwork liner shall be Texel Drainaform, Hydroform, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes". This formwork liner shall be used on all exposed substructure and superstructure formed surfaces, except soffit surfaces, or where a normal form finish is specified.
- (b) Paper-lined forms shall be used on all soffit surfaces, such as structural deck overhangs. The Contractor shall provide conclusive evidence that the paper-lined form proposed for use will not stain or otherwise blemish the hardened concrete surface.

E26.5.14 Curing Compound

- (a) Curing compound shall conform to the requirements of ASTM C309, either Type D with fugitive dye or Type 2.
- (b) Type 2 shall only be used on surfaces that will not be exposed to view.

E26.5.15 Curing Blankets

- (a) Curing blankets for wet curing shall be 100 percent polyester, 3 mm thick, white in colour. An approved product is "Mirafi Geotextile P150". Alternately, a 10 oz burlap, 5 mil polyethylene, curing blanket white in colour shall be used; "Curelap" manufactured by Midwest Canvas, together with a second layer of burlap, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E26.5.16 Bonding Agents

- (a) Latex Bonding Agent
 - (i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes". Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than 28 days in age.
- (b) Bonding Grout
 - (i) The grout for bonding the structural deck concrete to the precast concrete girders shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:
 - (i) 1 part water;
 - (ii) 1 part latex bonding agent; and

- (iii) 1 1/2 parts Type GUSF Portland cement.
- (ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E26.5.17 Epoxy Adhesive

- (a) Epoxy adhesive for bonding concrete to steel shall be one of the following approved products: Sternson ST432 or ST433, Dural Duralbond, Capper Capbond E, Sikadur 32 Hi-bond, Concrecive 1001 LPL, Meadows Rezi-Weld 1000, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E26.5.18 Epoxy Grout

- (a) Epoxy grout shall be one of the following approved products: Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E26.5.19 Cementitious Grout

- (a) Cementitious grout shall be nonshrink and non-metallic. Approved products are Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes". The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E26.5.20 Patching Mortar

- (a) Patching mortar shall be made of the same material and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2 parts sand by damp loose volume. White Portland Cement shall be substituted for a part of the grey Portland Cement on exposed concrete in order to produce a colour matching the colour of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling or placing.

E26.5.21 Flexible Joint Sealant

- (a) 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".

E26.5.22 Fibre Joint Filler

- (a) Fibre joint filler shall be rot-proof and of the preformed, nonextruding, resilient type made with a bituminous fibre 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".

E26.5.23 Precompressed Foam Joint Filler

- (a) Precompressed foam joint filler shall be "Emseal BEJS System" where shown on the drawings, satisfying the requirements of ASTM C711 and G155, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".
- (b) Precompressed foam joint filler shall be used around roadway approach slabs and approach sidewalks, and shall be used also between barrier joints.
- (c) The sealant system shall be comprised of three components:
 - (i) Cellular polyurethane foam impregnated with hydrophobic 100% acrylic, waterbased emulsion, factory coated and highway-grade, fuel resistant silicone;

- (ii) Field applied epoxy adhesive primer; and
 - (iii) Field injected silicone sealant bands.
- (d) 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.
- (e) Material shall be capable, as a dual seal, of movement 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.
- (f) 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 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 capacity (+50% nominal material size) within twenty-four (24) hours at 20°C.

E26.5.24 Ethafoam Joint Filler

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

E26.5.25 Low Density Styrofoam

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

E26.5.26 Backup Rod

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

E26.5.27 Void Form

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

E26.5.28 Screed Bases and Chairs

- (a) Screed bases shall be Hilti HAS 304 stainless steel threaded rods, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".
- (b) Screed chairs shall be Mega Screed as supplied by Brock White Canada Company, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E26.5.29 Dampproofing

- (a) Dampproofing materials shall be applied to all buried concrete surfaces in contact with the soil to within 300 mm of Finished Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Dampproofing materials shall be mineral colloid emulsified asphalt complying with Canadian General Standards Board Specification No. 37.16-M89. Acceptable product is Bakelite/Flintguard 710-11 Foundation Coating as manufactured by BAKOR, Elsro Fibrated Foundation Coating, Insulmastic 7103 Fibered Waterproofing, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".
- (b) All damaged concrete, including tie holes to be filled with non-shrink grout prior to application of dampproofing.
- (c) Primer for dampproofing shall be asphalt primer, penetrating type conforming to CGSB 37-GP-9Ma. Acceptable products are BAKOR Penetrating 910-01 Asphalt Primer as manufactured by BAKOR Inc., Elsro Asphalt Primer No. 510, Insulmastic 7501 C/B Roof

& Foundation Primer, or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E26.5.30 Anchor Units for Chain Link Fence

- (a) Anchor units for the aluminum pedestrian handrail shall be National Concrete Accessories 20mm Type DGR-1 135x135x300mm, hot dip galvanized with 20mm bolts or equal as accepted by the Contract Administrator, in accordance with B7 "Substitutes".

E26.5.31 PVC Pipe

- (a) PVC pipes are to be Schedule 40 PVC pipe or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E26.5.32 Screen on PVC Pipe

- (a) The screens shall be Type 316 stainless steel 13mm mesh and be 200 by 200mm or equal as accepted by the Contract Administrator, in accordance with B7, "Substitutes".

E26.5.33 Miscellaneous Materials

E26.5.34 Benchmark Plugs

- (a) Benchmark plugs shall be supplied by the City. Installation by the Contractor shall be considered incidental to these Works. Installation locations shall be shown on all Drawings.

E26.6 Equipment

E26.6.1 General

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

E26.6.2 Vibrators

- (a) The Contractor shall have sufficient numbers of internal concrete vibrators and experienced operators on site to properly consolidate all concrete in accordance with ACI 309. The type and size of vibrators shall be appropriate for the particular application, the size of the pour, and the amount of reinforcing and shall conform to standard construction procedures.
- (b) The Contractor shall use rubber coated vibrators for consolidating concrete containing epoxy-coated reinforcing steel and stainless steel reinforcing, such as in locations that the existing deck reinforcing is exposed.
- (c) The Contractor shall have standby vibrators available at all times during the pour.

E26.6.3 Placing and Finishing Equipment for Bridge Deck Concrete

(a) Placing Equipment

- (i) Adjacent exposed deck reinforcing steel shall be adequately protected during concrete placement.

(b) Screed for Structural Deck Concrete

- (i) The Contractor may choose to use a mechanical or non-mechanical screed to strike the surface of the structural deck concrete.
- (ii) Screed rails are required and shall be sufficient in number and length to ensure that the concrete cover is maintained and the finished elevation of the structural deck concrete meets the design elevations.
- (iii) Screed guides shall be placed and fastened in position to ensure finishing of the concrete to the required profile. Supporting rails, upon which the finishing machine travels, shall be placed outside the area to be concreted. Provisions for anchorage of supporting rails shall provide for horizontal and vertical stability; positive anchorage may be required by the Contract Administrator. A hold-down

device shot into concrete will not be permitted, unless the concrete is to be subsequently resurfaced.

- (iv) The mechanical screed on guides or rails shall be supported so that they are completely clear of the finished surface.
 - (v) Internal vibration of the concrete will be required with mechanical screeding. Care shall be taken not to overwork the concrete surface.
 - (vi) Care shall be taken to ensure that the screed bars are seated uniformly on the screed chairs and that the ends of the screed bars do not overhang the screed chairs by more than 75 mm.
 - (vii) Screed surface touching concrete shall not be made of aluminum (magnesium acceptable).
 - (viii) The supply, setup, operation, and takedown of the screed for structural deck concrete shall be considered incidental to the placement of the structural deck concrete. No separate measurement or payment shall be made for this Work.
- (c) Moveable Work Bridges for Structural Deck Concrete
- (i) At least two moveable Work Bridges will be required (one for finishing operations and one for curing operations), independent of the screeding and finishing machines for the structural deck concrete.
 - (ii) These moveable Work Bridges shall travel guided on rails supported clear of the finished structural deck.
 - (iii) The Contractor shall install a sturdy walkway with safety railing on each side of the Work area for the purpose of providing access to the Work Bridge.
 - (iv) The supply, set up, operation, and takedown of the moveable Work Bridges shall be considered incidental to the placement of the Bridge Deck concrete. No separate measurement or payment shall be made for this Work.
- (d) Enclosed Deck Hoarding
- (i) The roof of the hoarding shall be checked for damage before each concrete pour, and all repairs shall be made, as required, before concrete placing will be allowed to begin. The roof and sides shall be sealed to contain heat within the space at levels required to pour and cure all areas of the concrete surface. Temperature test shall be completed in all corners to the satisfaction of the Contract Administrator.
 - (ii) Heating equipment shall be able to produce constant heat and be maintained by a thermostatic controls capable of producing and maintaining temperature between 10°C and 20°C for extended periods. Multiple thermocouples shall be placed within the concrete to ensure the concrete temperatures are being maintained as temperature readings forwarded to the Contract Administrator. Gas fired heating equipment be provide forced heated air, shall be vented outside. There shall be a minimum of two units operating at any given time and backup units shall be on site.

E26.6.4 Placing and Finishing Equipment for Sidewalk Slab Concrete

(a) Sidewalk Slab Hoarding

- (i) The sidewalk slab hoarding shall consist of opaque panels which shall be placed over the sidewalk slab following finishing operations to protect concrete until curing blankets can be applied without marring the surface of the concrete.
- (ii) The supply, setup, and takedown of the sidewalk slab hoarding shall be considered incidental to the placement of the sidewalk slab concrete. No separate measurement or payment shall be made for this Work.

E26.6.5 Placing and Finishing Equipment for Approach Slab Concrete

(a) Mechanical Screed for Approach Slab Concrete

- (b) The mechanical screed shall be:
 - (i) Constructed to span the full width of the approach slab being placed;
 - (ii) Supported on screed rails positioned above the surface being screeded;
 - (iii) Sufficiently strong (truss type) to retain its shape under all working conditions, especially if any Work scaffolds are supported on the same screed rails;
 - (iv) Capable of producing the required flatness tolerance as specified
 - (v) The supply, setup, operation, and takedown of the movable mechanical screed shall be considered incidental to the placement of the approach slabs, and no separate measurement or payment shall be made for this Work.
- (c) Movable Work Bridge for Approach Slab Concrete Works
 - (i) The Contractor shall provide a movable Work Bridge, spanning the approach slab at right angles to the centreline of roadway in order to facilitate a broom finish, the application of curing compound, the inspection of the freshly-placed concrete, and any remedial Work required to be done to the screeded surface, including filling in any holes left by the screed bars. After the surface has been screeded, all further Work that may be required shall be done from the Work Bridge.
 - (ii) The Contractor shall install a sturdy walkway with safety railing on each side of the Work area, as required, for the purpose of providing safe access to the Work Bridge.
 - (iii) The supply, setup, operation, and takedown of the movable Work Bridge shall be considered incidental to the placement of the approach slabs, and no separate measurement or payment shall be made for this Work.

E26.7 Construction Methods

E26.7.1 General

- (a) It is intended that this Section cover all construction Work associated with Structural Concreting operations.

E26.7.2 Temporary False Work, Formwork, and Shoring

- (a) Construction Requirements
 - (i) Temporary false work, formwork, and shoring shall satisfy all requirements of the Navigable Waters Protection Program.
 - (ii) The Contractor shall construct false work, formwork and shoring for the new structural deck concrete overhangs strictly in accordance with the accepted sealed Shop Drawings.
 - (iii) All forms shall be of wood, metal or other materials as approved by the Contract Administrator. No formwork shall extend beneath the underside of the girders.
 - (iv) The false work, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the accepted sealed Shop Drawings.
 - (v) Forms shall be constructed and maintained so that the completed Work is within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.
 - (vi) Formwork shall be cambered, where necessary to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.
 - (vii) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be formed or set in coordination and cooperation with the trade concerned. No openings shall be made in structural members that are not shown on the Shop Drawings without the prior written approval of the Contract Administrator.

- (viii) Shores shall be provided with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.
 - (ix) Mud sills shall not be used
 - (x) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.
 - (xi) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.
 - (xii) Formwork shall have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
 - (xiii) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.
- (b) Form panels shall be constructed so that the contact edges are kept flush and aligned.
 - (c) Forms for the concrete barriers shall be accordingly aligned to each other and to the geometry shown on the Drawings so as to provide a smooth, continuous barrier. Any misalignments in the barrier shall be cause for rejection and removal of same. No snap ties within the barriers shall be placed below 250 mm above the top of the upper lift elevation.
 - (d) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against absorption of moisture from the concrete by a field applied form coating or a factory applied liner as accepted by the Contract Administrator.
 - (e) Where prefabricated panels are used, care shall be taken to ensure that adjacent panels remain flush. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface.
 - (f) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 30 mm in diameter. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in colour.
 - (g) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.
 - (h) It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and their decision shall be final regarding the use of them again.
 - (i) Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two panels of representative samples of the forms he proposes for reuse and shall strip them after forty-eight (48) hours for the Contract Administrator to judge the type of surface produced.
 - (j) All form lumber, studding, etc., becomes the property of the Contractor when the Work is finished, and it shall be removed from the concrete and the site by the Contractor after the concrete is set, incidental to the Work of this Specification, and the entire site shall be left in a neat and clean condition.

E26.7.3 Concrete Construction Joints

- (a) Concrete construction joints shall be located only where shown on the Drawings or as otherwise directed in writing by the Contract Administrator. Concrete construction joints

shall be formed at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints.

- (b) Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.
- (c) After the forms are stripped off the construction joint, the entire face of the joint, including the reinforcing steel, shall be thoroughly cleaned down to sound concrete and the surface roughened.
- (d) Refer to, E26.7.11, "Preparation for Concreting Against Hardened Concrete", for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E26.7.4 Bridge Deck Screeds

(a) Setting Deck Screeds

- (i) The Contractor shall adjust screeds to maintain slab thickness as noted on the Drawings. Adjust screed heights to plan elevations or to such other elevation as may be determined by the Contract Administrator in the field. Screed bases shall be anchored to the formwork and shall be adjustable to achieve the required elevations.
- (ii) The screed chairs and screed rail supports shall be spaced to prevent deflections of the screed bars or screed rails during screeding operations.

E26.7.5 Anchor Units for Bridge Aluminum Barrier Rail

- (a) All anchor units shall be installed as shown on the Drawings.
- (b) All anchor units shall be held securely in place so as not to become displaced during concrete placement operations.
- (c) The Contractor shall coordinate the installation of aluminum pedestrian handrail posts as described in E27, "Bridge Aluminum Barrier Rail".

E26.7.6 Anchor Units for Bridge Chainlink Fence

- (a) All anchor units shall be installed as shown on the Drawings.
- (b) All anchor units shall be held securely in place so as not to become displaced during concrete placement operations.
- (c) The Contractor shall coordinate the installation of the chain link fence posts as described in E28 "Chain Link Fence on the Bridge".

E26.7.7 Permeable Formwork Liner

- (a) Permeable formwork liner shall be used on all exposed vertical surfaces, unless otherwise noted on the Drawings.
- (b) The permeable formwork liner shall be used for only one (1) application.
- (c) The supply, setup, application, and removal of permeable formwork liner shall be considered incidental to the placement of structural concrete, and no separate measurement or payment shall be made for this Work.

E26.7.8 Benchmarks

- (a) The Contractor shall install benchmark plugs supplied by the Contract Administrator at such locations on the structure as may be directed by the Contract Administrator.

E26.7.9 Structure Identification Date

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

E26.7.10 Supply of Structural Concrete

- (a) All structural concrete shall be supplied from a plant certified by the Concrete Manitoba. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.
- (b) All mixing of concrete must meet the provisions of CAN/CSA A23.1, Clause 5.2, Production of Concrete.
- (c) Time of Hauling
 - (i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.
 - (ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement 24 hours prior to the scheduled placing of concrete.
 - (iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.
 - (iv) Unless otherwise noted in Table E26.1, "Requirements for Hardened Concrete", no retarders shall be used.
 - (v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CAN/CSA A23.1 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers' designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.
 - (vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the City upon request.
- (d) Delivery of Concrete
 - (i) The Contractor shall satisfy himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of re-handling, and without damage to the structure or the concrete.
- (e) Concrete Placement Schedule
 - (i) The Contractor shall submit to the Contract Administrator the proposed concrete placement schedule for all concrete placements for review and approval. If, in the opinion of the Contract Administrator, the volume of the placement is deemed larger than can be placed with the facilities provided, the Contractor shall either:
 - (i) Limit the amount to be placed at any time (using adequate construction joints);

- (ii) Augment his facilities and Plant in order to complete the proposed placement;
- (iii) In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting; and
- (ii) The Contractor shall adhere strictly to the concrete placement schedule, as approved by the Contract Administrator.

E26.7.11 Preparation for Concreting Against Hardened Concrete

- (a) All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:
 - (i) Concrete shall be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris.
 - (ii) All existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residues.
 - (iii) Immediately prior to placing new concrete, bonding grout shall be thoroughly brushed onto the entire surface of the existing hardened concrete in a thin and even coating that will not run or puddle.
 - (iv) For the Bridge traffic and median barriers, during concreting of the structural deck, the top surface of the concrete shall be roughened using a small rake running longitudinally between barrier dowels.

E26.7.12 Placing Structural Concrete

- (a) General
 - (i) The Contractor shall notify the Contract Administrator at least one (1) Working day prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, movable hoarding, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.
 - (ii) The Contractor shall conduct a dry run of the screed machine in the presence of the Contract Administrator to verify that the screed supporting rails are properly set to ensure compliance with the specified longitudinal and transverse deck grades. Sufficient screed supporting guide rails to provide the required coverage for the entire pour, as approved by the Contract Administrator, shall be set out and adjusted for height at least one (1) Working Day prior to the proposed pour. The Contract Administrator will verify that the screed machine and screed rails have been adjusted so that the height of the screed above the existing concrete at each point meets the requirements. To confirm the Contractor's adjustments of the machine and screed rails, the screed machine shall be "dry run", and screed clearance measurements taken at each support point by the Contractor. Resetting of the machine and/or screed rails shall be done by the Contractor as required by the Contract Administrator.
- (b) Placing Structural Concrete
 - (i) The nomograph, Figure D1, Appendix D of CAN/CSA A23.1 shall be used to estimate surface moisture evaporation rates.
 - (ii) 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.
 - (iii) 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.

- (iv) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.
- (v) 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.
- (vi) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or "cold joints" within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.
- (vii) When the Contractor chooses to pump the concrete, the operation of the pump shall produce a continuous flow of concrete without air pockets. The equipment shall be arranged such that vibration is not transmitted to freshly placed concrete that may damage the concrete. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.
- (viii) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (ix) The maximum free drop of concrete into the forms shall not be greater than 1.5 m, otherwise rubber tubes or pouring ports spaced not more than 1.5 m vertically and 2.5 m horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.
- (x) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7000 revolutions per minute immersed.
- (xi) Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally 300 to 900 mm). Apply the vibrator at any point until the concrete is sufficiently compacted (5 to 15 seconds), but not long enough for segregation to occur. The vibrators shall be inserted vertically and withdrawn out of the concrete slowly. Spare vibrators in good working condition shall be kept on the job site during all placing operations.
- (xii) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.
- (xiii) Before any concrete is placed for the approach slabs the Bridge structural deck or the sidewalk slab, the Contractor shall demonstrate to the satisfaction of the Contract Administrator before each pour that all necessary adjustments have been made to provide the required camber, crown, slab thickness, and concrete cover. This demonstration may be carried out by means of an attachment securely fastened to the finisher's strike-off machine and moving the machine and the strike-off across the deck over the reinforcing steel with a minimum 3 mm clearance between the steel and attachment.

E26.7.13 Finishing of Concrete Surfaces

(a) Finishing Operations for Unformed Surfaces

- (i) The Contractor shall ensure that sufficient personnel are provided for the finishing of the slab surfaces. In the event that the depositing, vibrating, and screeding operations progress faster than the concrete finishing, the Contractor shall reduce the rate of concrete placement or cease the depositing of concrete until the exposed area of unfinished concrete has been satisfactorily minimized. The Contract Administrator's judgement in this matter shall be final and binding

on the Contractor. All loads of concrete that exceed the 120 minute discharge time limit during the delay, while the finishing operations catch up, shall be rejected.

(b) Type 1 Finish – 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, but excluding soffit surfaces.
- (ii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.
- (iii) The surfaces shall be patched as specified in this Specification with surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of Sections E26.5.20 “Patching Mortar”, E26.5.16 “Bonding Agents”, and E26.7.17 “Patching of Formed Surfaces” of this Specification.
- (iv) All surfaces below 300 mm below finish grade shall receive dampproofing in accordance with E26.5.29, “Dampproofing” of this Specification.

(c) Type 2 Finish – Unformed Surfaces

- (i) All unformed concrete surfaces, with the exception of the approach, transition and deck concrete slabs 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.

(d) Type 3 Finish – Approach and Deck Concrete Slabs

- (i) 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. The tine device shall consist of a single line of flat, slightly flexible, tempered steel tines, spaced 15 mm apart. The tine width shall be 3.2 mm. Texturing is to be applied while the concrete is still plastic enough to obtain a depth of at least 3.2 mm but not more than 6.4 mm. The tine texture shall be obtained by one continuous pass of the device for the full width of pavement being textured.

(e) Type 4 Finish – Transition Slab and Sidewalk

- (i) Transverse broomed finish using a coarse broom to produce regular corrugations to a maximum depth of 3 mm.
- (ii) An edging tool shall be used at all edges, as accepted by the Contract Administrator.
- (iii) Edges of sidewalk surfaces shall be given a smooth float surface using a magnesium float.

(f) Working Base Concrete Finish

- (i) During placing, concrete working base shall be vibrated, screeded and floated.
- (ii) The supply, set up, operation, and finishing of working base concrete shall be considered incidental to the placement of working base concrete, and no separate measurement or payment shall be made for this Work.

E26.7.14 Surface Defects and Tolerances

- (a) The surface shall be free from open texturing, plucked aggregate and local projections.
- (b) Except across the crown, the surface shall be such that when tested with a 3 metre long straight edge placed anywhere in any direction on the surface, there shall not be a gap greater than 3 mm between the bottom of the straight edge and the surface of the deck anywhere below the straight edge.
- (c) The surface shall be checked by the Contractor, as described above, immediately after final bull floating and before texturing.
- (d) After checking and correcting of screeded surfaces has been completed, the marks in the screeded surfaces caused by the use of the straight edge shall be removed.
- (e) The surface shall again be checked by the Contractor at the end of the curing period in the same manner and to the same tolerance. Areas that do not meet the required surface accuracy shall be clearly marked out and the Contractor shall repair the concrete surface by one of the following methods, at his own expense:
 - (i) Grind down any areas higher than 3 mm but not higher than 10 mm above the correct surface,
 - (ii) Correct any areas lower than 3 mm but not lower than 10 mm below the correct surface, by grinding down the adjacent high areas, or
 - (iii) When the deviation exceeds 10 mm from the correct surface, the deck slab shall be replaced for a length, width and depth that will allow the formation of a new slab, of the required quality, in no way inferior to the adjacent undisturbed slab.
- (f) Grinding shall be carried out by an approved machine, of a type and capacity suitable for the total area of grinding involved, until the surface meets the specified requirements.
- (g) All corrective work will require the Contractor to submit a proposal to the Contract Administrator for review, prior to commencement of any work.
- (h) If the surface is damaged in any way by construction operations, or if the deck concrete shows signs of distress or scaling prior to the final acceptance, it shall be repaired or replaced by the Contractor at his own expense.

E26.7.15 General Curing Requirements

- (a) Refer to E26.7.18, "Cold Weather Concreting" for cold weather curing requirements and E26.7.19, "Hot Weather Concreting" of this Specification for hot weather curing requirements.
- (b) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping, running water, vibration, and mechanical shock. No machinery shall travel in the vicinity of freshly placed concrete for a period of 24 hours. Concrete shall be protected from freezing until at least 24 hours after the end of the curing period.
- (c) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3°C in one hour or 20°C in 24 hours.
- (d) The use of curing compound shall not be allowed.
- (e) Freshly finished concrete shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only. Water shall be applied as necessary to keep the concrete and curing blankets saturated. The Contractor must ensure the concrete and curing blankets are kept saturated with water for the entire seven (7) days.
- (f) Immediately following finishing of the structural deck, approach and transition slab concrete, apply fog misting until the concrete has enough strength to support the placement of the pre-dampened curing blankets. The misting device shall not be used to apply water to the concrete's surface for finishing purposes. The misting device shall not be directed towards the concrete surface. Only a fine coating or sheen should be applied by the misting device. There should be no standing water. Failure to apply wet curing blankets within 40 minutes after the structural deck concrete has been deposited shall be

cause for rejecting the Works so affected. Concrete in the rejected area shall be removed and replaced at no additional cost to the City.

- (g) Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator. Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the Bridge deck overhang surfaces.
- (h) For curing of barriers, formwork shall remain in place for seven (7) consecutive days in accordance with E26.7.16, "Form Removal". The top surface of the concrete surface shall be moist cured during this timeframe in accordance with E26.7.15(e).

E26.7.16 Form Removal

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written acceptance of the Contract Administrator.
- (b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.
- (c) Notwithstanding the above, the minimum strength of in-place concrete prior to removal of vertical forms shall be 70% percent of the 28 day strength, with the added provision that the member shall be of sufficient strength to safely carry its own weight, together with super-imposed construction loads..
- (d) Field-cured test specimens representative of the cast-in-place concrete being stripped shall be tested as specified in this Specification to verify the concrete strength.

E26.7.17 Patching of Formed Surfaces

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to removal of forms. Immediately after forms have been removed and before the Contractor commences any surface finishing or concrete patching operations, all newly exposed concrete surfaces shall be inspected by the Contract Administrator.
- (b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.
- (c) Patching of formed surfaces shall take place within 24 hours of formwork removal.
- (d) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 mm from the surface before patching.
- (e) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.
- (f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.

- (g) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

E26.7.18 Cold Weather Concreting

- (a) All concreting operations during cold weather shall be completed in accordance with CAN/CSA-A23.1 "Cold Weather Concreting".
- (b) Heating and hoarding is to remain in place a minimum of 7 days after the moist curing is removed.

E26.7.19 Hot Weather Concreting

(a) General

- (i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.
- (ii) Concrete at discharge shall be at as low a temperature as possible, preferably as low as 15°C, but not above 25°C. Concrete containing silica fume shall be between 10°C minimum and 18°C maximum at discharge. Aggregate stockpiles should be cooled by water sprays and sun shades.
- (iii) The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water; provided it has melted by the time mixing is completed.
- (iv) Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.
- (v) Sun shades and wind breaks shall be used as required during placing and finishing.
- (vi) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".
- (vii) The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water reducing agents to maintain Workability and strength, and these must appear in the Mix Design Statement submitted to the Contract Administrator.
- (viii) Hot weather curing shall follow immediately after the finishing operation.

(b) Hot-Weather Curing

- (i) When the air temperature is at or above 25°C, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation. Note that fog misting is mandatory for all structural deck and median slab pours at all temperatures.
- (ii) Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20°C, in order to minimize the temperature rise of the concrete.

(c) Job Preparation

- (i) When the air temperature is forecast to rise to 25°C or higher during the placing period, provisions shall be made by the Contractor for protection of the concrete in place from the effects of hot and/or drying weather conditions. Under severe drying conditions, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by mist fogging and evaporation, to the satisfaction of the Contract Administrator.

(d) Concrete Temperature

- (i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table E26.2,

“Acceptable Concrete Temperatures”, for the indicated size of the concrete section.

TABLE E26.2: ACCEPTABLE CONCRETE TEMPERATURES		
THICKNESS OF SECTION	TEMPERATURES °C	
	MINIMUM	MAXIMUM
Less than:		
1.0 m	10	27
1.2 m	5	25

E26.7.20 Cleanup

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

E26.8 Concrete Quality

E26.8.1 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) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.

E26.8.2 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.

E26.8.3 Materials

- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Quality Assurance Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.1.
- (c) All testing of materials shall conform to the latest edition and all subsequent revisions of CAN/CSA A23.2.
- (d) All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at their own expense.

E26.8.4 Quality Assurance and Quality Control

- (a) The Contract Administrator shall be afforded full access for the inspection and control and assurance testing of concrete and constituent materials, both at the site of Work and at any plant used for the production of concrete, to determine whether the concrete is being supplied in accordance with this Specification.

- (b) The Contract Administrator reserves the right to reject concrete in the field that does not meet the Specifications.
- (c) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for Quality Assurance tests and provide such assistance and use of tools and construction equipment as is required.
- (d) Quality Assurance and Control tests will be used to determine the acceptability of the concrete supplied by the Contractor.
- (e) The Contractor will be required to undertake Quality Control tests, of all concrete supplied. All test results are to be copied to the Contract Administrator immediately after the tests have been performed.
- (f) The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CAN/CSA A23.1. An outline of the quality tests is indicated below.
- (g) Contract Administrator shall undertake cover metre survey of top of bridge deck and inside face of barriers at sidewalk. Concrete areas with cover not within specified tolerances will be rejected.

E26.8.5 Concrete Testing

- (a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits in E26.4.2, "Concrete Mix Design Requirements" of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.
- (b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E26.4.2, "Concrete Mix Design Requirements" of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.
- (c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the latest edition and all subsequent revisions of ASTM Standard Test Method C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.
- (d) Rapid chloride permeability testing shall be performed in accordance with ASTM C1202 or CAN/CSA A23.2-23C, with testing performed at 56 days for all types of concrete.
- (e) Testing for the post-cracking residual strength index (Ri) of FRC shall be conducted as follows:
 - One (1) set of a minimum of five (5) concrete beam specimens, 100 mm by 100 mm by 350 mm long, shall be tested at 7 days in accordance with the latest edition 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, 0.75 mm, 1.0 mm, 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 to ASTM C1609 will be considered invalid if the initial crack in the specimen has occurred after 0.2 mm deflection.

- The R_i shall be taken as the average of the R_i 's from a minimum of five valid (5) 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.
- (f) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-04, "Sampling Plastic Concrete".
- (g) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C, "Making and Curing Concrete Compression and Flexure Test Specimens".
- (h) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28) day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.
- (i) Compressive strength tests on specimens cured under the same conditions as the concrete Works shall be made to check the strength of the in-place concrete so as to determine if the concrete has reached the minimum allowable working compressive strength as specified in Table E26.1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field cured strength test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E26.8.6 Corrective Action

- (a) If the results of the tests indicate that the concrete is not of the specified quality, the Contract Administrator shall have the right to implement additional testing, as required, to further evaluate the concrete, at the Contractor's expense. The Contractor shall, at their own expense, correct such Work or replace such materials found to be defective under this Specification in an acceptable manner to the satisfaction of the Contract Administrator.

E26.9 Measurement and Payment

E26.9.1 Structural Concrete

Structural concrete will not be measured and will be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, 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.

Items of Work:

Structural concrete:

- (i) Abutments;
- (ii) Wingwalls;
- (iii) Deck Slab;
- (iv) Approach Slabs
- (v) Transition Slabs
- (vi) Sidewalks
- (vii) Barriers

E26.9.2 Enclosed Deck, Approach and Transition Slab Hoarding

Heating concrete, and backfill materials, supplying, setting up, heating operating, maintaining and removing the enclosed hoarding will not be measured and will be

considered incidental to the Contract Lump Sum Price for the "Items of Work" for Structural Concrete.

E27. BRIDGE ALUMINUM BARRIER RAIL

E27.1 Description

- (a) This Specification shall amend and supplement the City of Winnipeg specification CW 3650.

E27.2 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 all anchor units, bolts and washers for the bridge aluminum barrier rails on the concrete traffic barriers.

E27.3 Submissions

- (a) At least ten (10) 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, connections (including proper CSA welding identification), bolt holes, and accessories.

E27.4 Materials

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

E27.5 Measurement and Payment

- (a) Supplying and installing the bridge aluminum barrier rail posts 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 here described and all other items incidental to the Work included in this Specification by the Contract Administrator.

E28. CHAIN LINK FENCE ON THE BRIDGE

E28.1 Description

E28.1.1 The specification shall amend and supplement City of Winnipeg specification CW 3550.

E28.2 Scope of Work

E28.2.1 The Work under this Specification shall involve:

- (a) Supply and installation of chain link fence fastened to the bridge. The fence posts shall be attached to based plates that are bolted to the bridge by bolts to the pre-installed ferrule inserts.
- (b) Supply and installation of the base plates on the fence posts, bolts and fabreeka pads shall be considered incidental to this Work.

E28.3 Submissions

E28.3.1 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.

- E28.3.2 The shop drawings shall consist of three (3) sets of full size prints and one (1) reproducible sepia set, or PDF drawing submitted by email.
- E28.3.3 The shop drawings shall clearly show shapes, dimensions, details, connections, and accessories.
- E28.4 Materials
 - E28.4.1 1.8mm thick Fabreeka pads or equal in accordance with B7 as accepted by the Contract Administrator.
- E28.5 Construction Methods
 - E28.5.1 The fence posts shall be set on the fabreeka pads and bolted to the pre-installed ferrule inserts.
- E28.6 Measurement and Payment
 - E28.6.1 Supplying and Installing the chain link fence on the bridge will not be measured and will be paid for at the Contract Lump Sum Price for "Supply and Install Chain Link Fence", 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.

E29. TIMBER BUMPER FENCE

- E29.1 Description
 - E29.1.1 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary or and incidental to the satisfactory performance and completion of all Work as hereinafter specified.
- E29.2 Materials
 - E29.2.1 The hardware shall be galvanized steel.
 - E29.2.2 The posts and rails shall be treated timber.
- E29.3 Construction Methods
 - E29.3.1 Shop Drawings are to be submitted to the Contract Administrator prior to the Contractor proceeding with the Work. The shop drawings shall state the size and length of all hardware.
 - E29.3.2 The existing timber bumper fence shall be removed in stages. Each existing timber post shall be completely removed. The Contractor shall install the new timber fence posts to the depth and height as shown in the Drawings. The holes shall be backfilled with compacted well graded granular material.
 - E29.3.3 The timber rails shall be installed using the mounting brackets and carriage bolts as shown on the Drawings. All end cuts shall be treated with topical solution.
 - E29.3.4 The Contractor shall ensure that during the period when the bumper fence has been removed, the portion of fence remaining shall have functional electrical plugs able to power vehicle block heaters during the Contract period.
 - E29.3.5 Existing electrical plug ins for vehicle block heater shall be reinstated to match the existing condition prior to the watermain renewal work.
- E29.4 Measurement and Payment
 - E29.4.1 Remove and Replace Timber Bumper Fence will be measured on a length basis and will be paid for at the Contract Unit Price per linear metre for "Remove Bumper Fencing" and "Timber Bumper Fence" which prices 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.

Items also considered incidental to this specification includes supplying and installing the posts, timber rails, electrical, painting, hardware, and backfilling post holes with compacted well graded granular material.

E30. NATURAL SEEDING

E30.1 Description

E30.1.1 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)

SALT TOLERANT GRASS MIX - SPECIES

Chewing's Fescue	Northern Wheatgrass
Creeping Fescue	Side-Oats Grama
Fult's Alkali Fescue	Slender Wheatgrass
Hard Fescue	Western Wheatgrass
Perennial Ryegrass	Little Bluestem

- (iv) Natural Area/Omand's Creek Seed Mix to consist of the following pre-mixed grass seed.

OMAND'S CREEK BANK GRASS MIX - SPECIES

Western Wheatgrass	Tuffed Hairgrass
Slender Wheatgrass	Rough Hair Grass
Fowl Bluegrass	Switch Grass
Canada Wildrye	Cordgrass
Virginia Wildrye	

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

E30.1.2 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.

E30.1.3 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.

E30.1.4 Submittal

- (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.

E30.2 Materials

E30.2.1 Topsoil

- (a) In accordance with E31 and CW 3540

E30.2.2 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.

E30.2.3 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 E32, "Erosion Control Blanket".

E30.2.4 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) Salt Tolerant and 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.

E30.3 Method of Construction

E30.3.1 Growth Media Preparation

E30.3.2 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.

E30.3.3 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 to 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.

E30.3.4 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.

E30.3.5 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.

E30.3.6 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.

City and adjacent landowner 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.

E30.3.7 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 (E30.3.8-E30.3.10).
- (e) Grass will be mechanically seeded using a Truax seed drill to allow for accurate distribution and proper seed coverage. In areas where the Truax cannot reach, a Brillion seed drill will be used. To a much smaller degree, broadcasting methods will be utilized only in areas where equipment cannot reach. All seeding methods require the same seedbed conditions and post-plant maintenance outlined in the specifications.
- (f) Contour seeding must be employed to discourage down slope erosion on sloped areas.
- (g) While on-site, seed requiring short-term storage shall be stored by the Contractor in a secure, dry and rodent-free environment either at or below ambient outdoor temperatures.
- (h) Following seeding, The Contractor shall return to the Contract Administrator the shipment tags from each bag of seed planted on site.

E30.3.8 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.

E30.3.9 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.

E30.3.10 Harrow-Broadcast 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.

E30.4 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.

E30.5 Method of Payment

E30.5.1 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.

E30.5.2 Weed Control is considered a lump sum item. No measurement shall be made.

E30.6 Basis of Payment

E30.6.1 Payment for Installation of Natural Seeding will be measured on an area basis and will be paid for at the Contract Unit Price per square metre for "Natural Seeding". 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 Natural Seeding shall be in accordance with the following:

- (a) Sixty five (65%) percent of quantity following supply and placement.
- (b) Remaining thirty five (35%) percent of quantity following termination of the Acceptance criteria.

E30.6.2 Payment for Installation of Weed Control will be measured on an area basis and will be paid for at the Contract Unit Price per square metre for "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.

E31. TOPSOIL AND FINISH GRADING

E31.1 Description

E31.1.1 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.

E31.1.2 Related Specifications

- (a) Tree Planting
- (b) Natural Seeding

E31.2 Provide submittals in accordance with Specifications.

E31.3 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.

E31.4 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.

E31.5 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.

E31.6 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.

E31.7 Organic Soil Amendments

- (a) Topsoil:

- (i) In accordance with CW3540 and E33.6.
- (b) Peatmoss:
 - (i) Derived from partially decomposed species of Sphagnum mosses.
 - (ii) Elastic and homogeneous, brown to black in colour.
 - (iii) Free from Wood and deleterious material which could inhibit growth; Debris and stones over 12.5 mm diameter.
 - (iv) Shredded particle minimum size: 5 mm.
- (c) Organic matter: compost Category A in accordance with CCME PN1340; unprocessed organic matter such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- (d) Inorganic Soil Amendments
 - (i) Fertilizer: In accordance with the Canada Fertilizers Act and Fertilizers Regulations; compatible with the seed mix and soil conditions.
 - (ii) Fertility: major soil nutrients present in following amounts:
 - (i) Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - (ii) Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
 - (iii) Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
 - (iv) Calcium, magnesium, sulfur and micro nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - (iii) pH value: 6.5 to 8.0.
- (e) Sand: washed coarse silica sand, medium to course textured.
- (f) Limestone:
 - (i) Ground agricultural limestone.
 - (ii) Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

E31.8 Temporary Erosion and Sediment 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.

E31.9 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.

E31.10 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.

E31.11 Placing and Spreading of Topsoil

- (a) Place stockpiled topsoil after subgrade meets conditions of E33.10 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.

E31.12 Soil Amendments

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

E31.13 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.

E31.14 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.

E31.15 Cleaning

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

E31.16 Measurement and Payment

E31.16.1 Topsoil and Finish Grading is considered incidental to, Natural Seeding. No payment will be made for Topsoil and Finish Grading.

E32. EROSION CONTROL BLANKET

E32.1 Description

E32.1.1 This Specification covers the supply, installation, and maintenance of erosion control blanket to be installed on areas disturbed during construction and as directed by the Contract Administrator.

E32.2 Materials

E32.2.1 Erosion Control Blanket (ECB)

- (a) Erosion Control Blanket shall be a machine-produced mat of 70% agricultural straw and 30% coconut blanket with a functional longevity of up to 24 months. Suitable products include SC 150 Extended Term manufactured by North American Green, or approved equivalent.
- (b) The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the topside with heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and a maximum 159mm x 159mm mesh and on the bottom side with a lightweight photodegradable polypropylene netting with a maximum 127mm x 127mm mesh. The blanket shall be sewn together on 381mm centres (maximum) with degradable thread.
- (c) ECB shall have the following properties:
 - (i) Matrix 70% Straw Fibre (0.19kg/m²) and 30% Coconut Fibre (0.08kg/ m²).
 - (ii) Netting top side heavyweight photodegradable with UV additives (1.47kg/100m²).
 - (iii) Bottom side lightweight photodegradable minimum netting weight (0.73 kg/100m²).
 - (iv) Degradable thread.

E32.3 Submittals

E32.3.1 The Contractor shall submit all manufacturers' product specifications and recommended installation methods for the proposed erosion control blankets and associated materials to the contract administrator a minimum of 14 days before construction.

E32.4 Construction Methods

E32.4.1 The Contractor shall supply all ECB materials required and store them on site. The installation and maintenance of all ECB will be as directed by the Contract Administrator. The installation will be required only if the outer coffer dam upstream of the culvert is going to be over topped.

E32.4.2 Actual alignment and location of the ECB may be adjusted in the field by the Contract Administrator.

E32.4.3 Erosion Control Blanket – Drainage Channel Installation

- (a) In general excavate a trench 150mm deep by 150mm wide at the upstream end of the drainage channel and leave 300mm of ECB beyond the upslope portion of the trench. Anchor blanket with 200mm long staples in trench as shown on the Drawings. Staples shall be a minimum of 300mm apart. Backfill trench with soil and compact. Apply seed to compacted soil. Fold remaining portion of blanket over sodded soil and secure with staples spaced 300mm (minimum) apart across width of blanket. Starting with the blanket on bottom of drainage channel, roll blanket out in direction of water flow. Securely fasten blanket against soil surface with staples. There shall be a minimum of 0.8 staples per

square metre. Place blankets end over end in the downstream direction and secure overlaps with a double row of staples, staggered 10cm (minimum) apart. There shall be a minimum 10cm to 15cm overlap between blankets in the downstream direction.

- (b) Repeat with blankets along the side slopes of the drainage channel. The overlap between adjacent blankets in the channel side slope direction shall be 50mm to 125mm (depending of blanket type). At the top of the side slope the full length edge of the blanket shall be anchored into a 150mm deep by 150mm wide anchor trench with staples spaced 300mm apart (minimum). The anchor trench shall be backfilled and compacted upon completion of stapling.
- (c) Secure downstream edges of ECB as per manufacturer's specifications and detail drawings.

E32.5 Maintenance

E32.5.1 The areas covered with ECB shall be regularly inspected especially after severe rainfall or storm events, to check for blanket separation or breakage.

E32.5.2 Any damaged or poorly performing areas as the result of storm events shall be replaced/repared immediately. Re-grading of the slope by hand methods may be required in the event of rill or gully erosion.

E32.5.3 Should the Contract Administrator determine that the Contractor has not maintained the erosion control blankets properly or has damaged the blankets from construction activities resulting in sediment releases beyond the work area, the Contractor shall retrieve all sediment that has left the construction area, to the fullest extent possible, at their own cost. As a minimum, the Contractor shall remove all deltas and sediment deposited in drainage ways and re-grade and/or reseed the areas where sediment removal results in exposed soil. The removal and restoration shall take place within 5 working days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and restoration must take place within 5 working days of obtaining access. The Contractor is responsible for contacting all local, regional, provincial, and federal authorities before working in surface waters and for obtaining applicable permits. The Contractor's restoration work to restore property outside of the designated work area shall be at their own cost.

E32.6 Measurement and Payment

E32.6.1 Supplying and placing Erosion Control Blanket will be measured on an area basis and will be paid for at the Contract Unit Price per square metre for "Supply and Install Erosion Control Blanket", 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.

E33. INTERLOCKING PAVING STONES

E33.1 Description

E33.1.1 This Specification shall cover the installation of interlocking paving stones on concrete sidewalk and lean concrete base.

E33.1.2 Referenced Standard Construction Specifications

- (a) CW 3325 – Portland Cement Concrete Sidewalk
- (b) CW 3335 – Installation of Interlocking Paving Stones on a Lean Concrete Base

E33.2 Materials

E33.2.1 Interlocking Paving Stones

- (a) Paving stones for sidewalk bands shall be Barkman Concrete Holland Stone Pavers (200 x200). All pavers to be "Charcoal" in colour.
- (b) Pavers shall be 60mm thick when placed in the sidewalk, and 80mm thick when placed in the roadway.

- (c) Paving stones shall conform to the requirements of CAN3-A231.2, Precast Concrete Pavers.
- (d) Further to CAN3-A231.2.6.1.1, where concrete pavers are shipped for installation before the pavers are twenty-eight (28) days old, the average compressive strength of these pavers at the time of delivery to the work site shall be not less than 40 MPa.

E33.2.2 Other Materials

- (a) Bedding sand shall be in accordance with CW 3335.
- (b) Concrete sidewalk base to be in accordance with CW 3325.

E33.3 Construction Method

E33.3.1 Installation of Paving Stones

- (a) Sidewalk bands shall be installed on a 100 mm concrete sidewalk base, or reinforced concrete pavement, which shall be constructed in accordance with CW 3325.
- (b) Install paving stones on concrete sidewalk with bedding sand in accordance with the Drawings and CW 3335.
- (c) The concrete below the paving stone, as part of the sidewalk with block out for pavers, shall be reasonably smooth such that the sand bedding had a reasonably consistent thickness throughout.

E33.4 Measurement and Payment

E33.4.1 Supply and installation of interlocking paving stones shall be measured on an area basis. The amount to be paid for shall be the total number of square metres of paving stones supplied and installed in accordance with this Specification and the Drawings and accepted by the Contract Administrator. Supply and Installation of Paving Stones shall be paid for at the Contract Unit Price for "Interlocking Paving Stones", which price shall be payment in full for the supply of all materials and for performing all operations required to complete the work as specified.

- (a) No measurement or payment will be made for bedding sand. Bedding sand shall be included in the price paid for "Interlocking Paving Stones".
- (b) Supply and installation of 100 mm concrete sidewalk base shall be measured and paid for in accordance with CW 3325.

E34. HYDRO EXCAVATION

E34.1.1 Description

E34.1.2 This specification covers the removal of earthen material immediately adjacent to underground utilities infrastructure by means of high-pressure water spray, and the recovery of evacuated material by vacuum type means or equivalent method as approved by the Contract Administrator. It is to be used to excavate the material over the utility line and not used as confirming utility elevations/ exploratory to find utilities.

E34.2 Equipment

E34.2.1 Hydro Excavation unit shall be capable of maintaining a minimum working pressure of 10,000 psi, at a rate of 10 to 12 gallons per minute. Unit should be adjustable, so as to provide adequate pressure to remove earthen material identified by the Contract Administrator.

E34.2.2 Spray head shall be equipped with a rotating nozzle, in order to provide a wider path of cut.

E34.3 Construction Methods

E34.4 Hydro-Removal of Earthen Material

E34.4.1 Earthen material adjacent to utility entity shall be sprayed with high pressure water so as to remove all such material identified by the Contract Administrator.

E34.5 Recovery of Excavated Material

E34.5.1 The recovery of excavated material shall be done using a vacuum type method, or other type of method approved by the Contract Administrator.

E34.5.2 The recovery of material shall follow immediately behind the excavation, to avoid excavated areas from filling with excavated material.

E34.5.3 The use of mechanical sweepers will not be allowed.

E34.5.4 Depose of material in accordance with Section 3.4 of CW-1130.

E34.6 Backfill of Hydro Excavated Hole

E34.6.1 The Contractor shall be responsible for the backfill of the hydro excavated hole upon the completion of the Work described herein, to the approval of the Contract Administrator.

E34.7 Measurement and Payment

E34.7.1 Hydro Excavation of earthen material will be measured on an hourly basis and paid for at the Contract Unit Price per hour for "Hydro Excavation". The hours to be paid for will be the total number of hours of Hydro Excavation in accordance with this Specification, accepted and measured by the Contract Administrator.

E35. WORKING NEAR RAIL

E35.1 General Requirements

E35.1.1 The Contractor shall be responsible to meet all railway company, Canadian Pacific Railway (CP), constraints, requirements, and safety measures.

E35.1.2 Prior to commencement of roadworks within the Rail right-of- way the Contractor is responsible to coordinate a kick-off meeting with CP to determine limits of Work Foul of Track.

E35.2 Description of Work

E35.2.1 CP will be responsible for any Works on the railway crossing to the limit of 300mm outside the end of railway tie. The Contractor will be responsible to tie into the railway crossing with required resurfacing roadworks. The intended detailed railway crossing shall be City of Winnipeg SD-230.

E35.2.2 All sections of Appendix 'D' covering railway requirements apply.

E35.3 CP Requirements

E35.3.1 CP requirements are included in Appendix 'D'. The Contractor is advised that the requirements are applicable to all of the Contractor's personnel and equipment crossing CP tracks and property.

E35.4 Railway Flagging Costs

E35.4.1 The railway company will provide a Protecting Foreman for the protection of the railway's plant and equipment and no cost shall be borne by the Contractor. No measurement for payment will be made for performing all operations herein described and all other items incidental to the Work described.

E35.4.2 The Contractor shall coordinate work so as to limit operations requiring railway flagging, to minimize these costs to the project to the satisfaction of the Contract Administrator. Railway flagging costs identified by the Contract Administrator to be a result of poor coordination shall be borne by the Contractor.

E35.5 Working Within the Rail Right-of-Way

E35.5.1 The Contractor shall minimize the time working within the rail right-of-way. The Contractor shall only enter the right of way for;

- (a) Construction of the new rail crossing;
- (b) Construction of the pavement and related works adjacent to the rail only if required and;
- (c) Working with CP within the right-of-way;

E35.6 Work by the Contractor that requires flagging protection by CP shall be performed through consecutive working days in a continuous operation, such that flagging protection can be provided for a single distinct time period.

E35.7 Measurement and Payment

E35.7.1 Working Near Rail will be considered incidental to the Work. No measurement and payment will be made within this section.

E36. EXCAVATION OF CONTAMINATED SOILS FOR ROADWAY CONSTRUCTION

E36.1 General Requirements

E36.1.1 Excavation for all existing soils for the roadway between 30m east and west of the center of the Creek embankment shall follow the appropriate disposal as outlined in the Remediation Plan approved by Manitoba Sustainable Development. The soils are to be disposed of at an appropriate facility as outlined in the Remediation Plan. Should the remedial method change or disposal facility or location change, approval from Manitoba Sustainable Development would be required in advance of the alteration of the disposal facility.

E36.2 Measurement and Payment

E36.2.1 Excavation including removal, hauling, disposal and tipping shall be included paid for at the Contract Unit Price per cubic meter for "Excavation of Contaminated Soils for Roadway Construction". The area to be paid will be the total number of cubic meters of existing soil excavated in accordance with this specification, as measured and accepted by the contract administrator.

E37. OPERATING CONSTRAINTS FOR WORK IN CLOSE PROXIMITY TO CRITICAL WATER INFRASTRUCTURE

E37.1 General Requirements

E37.1.1 This Section details operating constraints for all work to be carried out in close proximity to the City feeder mains and other critical water infrastructure. Close proximity shall be deemed to be any construction activity within a 5 m horizontal offset from the centreline of the feeder main/water main, within 5 m of valve chambers and other appurtenances, and any other infrastructure identified below.

E37.2 The following shall be considered critical pipelines and water infrastructure for this project:

E37.2.1 900 Feedermain

- (a) Runs east to west and located between the CP Rail line and Saskatchewan Avenue.

E37.3 General Considerations for Work in Close Proximity to Critical Water Infrastructure:

E37.3.1 Feeder mains and large diameter water mains are a critical component of the City of Winnipeg Regional Water Supply System and work in close proximity to feeder mains shall be undertaken with an abundance of caution. Large diameter feeder main and water mains cannot typically be taken out of service for extended periods to facilitate construction and inadvertent damage caused to the pipe would likely have catastrophic consequences.

E37.3.2 Work around critical water infrastructure shall be planned and implemented to minimize the time period that work is carried out in close proximity to the pipe and to ensure that the pipeline is not subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement

- E37.3.3 Large diameter pressure pipe generally has limited ability to withstand increased earth and live loading. Therefore, every precaution must be undertaken to ensure that applied loading during all phases of construction is within accepted loading parameters. PCCP typically fails in a non-ductile mode with the potential to cause extensive consequential damage to infrastructure if failure should occur. All large diameter feeder mains/water mains have the potential to cause extensive flooding.
- E37.3.4 Construction in close proximity to critical infrastructure shall not commence until both the equipment and construction method statements have been submitted, reviewed, and accepted by the Contract Administrator.
- E37.4 Submittals
- E37.4.1 Submit proposed construction equipment specifications to the Contract Administrator for review a minimum of ten (10) Business Days prior to construction. The equipment submission shall include:
- (a) equipment operating and payload weights;
 - (b) equipment dimensions, including: wheel or track base, track length or axle spacing, track widths or wheel configurations; and,
- E37.4.2 Submit a construction method statement to the Contract Administrator a minimum of ten (10) business days prior to construction. The construction method statement shall contain the following minimum information:
- (a) proposed pavement removal plan including excavation locations, excavation equipment locations, and loading positions;
 - (b) excavation plans, including shoring designs, for excavations occurring in close proximity to feeder mains (within 5 m horizontal of the pipe's centerline) where the excavation to be extended below the top of the critical infrastructure embedment zone (150 mm above the pipe); and,
 - (c) any other pertinent information required to accurately describe the construction activities in close proximity to the critical infrastructure and permit the Contract Administrator to review the proposed construction plans.
- E37.4.3 Incomplete or partial submissions will not be reviewed and will be returned to the Contractor for re-submission.
- E37.4.4 Allow five (5) Business Days for review by the Contract Administrator.
- E37.5 Feeder Main Operational Limitations
- E37.5.1 Feeder main shutdowns will not be permitted.
- E37.6 Construction Methods
- E37.6.1 Pre-Work, Planning and General Execution
- E37.6.2 No work shall commence in close proximity to feeder mains, chambers, and critical infrastructure until the equipment specifications and construction method statement have been submitted and accepted, and feeder main locations have been clearly delineated in the field. Work over feeder mains shall only be carried out with equipment that has been reviewed and quantified in terms of its loading implications on the pipe.
- E37.6.3 Contact the City of Winnipeg Water and Waste Department, Construction Services Coordinator prior to construction.
- E37.6.4 Locate feeder mains and water mains and confirm their position horizontally and vertically prior to undertaking work in close proximity to the identified feeder mains. Note that exact locations to be identified in the field. Deviations from the elevations noted on the Drawings shall be reported to Contract Administrator for review prior to proceeding with work.
- E37.6.5 Visually delineate all critical infrastructure identified herein on Site by use of paint, staking/flagging, construction fencing, snow fencing, or other suitable methods

- E37.6.6 Only utilize construction practices and procedures that do not impart excessive vibratory loads on feeder mains and chambers and critical infrastructure or that would cause settlement of the subgrade below feeder mains and critical pipelines.
- E37.6.7 Where the existing road structure must be removed, crossing of critical infrastructure shall be prohibited from the time the existing roadway structure is removed until the completion of granular base construction. At all times prior to completion of final paving; reduce equipment speeds to levels that minimize the effects of impact loading to the critical infrastructure.
- E37.6.8 Only equipment and construction practices stipulated in the accepted construction method statement and the supplemental requirements noted herein may be utilized in close proximity to feeder mains, chambers, and other critical infrastructure identified herein.
- E37.6.9 Construction operations should be staged in such a manner as to limit multiple construction loads at one time, (e.g., offset crossings sufficiently from each other, rollers should remain a sufficient distance behind spreaders to limit loads. A reasonable offset distance is 3 m between loads).
- E37.6.10 The Contractor shall ensure that all crew members understand and observe the requirements of working near feeder mains, valve chambers, and critical infrastructure. Prior to commencement of on-Site work, the Contractor shall jointly conduct an orientation meeting with the Contract Administer, all superintendents, foreman, and heavy equipment operators to make all workers on the Site fully cognizant of the limitations of altered loading on, the ramifications of inadvertent damage to, and the constraints associated with work in close proximity to feeder mains and critical pipelines. New personnel introduced after commencement of the Project need to be formally orientated as outlined herein. It is recommended that restrictions associated with the crossing, consistent with the Contractor's submitted method statement be posted on Site and near the crossing.
- E37.7 Demolition, Excavation, and Shoring
- E37.7.1 Use of pneumatic concrete breakers within 5 m of a feeder main, valve chamber, or critical pipeline is prohibited. Pavement shall be full depth sawcut and carefully removed. Use of hand held jackhammers for pavement removal will be allowed.
- E37.7.2 Only the use of permitted excavation equipment shall be allowed within 3.0m of the centerline of critical infrastructure.
- E37.7.3 Excavation:
- (a) Utilize only smooth edged excavation buckets, soft excavation, or hand excavation techniques where there is less than 1.5 m of earth cover over the pipeline.
 - (b) Where there is less than 1.0 m of soil cover above the pipeline, provide full time supervision and complete the excavation utilizing hand excavation, soft excavation methods, or machine excavation. Where machine excavation is to be used the crown of the pipeline must be exposed (or suitable located) using hand or soft excavation methods a minimum of every 1.8 m.
 - (c) Where there is less than 0.5 m of soil cover above the pipeline, provide full time supervision and complete the excavation utilizing hand excavation or soft excavation methods only.
- E37.7.4 Equipment should not be allowed to operate while positioned directly over a feeder main or critical pipeline except were permitted herein, outlined in the reviewed and accepted construction method statement.
- E37.7.5 Excavations within 3 m of the outside edge of a feeder main (hydrovac holes for confirming trenchless installations excluded) and which extend below obvert of the feeder main shall utilize shoring methods that precludes the movement of native in-situ soils (i.e. a tight shoring system).
- E37.8 Subgrade Construction
- E37.8.1 No subgrade construction is anticipated within this Work.

E37.9 Subbase and Base Course Construction

E37.9.1 Subbase or base course materials shall not be dumped directly on pipelines but shall be stockpiled outside limits noted in these recommendations and shall be carefully bladed in place.

E37.9.2 Subbase compaction within 3 m horizontal of the centreline of a critical pipeline shall be either carried out by static methods (without vibration) or with smaller approved equipment such as hand held plate packers or smaller roller equipment.

E37.10 Paving

E37.10.1 Vibratory compaction of asphalt pavements *shall* be permitted within 3 m (horizontal) of the center of critical pipelines.

E37.11 Measurement and Payment

E37.11.1 Working in Close Proximity to Critical Water Infrastructure will be considered incidental to the Work. No measurement and payment will be made within this section.

E38. CONCRETE SIDEWALK AND APPROACH WITH BLOCKOUTS

E38.1 Description

E38.1.1 Further to CW 3325 - R5, this specification will cover the installation of concrete sidewalk containing block outs for interlocking stone pavers.

E38.2 Referenced Standard Construction Specifications

(a) CW 3325 – Portland Cement Concrete Sidewalk

(b) CW 3310 – Portland Cement Concrete Pavement Works

E38.3 Materials

E38.3.1 Concrete mix design shall comply with CW 3310

E38.3.2 All other materials as per CW 3310.

E38.4 Construction Methods

E38.4.1 Construction as per Contract Drawings and as per CW 3310 and CW3325.

E38.4.2 Block outs for all paving patterns in sidewalk to be constructed as per the Drawings. All forming is incidental to the unit bid price for this specification.

E38.4.3 Longitudinal saw-cut shall be placed as per the Drawings and is incidental to the unit price Bid.

E38.4.4 Any thickened edges of sidewalk or approach will be incidental to the unit price Bid for the concrete sidewalk.

E38.4.5 Block outs for all bridge works such as but not limited to the transition slab, approach slab and on the bridge deck is incidental to the associated bridge item or Work.

E38.5 Measurement and Payment

E38.5.1 Supply and Installation of concrete sidewalk with block outs for paving stones will be measured on an area basis and paid for at the Contract Unit Price for "100 mm Concrete Sidewalk with Block Out for Paving Band". The area to be paid for shall be the total number of square metres formed and placed in accordance with this Specification and as measured and accepted by the Contract Administrator.

E38.5.2 Supply and Installation of concrete approach with block outs for paving stones will be measured on an area basis and paid for at the Contract Unit Price for "Construction of 300mm Concrete Pavement for Early Opening 72 hour (Reinforced) c/w Block-out for Paving Band". The area to

be paid for shall be the total number of square metres formed and placed in accordance with this Specification and as measured and accepted by the Contract Administrator.

E39. CONCRETE RETAINING CURBS AT BACK OF SIDEWALK

E39.1 Description

E39.1.1 Further to CW 3325 and CW 3310, this specification will cover the installation of concrete sidewalk containing block outs for interlocking stone pavers.

E39.2 Referenced Standard Construction Specifications

(a) CW 3325 – Portland Cement Concrete Sidewalk

(b) CW 3310 – Portland Cement Concrete Pavement Works

E39.3 Materials

E39.3.1 Concrete mix design shall comply with CW 3310

E39.3.2 All other materials as per CW 3310.

E39.4 Construction Methods

E39.4.1 Construction as per Contract Drawings and as per CW 3310 and CW3325.

E39.4.2 Height, width and length of retaining curbs at the back of the sidewalk to be constructed as per the Drawings. All forming and reinforcing steel is incidental to the unit bid price Bid for this specification.

E39.4.3 Any thickened edges of sidewalk will be incidental to the unit bid price Bid for the concrete sidewalk.

E39.4.4 Retaining curb concrete shall have a smooth face finish.

E39.4.5 Curing compound is to be applied to all exposed surfaces, and promptly following stripping of forms.

E39.4.6 Bonding agent is to be applied to bearing surfaces prior to placement of retaining curbs and is incidental to the unit bid price.

E39.4.7 Free draining granular backfill will be placed behind the retaining curb up to 200mm below top of curb shall be incidental to the unit bid price. Final surface such as boulevard grading or asphalt shall be paid for at the corresponding unit bid price.

E39.5 Measurement and Payment

E39.5.1 Supply and Installation of concrete retaining curbs 150mm tall at the back of sidewalk will be measured on a per metre basis and paid for at the Contract Unit Price for "Construction of Retaining Curb (150 mm ht Separate)". The length to be paid for shall be the total number of linear metres formed and placed in accordance with this Specification and as measured and accepted by the Contract Administrator.

E39.5.2 Supply and Installation of concrete retaining curbs 200mm tall at the back of sidewalk will be measured on a per metre basis and paid for at the Contract Unit Price for "Construction of Retaining Curb (200 mm ht Separate)". The length to be paid for shall be the total number of linear metres formed and placed in accordance with this Specification and as measured and accepted by the Contract Administrator.

E39.5.3 Supply and Installation of concrete retaining curbs 300mm tall at the back of sidewalk will be measured on a per metre basis and paid for at the Contract Unit Price for "Construction of Retaining Curb (300 mm ht Separate)". The length to be paid for shall be the total number of

linear metres formed and placed in accordance with this Specification and as measured and accepted by the Contract Administrator.

- E39.5.4 Supply and Installation of concrete retaining curbs 400mm tall at the back of sidewalk will be measured on a per metre basis and paid for at the Contract Unit Price for "Construction of Retaining Curb (400 mm ht Separate)". The length to be paid for shall be the total number of linear metres formed and placed in accordance with this Specification and as measured and accepted by the Contract Administrator.

E40. OUTFLOW RESTRICTION OF CATCH BASINS

E40.1 Description

- (a) Further to CW 2130, this specification covers the supply and installation of sewer service outlet restrictors.

E40.2 Materials and Construction Methods

- (a) Restrictors are to be installed as per SD-025B.

E40.3 Measurement and Payment

- E40.4 Supply and Installation of sewer service restrictors will be measure for each location and paid for at the Contract Unit Price for "Supply and Install Sewer Service Outlet Restrictor" as per the corresponding reduced diameter. The units will be paid for each unit supplied and placed in accordance with this Specification and as measured and accepted by the Contract Administrator.

E41. BONDING AGENT

E41.1 Description

- E41.1.1 Further to CW 3230 – R8, this specification covers the installation of bonding agent to be used for bonding tie bars and dowels into hardened concrete for the roadway

E41.2 Materials

- E41.2.1 Sika AnchorFix – 3001 – High-strength, high-load and low-voc, pure epoxy anchoring adhesive with extended working time, or equivalent product approved by the Contract Administrator.

E41.3 Construction Methods

- E41.3.1 Follow manufacturers instructions for the installation of bonding agent.

E41.4 Measurement and Payment

- E41.4.1 No measurement for payment will be made for performing all supply and operations herein described and shall be considered incidental to drilled tie-bar and/or dowel installation.

E42. INSULATION OF EXISTING WATER SERVICES

E42.1 Description

- E42.1.1 This specification shall cover the supply and installation of rigid installation over watermains, feeder mains, water services and other water infrastructure

E42.2 Materials

- (a) Approved Products

- (i) High Strength Rigid insulation for installation below grade to be CAN/ULC S701, Type 4, Styrofoam HI 40 by Dow Chemical, Foamular 400 by Owens Corning, or approved equal.

E42.3 Construction Methods

E42.3.1 Insulation shall be installed in accordance with CW2110, SD-018 and as directed by the Contract Administrator.

E42.3.2 Rigid insulation shall be installed with the top of the insulation flush with the top of the subgrade.

E42.3.3 Rigid insulation sheets shall be installed in a staggered pattern to maximize joint overlap.

E42.4 Measurement and Payment

E42.4.1 Insulation of existing water services, watermains, feeder mains and other water infrastructure will be measured on an area basis and paid for at the Contract Unit Price per square meter for "Watermain and Water Service Insulation". The area to be paid will be the total number of square meters of insulation installed in accordance with this specification, as measured and accepted by the contract administrator.